

FINAL REPORT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESMP) FOR THE NIGERIA POLICE ACADEMY KANO INTERCONNECTED SOLAR-HYBRID PROJECTS UNDER THE NIGERIA DISTRIBUTED ACCESS THROUGH RENEWABLE ENERGY SCALE-UP (DARES) - REA- NEP/DARES/C/CQS/071/2025

Submitted to



***Federal Ministry of Environment
Mabushi, FCT, Abuja.***

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FINAL ESMP REPORT

**Of the Proposed Solar Power Plant and Associated Infrastructure at the Nigeria Police Academy
(POLAC), Wuldi, Kano State**

Under the Nigeria Distributed Access Through Renewable Energy Scale-up (DARES)

**Submitted to
*Federal Ministry of Environment
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LIST OF ACRONYMS AND ABBREVIATIONS

APPI	Area of Potential Project Influence
ARAP	Abbreviated Resettlement Action Plan
BESS	Battery Energy Storage System
BMP	Biodiversity Management Plan
BOD	Biochemical Oxygen Demand
COPE	Care of the People
CWD	Coarse woody debris
DRG	Debt Relief Gains
EA	Environmental Assessment
ECN	Energy Commission of Nigeria
EEP	Energizing Education Programme
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMF	Electromagnetic Field
EMS	Environmental Management Strategy
ERSED	Erosion and sediment control
ERRP	Emergency Reporting and Response Plan
ESCP	Erosion and Sediment Control Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FEPA	Federal Environmental Protection Agency
FGN	Federal Government of Nigeria
FMEnv	Federal Ministry of Environment
GPS	Global Positioning System
GW	Gigawatt
Ha	Hectares
HSE	Health, Safety, and Environment
HT	High Tension
ICREEE	Inter-ministerial Committee on Renewable Energy and Energy Efficiency
LGA	Local Government Area
LT	Low Tension
NACOP	National Council on Power
MW	Megawatt
MWh	Megawatt hour
MWp	Megawatt peak
NEEAP	National Energy Efficiency Action Plan
NEP	Nigeria Electrification Project
NEPP	National Electric Power Policy
NERC	Nigerian Electricity Regulatory Commission
NESREA	National Environmental Standards and Regulations Enforcement Agency

NIMET	Nigerian Meteorological Agency
NML	Noise Management Level
NOx	Nitrogen oxides
NSITF	National Social Insurance Trust Fund
NUC	National University Commission
O&M	Operations and maintenance
PAPs	Project Affected Persons
PCT	Plant Community Type
PESCP	Progressive Erosion and Sediment Control Plan (aka ESCP)
PMP	Project Management Plan
POLAC	Nigeria Police Academy
PV	Photovoltaic
REA	Rural Electrification Agency
SE4All	Sustainable Energy for All
Sp./spp.	Species/species (plural)
SWMP	Soil and Water Use Management Plan
TCN	Transmission Company of Nigeria
TCP	Traffic Control Plans
TMP	Traffic Management Plan
TWA	Time Weighted Average
VLMP	Vegetation and Land Management Plan
WMP	Waste Management Plan
WPMP	Weed and Pest Management Plan

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EXECUIVE SUMMARY

ES01 INTRODUCTION

The Federal Government of Nigeria (FGN) has, over the past decade, prioritized expanding access to electricity as a critical driver of economic growth, social inclusion, and sustainable development. In 2018, this commitment materialized through the Nigeria Electrification Project (NEP), financed by concessional funding from the World Bank and the African Development Bank. The NEP was designed as a flagship off-grid electrification initiative to bridge the energy access gap in rural and underserved communities. Implemented by the Rural Electrification Agency (REA), the project successfully deployed mini-grids and standalone solar systems, delivering clean and reliable electricity to over seven million Nigerians, while stimulating private sector participation through results-based financing mechanisms.

The Rural Electrification Agency (REA) is a Nigerian government agency responsible for ensuring electricity reaches every part of the country. REA focuses on rural electrification projects, providing power solutions for on-grid and off-grid areas with an emphasis on renewable energy. As the Implementing Agency of the Federal Government of Nigeria, the team at REA is tasked with the electrification of rural and unserved communities across Nigeria.

Project Specific Activities

This component of the project will involve activities undertaken during the various implementation phases of the project as follows; the activities are separated in Section 5.3 of this report.

- Site clearing
- Civil, mechanical and electrical works
- Installation of PV panels and associated plant facilities
- Construction of training centre
- Installation of streetlights as well as underground armoured cable for power evacuation
- An upgrade of some of the existing power distribution infrastructure within the University will be carried out.
- Testing and checking individual equipment /system, as well as the associated infrastructure to ensure they have been installed correctly and can be handed over for use.
- Generation and distribution of electricity to different sections of the University campus
- Operation of the renewable energy training centre to support learning and capacity development in clean energy technologies
- Preventive and corrective maintenance aimed at maintaining optimal system performance throughout the plant's lifespan

Objectives of the ESMP

The purpose of the Environmental and Social Management Plan (ESMP) is to ensure that Environmental and Social impacts identified during the ESMP process are effectively addressed during the construction, operation and closure of the project. The ESMP specifies the mitigation and management measures to which the Proponent is committed and shows how the Project will mobilize organizational capacity and resources to implement these measures. The ESMP will be a living document and will continue to develop during the design and construction phases to enable continuous improvement of the Project's environmental performance.

The specific objectives of the ESMP are to:

- Promote effective environmental and social management and communicate the objectives and requirements of the ESMP.
- Ensure compliance with applicable environmental and social laws, regulations, permit conditions, and Project commitments.
- Define clear roles, responsibilities, and accountability for implementing environmental and social measures.
- Integrate environmental and social considerations into Project planning, design, construction, and operation.
- Apply the mitigation hierarchy by avoiding, minimizing, restoring, and, where necessary, compensating for adverse impacts.
- Enhance positive environmental, social, and economic benefits generated by the Project.
- Serve as an action plan for implementing environmental and social management measures.
- Provide a framework for implementing and monitoring mitigation and enhancement measures identified in the ESMP.
- Support continual improvement through monitoring, reporting, and corrective actions.

Rationale for ESMP

The rationale for an Environmental and Social Management Plan (ESMP) is rooted in the necessity to bridge the gap between environmental policy and project implementation. In the context of large-scale development, the ESMP acts as the primary mechanism for ensuring that the findings of an Environmental and Social Impact Assessment (ESMP) are not merely academic, but are integrated into the daily operational workflow of a project.

Scope of the ESMP

The scope of the ESMP includes;

- Project Lifecycle Integration.
- Institutional and Regulatory Boundaries
- Environmental and Social Receptors
- Mitigation and Monitoring Protocols

Work Execution Plan/Methodology

This ESMP has been prepared in accordance with standard procedures for Environmental Assessment, including other applicable World Bank safeguard policies and Nigerian policy guidelines. The baseline status of the project area was obtained through consultations with the relevant stakeholders, a review of relevant literature as well as field studies. Environmental data acquisition involved a multidisciplinary approach and was conducted in line with regulatory requirements and best international practices. This approach includes literature desktop review, designing, and development of field sampling strategy; confirmation of the sampling design and locations, pre-mobilization activities (job hazard analysis, sampling equipment/materials calibrations and checks and mobilization to the field; community consultations, sample collection, handling, documentation, and storage protocols and, and demobilization from the field, transfer of sample custody to the laboratory for analysis.

Key Components of DARES are:

- Component 1: Solar Hybrid Mini Grids for Rural Economic Development: \$410 million IDA commitment to deploy mini-grids for rural economic growth.
- Component 2: Stand-alone Solar Systems for Homes and MSMEs: \$300 million IDA commitment to provide solar systems for households and micro, small, and medium-sized enterprises
- Component 3: Technical Assistance: \$40 million IDA commitment for technical support and capacity building.

The Rural Electrification Agency (REA) is implementing DARES through its existing Project Management Unit (PMU). The project has already shown significant progress, with over 200 mini grids delivered nationwide. REA has also signed grant agreements with eight renewable energy companies to deploy solar home systems and mini grids, aiming to electrify underserved communities and drive economic growth.

Description of Project Intervention

The project is being implemented under the Distributed Access through Renewable Energy Scaleup (DARES) programme, which serves as a scale-up initiative from the Nigeria Electrification Project (NEP). Given that this is an Energy-as-a-Service (EaaS) model, the same Energy Service Company (ESCO) responsible for the design and construction of the project will also manage its operations and maintenance (O&M) throughout the service period. This arrangement promotes lifecycle accountability because the ESCO has a direct incentive to ensure that the system is designed for reliability, efficiency, maintainability, and long-term performance. Its O&M responsibilities will typically include routine inspections, preventive and corrective maintenance, fault response, equipment replacement, spare-parts management, performance monitoring, and compliance with agreed service-level requirements and key performance indicators (KPIs).

The project intervention for a utility-scale solar photovoltaic (PV) plant involves a multi-phase transformation of land to harness solar irradiance for electrical power generation. The intervention begins with site preparation, which necessitates the clearing of vegetation and the leveling of terrain to accommodate the mounting structures. This phase is critical as it alters the local topography and drainage patterns, requiring careful management to prevent soil erosion and sedimentation.

The core of the intervention involves the installation of PV modules, which are typically arranged in arrays mounted on steel or aluminum racking systems. These systems may be fixed-tilt or utilize single-axis tracking mechanisms to optimize the angle of incidence, thereby maximizing energy yield.

The electrical infrastructure component includes the installation of inverters to convert direct current (DC) to alternating current (AC), transformers to step up the voltage for grid transmission, and a network of underground or overhead cabling. The intervention also requires the construction of access roads, perimeter fencing, and an operations and maintenance (O&M) building. The total land footprint is a function of the power capacity and the technology employed, often requiring significant spatial allocation to minimize inter-row shading. The intervention concludes with the grid interconnection, which links the facility to the regional transmission network, marking the transition from the construction phase to the operational phase.

Project Schedule

The project is scheduled to last till the last quarter of 2028, starting from the second quarter of 2026 (see **Table 2.1** in Chapter 2 of the Report).

ES03 Relevant Policies, Legal and Administrative Framework

The project shall ensure compliance with the relevant and applicable local and international regulations, policies, and standards throughout its life cycle.

Policy Framework

- National Environmental Policy/ National Policy on the Environment (Revised 2016)
- Social Protection Policies
- National Policy on Climate Change/ National Climate Change Policy for Nigeria 2021-2030
- The National Electric Power Policy (NEPP), 2001
- The National Energy Policy (NEP) 2013
- The National Energy Efficiency Action Plans of Nigeria

National Legal Framework

- The Environmental Impact Assessment Act No. 86, 1992/Environmental Impact Assessment Act Cap E12 LFN 2004
- Electricity Act, 2023
- Energy Commission of Nigeria Act CAP 109 LFN 1990
- Land Use Act, Cap. L5, Laws of the Federation of Nigeria (LFN) 2004
- The Nigerian Urban and Regional Planning Act CAP N138, LFN 2004
- Harmful Waste (Special Criminal Provisions) ACT CAP H1, LFN 2004
- The Endangered Species Act, CAP E9, LFN 2004
- Inland Fisheries Act, Cap I10, LFN 2004
- The Factories Act, 1987 (Factory Act cap 126, LFN, 1990)
- Wages Boards and Industrial Councils Act, Cap W1, LFN 2004
- Employees' Compensation Act, 2010 (ECA 2010)
- National Environmental Standards & Regulations Enforcement Agency (NESREA) Act, 2007
- National Environmental Regulations:
- EIA Procedural Guidelines:
- EIA Sectoral Guidelines (Infrastructures):
- FMEnv ESMP Guidelines for Solar Mini-Grid Projects in Nigeria

International Legislation

The International Conventions, to which Nigeria is a signatory, relevant to this programme are as follows:

- African Convention on the Conservation of Nature and Natural Resources
- Convention on Biological Diversity
- Endangered Species (Control of International Trade and Traffic)
- Conservation of Migratory Species of Wild Animals 1973
- Framework Convention on Climate Change 1992
- Convention to Combat Desertification 1994
- Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW)
- Human and Peoples' Rights on the Rights of Women in Africa 2005
- Civil and Political Rights Covenant
- Economic, Social and Cultural Rights Covenant

- Convention on the Elimination of All Forms of Violence Against Women
- Convention on the Rights of the Child

Institutional Framework

This section highlights the relevant institutions through which the planning and implementation of the program will be affected. Several institutions have been identified and will be involved in the overall implementation of this programme. These include:

- The Federal Government of Nigeria (FGN)
- Federal Ministry of Power
- Transmission Company of Nigeria (TCN)
- Federal Ministry of Environment (FMEnv)
- Nigerian Electricity Regulatory Commission (NERC)
- National Environmental Standards and Regulatory Enforcement Agency (NESREA)
- National University Commission (NUC)
- Relevant State Agencies: State Ministry of Lands, State Ministry of Environment and State Environmental Protection Agencies
- Local Government Authority (LGA)

ES04 Baseline Condition of the Project Area

Overview of the Project Environment

The study adopted a multidisciplinary approach that combined field sampling, stakeholder consultations, and literature review to characterize the biophysical, socio-economic, and health conditions of the Nigeria Police Academy. Data collection was conducted using standardized methods and equipment for air quality, noise, soil, vegetation, and wildlife assessments, supported by laboratory analysis and statistical evaluation. Quality assurance and control measures were strictly implemented throughout the study to ensure the reliability and accuracy of results, in line with regulatory requirements and international best practices.

The findings indicate that the project area is characterized by a Sudan savanna ecosystem with a tropical continental climate, featuring distinct wet and dry seasons, high temperatures, and moderate rainfall. Seasonal climatic variation in Kano is marked by a prolonged dry season (October–May) and a shorter wet season (June–September). During the dry season, especially between November and February, the Harmattan period is characterized by dusty north-easterly winds, reduced visibility, low humidity, and elevated particulate matter concentrations. Conversely, the wet season experiences relatively lower temperatures, increased humidity, and reduced dust levels due to rainfall scavenging effects. Average annual rainfall ranges from approximately 800–1000 mm, while mean daily temperatures commonly vary between 26°C and 38°C, with peak temperatures occurring during March and April.

Ambient air quality in the area is generally good, with monitored gaseous pollutants remaining below national and international permissible limits. Measured concentrations of carbon monoxide (CO) ranged between 0.4–1.8 ppm, sulphur dioxide (SO₂) between 0.002–0.008 ppm, nitrogen dioxide (NO₂) between 0.003–0.015 ppm, and hydrogen sulphide (H₂S) was largely negligible (<0.001 ppm). Particulate matter concentrations recorded average values of approximately 18–42 µg/m³ for PM₁₀ and 8–20 µg/m³ for PM_{2.5}, with higher concentrations observed during the dry Harmattan season due to increased dust transport and anthropogenic activities such as vehicular movement and biomass burning. Noise levels across sampled locations ranged from about 42–68 dB(A), remaining within acceptable regulatory limits for institutional and residential environments.

Soil analysis shows predominantly sandy to loamy soils with moderate fertility and acceptable levels of heavy metals within regulatory limits. Soil pH ranged from slightly acidic to neutral (approximately 6.2–7.4), while organic matter content was generally low to moderate, reflecting the semi-arid ecological conditions. Concentrations of heavy metals such as lead (Pb), cadmium (Cd), chromium (Cr), and zinc (Zn) were within permissible standards and showed no evidence of significant contamination. Seasonal variations in soil moisture and nutrient availability were observed, with improved soil moisture retention and vegetation productivity during the rainy season.

Vegetation is mainly composed of grasses, shrubs, and drought-resistant trees such as acacia, neem, and baobab, although human activities like farming, grazing, fuelwood harvesting, and deforestation have altered the natural ecosystem. Vegetation density and greenness increase significantly during the rainy season, while dry-season conditions result in sparse ground cover and increased susceptibility to erosion and bush burning. Wildlife in the area is typical of savanna environments, including small mammals, reptiles, and bird species adapted to semi-arid conditions, with some species facing conservation concerns due to habitat degradation and human pressures.

Socio-economic and health assessments reveal a stable and moderately developed community with good access to healthcare and basic infrastructure, though livelihoods are largely dependent on agriculture and informal economic activities. The population is predominantly young to middle-aged, with relatively good sanitation facilities and mixed income levels. While electricity access exists, supply is unreliable, leading to reliance on alternative energy sources such as generators and solar systems. Community perceptions of the proposed solar power project are overwhelmingly positive, with expectations of improved power supply, economic benefits, and minimal environmental or health risks. However, the study highlights the need for enhanced stakeholder awareness, continuous environmental monitoring across both wet and dry seasons, and attention to social issues such as gender-based vulnerabilities to ensure sustainable project implementation. (see Chapter Four).

ES05 Description of Environmental and Social Impacts

The basis for identification of potential environmental and social impacts that may be associated with the proposed Solar Power project was formed during field inspections and observations, issues arising from stakeholder consultations as well as project description and designs.

Highlights of the ESMP as the primary instrument for ensuring that a project's commitment to sustainability is maintained throughout its lifecycle, bridging the gap between theoretical impact prediction and practical field execution is presented here. By establishing a rigorous system of governance, the ESMP ensures that project activities remain in strict alignment with national regulatory requirements, international lending standards, and the fundamental principles of corporate social responsibility. It provides a systematic blueprint for the mitigation of environmental and social risks and as well delineates the institutional framework, clearly assigning roles and responsibilities to project developers, contractors, and environmental consultants to ensure accountability at every stage of development. It also integrates specific mitigation measures, monitoring protocols, and reporting requirements designed to protect natural ecosystems, minimize pollution, and safeguard the well-being of local communities.

Evaluation of Impacts

Positive Impacts: The anticipated positive impacts of the proposed solar power project have been rated as either major or moderate which include;

- Independent and reliable power supply to POLAC through solar energy source and thus, improve the quality of education and other services within the institution as there will be longer hours available with better illumination for studying. Reduced noise and pollutants from generator sets, and natural habitats and human health will be protected from pollution arising from the use of fossil fuels.
- The renewable energy training centre constructed during the project implementation will provide capacity development through learning renewable energy technologies and practices in the University and consequently, the certification of trained individuals.
- The installation of streetlights as part of the proposed Project will improve safety by reducing hazards associated with flammable fuels and candles and enhance security within the school.
- Improve social cohesion and community development and generate new income as it would stimulate economic activities and offer new opportunities for small businesses in the University premises.
- The employment opportunities for skilled, semi-skilled, and unskilled labour associated with the project will multiply job creation, especially during construction to facilitate overall socioeconomic development.

Negative Impacts: Anticipated negative impacts of the proposed project have been rated as major, moderate, minor or even negligible and could include the following:

- Loss of terrestrial floral and faunal population during site clearing
- Disturbance of soil formation during excavation
- Particulate matter in form of dust, and NO_x, CO, Total Suspended Particulates (TSP), SO_x from combustion engines of the earth-moving equipment that will be used for clearing will likely impact on air quality.
- Intermittent noise emissions could also occur from the operation of the machinery.
- Injury and accidents may occur especially when those involved are unskilled

ES06 Environmental and Social Mitigation and Management Plan

The ESMP also incorporates the actions needed to implement these measures, including the following features:

- Mitigation measures based on the potential environmental and social impacts describing with technical details each mitigation measure;
- The ESMP also includes monitoring objectives that specifies the type of monitoring activities that will be linked to the mitigation measures. Specifically, the monitoring section of the ESMP provides:
 - A specific description, and technical details, of monitoring measures that includes the parameters to be measured, frequency of measurements and definition of thresholds that will signal the need for corrective actions;
 - Monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and to furnish information on the progress and results of mitigation.
- The ESMP provides a description of institutional arrangements i.e. who is responsible for carrying out the mitigating and monitoring measures (for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training);

- Additionally, the ESMP includes an estimate of the costs of the measures and activities recommended; and
- The ESMP is required all through the implementation stage of the project or sub-project.

Mitigation/Action Plan

Mitigation and management measures for the significant adverse impacts (rated as moderate or major) identified from the analysis and evaluation of the potential impacts from the proposed project activities are provided in **Table 6.1** of the report.

Environmental and Social Monitoring

Environmental and Social monitoring is an important aspect of an ESMP during project implementation. It is a way of systematically monitoring both effects and compliance of the proposed project to existing regulations throughout the entire life cycle and shall oversee the effectiveness of impact mitigation measures, including the extent to which mitigation measures are successfully implemented. This is presented in **Table 6.2** of this report.

Capacity Building for Implementation of ESMP and Permit Conditions

All staff employed will be trained in the following:

- General operation of the plant.
- Environmental management.
- Specific job roles and procedures.
- Occupational health and safety; and
- Contingency plans and emergency procedures. Training will include:
- Induction training on appointments.
- Specialist training (as required for specific job roles); and
- Refresher training as required.

The capacity building plan proposed to achieve this is provided in **Table 6.3** of the report.

Roles, Responsibilities and Accountabilities

The Rural Electrification Agency Project Management Unit (REA-PMU) supervises the implementation of the ESMP throughout the project life span while conformance with the mitigation measures will be ensured by the Engineering, Procurement and Construction (EPC) contractor during the construction phase and by the operations and maintenance (O&M) contractor during the operational phase of the project. This is presented in **Table 6.4** of this report.

Estimated Budget for ESMP Implementation

Table 6.5 of this report provides a summary of the cost estimate required to effectively and efficiently implement the recommended mitigation measures and management plans required to address the potential and associated impacts of the proposed project. The total cost of implementing the ESMP is estimated at US\$ **57,300** with the current Naira value of 1,3500 to 1 dollar.

ES07 Incident Reporting and Emergency Response Plan

The primary objective of the ERRP is to establish a clear protocol for the identification, notification, and mitigation of emergencies. The plan must be structured around a tiered response system.

ES08 Remediation and Abandonment Plan

The average life span of the solar Photovoltaic (PV) power plant to be provided as part of the proposed Project is 25years (which can be extended through regular maintenance), while the training center can last for 40 years or more. Even after 25 years, the PV panels can still generate up to 90% of the design capacity.

Site abandonment shall be preceded by the following practices:

- Identification of the components of the power plant that will be abandoned and/or removed;
- The proposed methods for abandonment or re-use of the plant equipment/material are applicable;
- Processes put in place to mitigate potential environmental impacts associated with the abandonment process; and
- Appropriate site rehabilitation programs (including re-vegetation of the site with native plant species) to return the Project site to its original status (as much as possible).

ES09 Stakeholder Engagement and Grievance Redress Mechanism

All consultation activities were properly documented, including relevant data, supporting evidence, participant lists with contact information, and photographic records. Information disclosure complied with the provisions of national regulations, including the EIA Act No. 86 of 1992 (as amended under Cap E12 LFN 2004), as well as the World Bank's Environmental and Social Safeguards Standards (ESSS).

The stakeholders were identified based on the direct project beneficiaries, adversely impacted groups, project supporters /proponents, regulatory/ planning, However, the stakeholders covered are;

- Rural Electricity Agency (REA)
- Federal Ministry of Environment (FMEnv)
- Kano State Ministry of Environment
- Wuldi Local Government Area
- Federal University, Kashere community

Key feedback received during Stakeholder Consultations are presented in **Table 9.1** of the report

Grievance Redress Mechanism

The GRM serves as a structured framework that enables stakeholders to lodge complaints, track their progress, and receive timely feedback on resolutions. It ensures that grievances are handled in a fair, consistent, and efficient manner, thereby strengthening accountability and trust between project implementers and host communities. The mechanism covers a wide range of issues, including environmental impacts, social concerns, land-related matters, and labor issues. Clear procedures are established for receiving, recording, assessing, and resolving grievances, with defined timelines and responsibilities at each stage.

To ensure effectiveness, the GRM will be widely communicated to all stakeholders throughout the project lifecycle. This includes raising awareness during consultations, community meetings, and through information disclosure channels. Stakeholders will be informed about how to access the mechanism, the types of grievances that can be reported, and the expected timelines for resolution. In addition, a grievance register will be maintained to document all complaints received, actions taken, and outcomes achieved, ensuring transparency and enabling continuous improvement of the system.

The GRM will remain operational throughout the entire project lifecycle, ensuring that stakeholders have continuous access to a reliable platform for raising concerns and seeking redress, thereby contributing to the overall sustainability and social acceptability of the project.

ES10 Conclusion and Recommendations

The ESIA for the proposed solar power plant at the Nigeria Police Academy, Wudil, Kano, was conducted to ensure compliance with Nigerian regulations, international standards, and stakeholder expectations. The study integrates environmental and social considerations into project planning and implementation, aligning with the Nigerian EIA Act and the World Bank's Environmental and Social Safeguard Standards. It aims to support informed decision-making and promote sustainable development by identifying potential impacts and addressing them proactively.

The assessment involved extensive stakeholder consultations, which helped capture community concerns and ensure transparency throughout the project lifecycle. Baseline environmental and social conditions were established through field surveys, data collection, and literature reviews, providing a benchmark for future monitoring. The study also analyzed the interaction between project activities and the existing environment to identify potential environmental and socio-economic impacts. Based on these findings, appropriate mitigation measures were developed using best practices and health, safety, and environmental standards. An Environmental and Social Management Plan (ESMP) was prepared to guide the implementation of mitigation measures and ensure effective monitoring of environmental parameters such as air quality, noise levels, and groundwater conditions. The Rural Electrification Agency (REA) will be responsible for ensuring compliance with regulatory standards set by the Federal Ministry of Environment and the World Bank.

The ESMP study specifically recommends the following:

- Ensure full implementation of the Environmental and Social Management Plan (ESMP) throughout the project lifecycle.
- Conduct regular environmental monitoring for air quality, noise, groundwater, and waste management.
- Maintain continuous stakeholder engagement and effective community communication.
- Prioritize local employment, capacity building, and renewable energy training opportunities.
- Implement strong occupational health and safety measures, including emergency response systems.
- Establish and maintain an efficient Grievance Redress Mechanism (GRM) for timely resolution of complaints.
- Promote proper waste management, including safe disposal of hazardous and electronic waste.
- Ensure compliance with regulatory requirements through continuous oversight by the Rural Electrification Agency and relevant authorities.

ACKNOWLEDGEMENTS

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CHAPTER ONE

INTRODUCTION

1.1 Background

The Federal Government of Nigeria (FGN) has, over the past decade, prioritized expanding access to electricity as a critical driver of economic growth, social inclusion, and sustainable development. In 2018, this commitment materialized through the Nigeria Electrification Project (NEP), financed by concessional funding from the World Bank and the African Development Bank. The NEP was designed as a flagship off-grid electrification initiative to bridge the energy access gap in rural and underserved communities. Implemented by the Rural Electrification Agency (REA), the project successfully deployed mini-grids and standalone solar systems, delivering clean and reliable electricity to over seven million Nigerians, while stimulating private sector participation through results-based financing mechanisms.

In response to this need, the Nigeria Distributed Access through Renewable Energy Scale-Up (DARES) Project was conceived as a follow-on initiative to build on the successes of the NEP. Launched by the World Bank at COP27, DARES represents a strategic effort to accelerate electrification through increased financing, innovative de-risking instruments, and enhanced private sector engagement. With a financing envelope of US\$750 million, the project aims to provide electricity access to over 13 million Nigerians by significantly scaling up the deployment of mini-grids both isolated and interconnected—as well as standalone solar home systems.

The rationale for the DARES project lies in the need to deepen and expand the impact of earlier interventions while addressing persistent barriers to energy access. These barriers include high upfront capital costs, limited access to financing for developers, and the risks associated with operating in underserved markets. By leveraging public funds to crowd in private investment and applying results-based financing approaches, DARES seeks to triple the pace of electrification in Nigeria. Furthermore, the project aligns with Nigeria's broader energy transition objectives by promoting clean energy solutions that reduce reliance on fossil fuels and contribute to climate mitigation efforts.

The Rural Electrification Agency (REA) is a Nigerian government agency responsible for ensuring electricity reaches every part of the country. REA focuses on rural electrification projects, providing power solutions for on-grid and off-grid areas with an emphasis on renewable energy. As the Implementing Agency of the Federal Government of Nigeria, the team at REA is tasked with the electrification of rural and unserved communities across Nigeria.

1.2 Project Specific Activities

This component of the project will involve activities undertaken during the various implementation phases of the project as follows;

- Site clearing
- Civil, mechanical and electrical works
- Installation of PV panels and associated plant facilities
- Construction of training centre

- Installation of streetlights as well as underground armoured cable for power evacuation
- An upgrade of some of the existing power distribution infrastructure within the University will be carried out.
- Testing and checking individual equipment /system, as well as the associated infrastructure to ensure they have been installed correctly and can be handed over for use.
- Generation and distribution of electricity to different sections of the University campus
- Operation of the renewable energy training centre to support learning and capacity development in clean energy technologies
- Preventive and corrective maintenance aimed at maintaining optimal system performance throughout the plant's lifespan
- Periodic cleaning of photovoltaic (PV) panels to maintain their efficiency
- Regular safety inspections and implement measures aimed at preventing accidents, injuries, and occupational health risks
- Wastes management

1.3 Objectives of the ESMP

The purpose of the Environmental and Social Management Plan (ESMP) is to ensure that Environmental and Social impacts identified during the ESMP process are effectively addressed during the construction, operation and closure of the project. The ESMP specifies the mitigation and management measures to which the Proponent is committed and shows how the Project will mobilize organizational capacity and resources to implement these measures. The ESMP will be a living document and will continue to develop during the design and construction phases to enable continuous improvement of the Project's environmental performance.

The specific objectives of the ESMP are to:

- Promote effective environmental and social management and communicate the objectives and requirements of the ESMP.
- Ensure compliance with applicable environmental and social laws, regulations, permit conditions, and Project commitments.
- Define clear roles, responsibilities, and accountability for implementing environmental and social measures.
- Integrate environmental and social considerations into Project planning, design, construction, and operation.
- Apply the mitigation hierarchy by avoiding, minimizing, restoring, and, where necessary, compensating for adverse impacts.
- Enhance positive environmental, social, and economic benefits generated by the Project.
- Serve as an action plan for implementing environmental and social management measures.
- Provide a framework for implementing and monitoring mitigation and enhancement measures identified in the ESMP.
- Support continual improvement through monitoring, reporting, and corrective actions.

1.4 Rationale for ESMP

The rationale for an Environmental and Social Management Plan (ESMP) is rooted in the necessity to bridge the gap between environmental policy and project implementation. In the context of large-scale development, the ESMP acts as the primary mechanism for ensuring that the findings of an

Environmental and Social Impact Assessment (ESMP) are not merely academic, but are integrated into the daily operational workflow of a project.

The fundamental rationale for the ESMP is the mitigation of uncertainty. During the planning phase, environmental impacts are often predicted through modeling and baseline studies. The ESMP provides a structured, iterative process to verify these predictions and manage unforeseen impacts as they arise during construction and operation. By establishing a formal management system, the ESMP ensures that the project developer fulfills their "duty of care" toward the environment and local communities, thereby reducing the risk of legal liability, project delays, and reputational damage.

Furthermore, the ESMP is essential for the allocation of resources. It defines the institutional framework, assigning specific roles and responsibilities to contractors and environmental managers, which prevents the diffusion of accountability. From a financial perspective, international lending institutions—such as those adhering to the Equator Principles—require an ESMP as a condition for project financing. The rationale here is to ensure that the project meets international environmental and social performance standards, which serves to protect the lender's investment by minimizing the risk of environmental litigation or social unrest.

1.5 Scope of the ESMP

The scope of the ESMP includes;

1. The ESMP will address the distinct environmental challenges associated with each phase. During construction, the scope focuses on site-specific impacts such as erosion, dust, noise, and waste management. During operation, the scope shifts toward long-term monitoring of emissions, resource consumption, and ongoing community engagement.
2. The scope defines the limits of responsibility for the project developer, contractors, and subcontractors. It establishes the legal and administrative framework within which all project personnel must operate to ensure adherence to environmental permits and licenses.
3. The plan also covers a wide array of receptors, including physical (air, water, soil), biological (flora, fauna, ecosystems), and social (local communities, cultural heritage, public health) elements. The scope is defined by the spatial and temporal boundaries established during the ESMP, ensuring that all areas directly or indirectly affected by the project are managed.
4. The scope includes the development of specific procedures for incident reporting, emergency response, and training. It mandates the use of quantitative benchmarks, where the effectiveness of management is evaluated against established quality standards.

1.6 Work Execution Plan/Methodology

This ESMP has been prepared in accordance with standard procedures for Environmental Assessment, including other applicable World Bank safeguard policies and Nigerian policy guidelines. The baseline status of the project area was obtained through consultations with the relevant stakeholders, a review of relevant literature as well as field studies. Environmental data acquisition involved a multidisciplinary approach and was conducted in line with regulatory requirements and best international practices. This approach includes literature desktop review, designing, and development of field sampling strategy; confirmation of the sampling design and locations, pre-mobilization activities (job hazard analysis, sampling equipment/materials calibrations and checks and mobilization to the field; community consultations, sample collection, handling, documentation, and storage

protocols and, and demobilization from the field, transfer of sample custody to the laboratory for analysis. A summary of field sampling methods is discussed in the sub-sections below.

1.6.1 Daily Toolbox Meeting

A daily toolbox meeting was held before work to ensure that team members understood the work plan of the day and the security and safety tips. These are geared toward achieving a successful data-gathering exercise and zero incidents.

1.6.2 Data collection and information gathering

Data gathering for the biophysical and social components of the project environment was undertaken from 12th to 14th February 2026 (dry season), while the secondary data collection was obtained from existing sources, including the following:

- Stakeholders, including government agencies, community chiefs, elders, women, and youths in various communities and community-based organizations (cooperative societies, development committees, etc).
- Local experts and research, and academic organizations
- National and state data sources (population data).
- Environmental Assessment of Cobalt 20214.

1.6.3 Sampling Design/ Protocol

Sampling maps were designed to provide spatial distributions of the sampling points within the study area.

Table 1.1 List of Geographical Coordinates

Sample ID	Latitude	Longitude	Environmental Matrix
AQ	N 11 ⁰ 49' 23.6784''	E 8 ⁰ 47' 48.7896''	Air /noise
AQ	N 11 ⁰ 49' 22.4981''	E 8 ⁰ 47' 59.2341''	Air /noise
AQ	N 11 ⁰ 49' 25.4772''	E 8 ⁰ 47' 58.2502''	Air /noise
AQCTL	N 11 ⁰ 49' 26.8458''	E 8 ⁰ 47' 59.8641''	Air /noise
SS1	N 11 ⁰ 49' 23.6784''	E 8 ⁰ 47' 48.7896''	Soil
SS2	N 11 ⁰ 49' 22.4981''	E 8 ⁰ 47' 59.2341''	Soil
SS3	N 11 ⁰ 49' 25.4772''	E 8 ⁰ 47' 58.2502''	Soil
SS CTL	N 11 ⁰ 49' 26.8458''	E 8 ⁰ 47' 59.8641''	Soil



Figure 1.1: Sampling Map

1.6.4 Field Sampling Equipment and Methods

1.6.4.1 Meteorology/Air Quality and Noise Measurements

Meteorological elements, namely wind, speed, wind direction, humidity, and temperature, were measured during the fieldwork from 4 predetermined locations (See Sampling Map – Figure 4.1). Each sampling location was adequately georeferenced with a GPS. Gombemax Gas Meter with Model No.2750 was used for the measurement of the following parameters: Carbon Monoxide (CO), Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Carbon Dioxide (CO₂), and Hydrogen Sulphide (H₂S). Particulate Meter (PM) with Model No. DT-9880 was used to measure suspended particulate matter (SPM). The Noise levels at each point was measured with an Extech Noise Meter (Model No.407722). The sensor of the noise meter was directed toward the source of noise and the average reading over a period of three minutes was taken to be the Noise level at each point. Plate 4.2 shows air quality and noise measurements being taken during the studies.

1.6.4.2 Soil Sampling

Topsoil (0-15cm) and bottom soil (15-30cm) samples were collected from 3 points and 1 control using a hand auger. Two (2) auger bores were homogenized to form a composite sample. Samples for microbiology were taken in 25 ml sterilized vials. Samples for physico-chemical parameters were collected in pre-cleaned 250ml amber bottles. The samples were properly labeled and preserved in ice chests at 4°C.

1.6.4.3 Vegetation and Wildlife Studies

The vegetation survey was carried out along designated sampling transects/sub-transects. The location of each sampling point was confirmed using GPS. Vegetation was studied in sampling quadrats measuring 20 m x 20 m. For each sampling point, information on habitat, vegetation structure and species were recorded. Habitat data included vegetation description, latitude, longitude, and signs of wildlife. Plant species were categorized into trees (4m or more), shrubs (0.5m to 4m), and herbs (less than 0.5m). Dendrometric parameters recorded included height (m), diameter (cm) and number of trees. A pair of binoculars (Model: Helios Fieldmaster 8x40) was employed to aid in the field identification of trees. Plants were also observed for any disease symptoms/conditions.

Field observations were made at each sampling location for evidence of vertebrate wildlife. Hideouts such as crevices, leaf litter, logs etc. were probed with props to root out any hidden animals. Tree canopies were observed for birds and other arboreal animals such as squirrels and snakes. The indirect count method was employed, particularly for animals that do not readily offer themselves for observation.

1.6.5 Quality Assurance/Quality Control

Standard methods and procedures were strictly adhered to in the course of this study. The quality assurance program covers all aspects of the study, including sample collection, handling, laboratory analysis, data coding, statistical analysis, presenting and communicating results.

Chain of custody procedures including sample handling, transportation, logging and cross-checking in the laboratory were also implemented. Trip blanks were used to assess the quality assurance/quality control of sample preservation, packaging, shipping, and storage.

The following precautions were also observed:

- ✓ Samples were collected in bottles that have been thoroughly washed with detergent (nutrient-free) and rinsed thoroughly;
- ✓ All sampling equipment is properly protected and maintained in accordance with manufacturers' manuals;
- ✓ Sampling bottles were adequately labeled with masking tapes and indelible markers to avoid mistaken identity;
- ✓ Only analytical grade (Analar) chemicals were used and where applicable, redistilled.
- ✓ Automated equipment is calibrated prior to field sampling.

Where samples were sent to another laboratory for analysis, a duplicate copy of the samples' information was sent along with the sample to the laboratory, independent of the sample. All movements of the samples were included in the sample record. Basic information was recorded together with the results of the analysis, in a sample registry. With proper, sustained calibration of the instrument and the use of standardized observational procedures, equipment errors were brought to an acceptable minimum.

1.6.5.1 Sample Handling and Preservation

All the samples collected during the fieldwork were labeled clearly and secured in easily identifiable containers. Each label contained the following Information:

- Date and/or time of sampling
- Sample name and number
- Type of sample
- Type of preservative used if any.

1.6.6 Laboratory Analysis

After the fieldwork exercises, study samples were transported to Tudaka Analytical Nigeria Ltd, Warri Delta State, Nigeria (accredited by FMEnv) for analyses. Samples brought to the laboratory were analyzed using standard analytical methods. The synoptic description of the laboratory methods and procedures employed for the various physical, chemical, and biological parameters, as well as the detection limits of these parameters in water and sediment samples.

CHAPTER TWO

PROJECT DESCRIPTION

2.1 Project Overview

The Nigeria Police Academy Wudil is located in Wudil Local Government Area of Kano State, a region that falls within the Sudan–Sahel ecological zone of northern Nigeria. The environmental conditions around the academy are largely shaped by a tropical savannah climate characterized by high temperatures, seasonal rainfall, and semi-arid features. The terrain is generally flat to gently undulating, with sparse vegetation dominated by grasses, shrubs, and scattered drought-resistant trees typical of the savannah ecosystem.

Climatically, the area experiences two distinct seasons: a wet (rainy) season and a dry season. The rainy season usually occurs between May and September, bringing moderate rainfall that supports limited agricultural activities and temporary greening of the landscape. In contrast, the dry season extends from October to April and is marked by intense heat, low humidity, and the influence of the Harmattan; a dry, dusty wind from the Sahara Desert. Temperatures in Wudil are generally high throughout the year, often ranging between about 12°C and over 38°C, with peak heat occurring between March and May.

The natural vegetation around the academy reflects the semi-arid environment. It consists mainly of savannah grassland interspersed with thorny shrubs and scattered trees such as acacia and baobab. During the rainy season, grasses grow rapidly and provide temporary ground cover, but much of this vegetation dries up during the long dry season. Soil types in the area are typically sandy or loamy, which are prone to erosion and reduced fertility, especially under conditions of overgrazing and human activity.

Human activities also influence the environmental conditions around the academy. The surrounding communities engage in farming, livestock rearing, and small-scale trading, which contribute to land-use changes such as deforestation and soil degradation. Additionally, the broader northern Nigerian environment faces challenges such as desertification, water scarcity, and increasing temperatures due to climate change. These factors collectively shape the environmental context of the Nigeria Police Academy, making it a region characterized by fragile ecosystems and the need for sustainable environmental management practices.

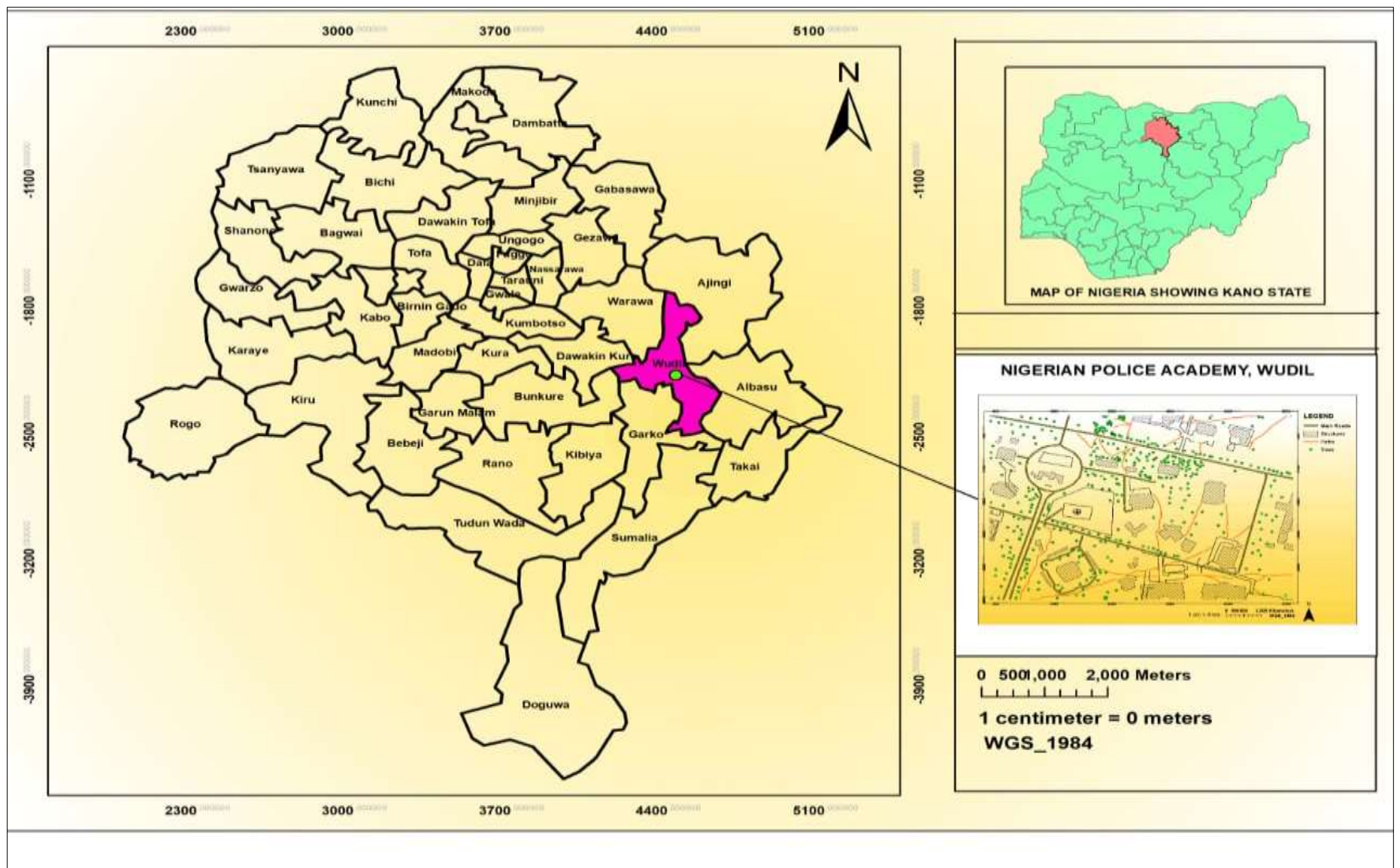


Figure 2.1: Administrative Map of Kano Showing the Project Area

2.2 Project Components

There are three key components of the project and the specific activities under these components are discussed below

Component One: The deployment of Solar Hybrid Mini-Grids which represents a transformative approach to rural electrification, particularly in regions where traditional grid extension is economically unfeasible. The World Bank's International Development Association (IDA) has committed \$410 million to scale these projects, recognizing that reliable electricity is a fundamental catalyst for rural economic growth. By integrating solar photovoltaic (PV) arrays with battery energy storage systems (BESS) and often a secondary power source—such as a diesel generator or wind turbine—these hybrid systems provide a stable, 24/7 power supply that supports local businesses, agricultural processing, and essential community services. The economic impact of these mini-grids is measured by their ability to foster "productive use of energy" (PUE), which allows rural entrepreneurs to transition from manual labor to mechanized processes.

Component Two: The deployment of stand-alone solar systems, often referred to as Solar Home Systems (SHS), represents a critical strategy for bridging the energy access gap for households and Micro, Small, and Medium-sized Enterprises (MSMEs). Supported by a \$300 million commitment from the International Development Association (IDA), these systems provide decentralized power solutions that bypass the need for expensive and time-consuming grid infrastructure expansion. By utilizing individual photovoltaic panels, charge controllers, and battery storage, these systems enable users to power essential lighting, communication devices, and small-scale business equipment, thereby fostering immediate economic activity in off-grid areas.

To ensure reliability, the system must be sized to account for "days of autonomy," which refers to the number of consecutive days the battery can power the load without sufficient solar input. For MSMEs, these systems are often modular, allowing businesses to scale their energy capacity as their operational needs grow. The IDA funding is instrumental in lowering the barrier to entry for these technologies through innovative financing mechanisms, such as pay-as-you-go (PAYG) models, which allow low-income users to pay for their systems in affordable installments rather than a large upfront capital expenditure. This approach not only enhances the financial viability of the projects but also ensures the long-term sustainability of the energy assets by integrating maintenance and service support into the business model.

Component Three: The \$40 million IDA commitment for Technical Assistance (TA) and capacity building serves as the foundational pillar for ensuring the long-term success and sustainability of solar energy interventions. While hardware deployment provides immediate access, technical assistance addresses the "soft" infrastructure—policy frameworks, regulatory clarity, and local expertise—required to maintain these systems. This funding is specifically designed to bridge the gap between international standards and local implementation capabilities, ensuring that projects are not merely installed but are effectively managed and integrated into the national energy strategy.

The assistance is to institutionalize best practices in project management, grid integration, and environmental compliance. This includes training local technicians in the operation and maintenance (O&M) of solar hybrid mini-grids and stand-alone systems, which is critical for reducing the Mean Time

to Repair (MTTR) and ensuring system longevity. Furthermore, the TA program facilitates the development of standardized procurement guidelines and quality assurance protocols, which help mitigate the risks associated with low-quality equipment. By investing in human capital, the IDA commitment ensures that the technical capacity to manage energy assets remains within the host country, fostering a self-sustaining ecosystem for renewable energy development. This capacity building often utilizes a "train-the-trainer" model, where local engineers are equipped with the skills to perform complex system diagnostics, such as analyzing the performance ratio of a plant.

The Rural Electrification Agency (REA) is implementing DARES through its existing Project Management Unit (PMU). The project has already shown significant progress, with over 200 mini grids delivered nationwide. REA has also signed grant agreements with eight renewable energy companies to deploy solar home systems and mini grids, aiming to electrify underserved communities and drive economic growths

2.3 Description of Project Intervention

The project is being implemented under the Distributed Access through Renewable Energy Scaleup (DARES) programme, which serves as a scale-up initiative from the Nigeria Electrification Project (NEP). Given that this is an Energy-as-a-Service (EaaS) model, the same Energy Service Company (ESCO) responsible for the design and construction of the project will also manage its operations and maintenance (O&M) throughout the service period. This arrangement promotes lifecycle accountability because the ESCO has a direct incentive to ensure that the system is designed for reliability, efficiency, maintainability, and long-term performance. Its O&M responsibilities will typically include routine inspections, preventive and corrective maintenance, fault response, equipment replacement, spare-parts management, performance monitoring, and compliance with agreed service-level requirements and key performance indicators (KPIs).

The project intervention for a utility-scale solar photovoltaic (PV) plant involves a multi-phase transformation of land to harness solar irradiance for electrical power generation. The intervention begins with site preparation, which necessitates the clearing of vegetation and the leveling of terrain to accommodate the mounting structures. This phase is critical as it alters the local topography and drainage patterns, requiring careful management to prevent soil erosion and sedimentation.

The core of the intervention involves the installation of PV modules, which are typically arranged in arrays mounted on steel or aluminum racking systems. These systems may be fixed-tilt or utilize single-axis tracking mechanisms to optimize the angle of incidence, thereby maximizing energy yield.

The electrical infrastructure component includes the installation of inverters to convert direct current (DC) to alternating current (AC), transformers to step up the voltage for grid transmission, and a network of underground or overhead cabling. The intervention also requires the construction of access roads, perimeter fencing, and an operations and maintenance (O&M) building. The total land footprint is a function of the power capacity and the technology employed, often requiring significant spatial allocation to minimize inter-row shading. The intervention concludes with the grid interconnection, which links the facility to the regional transmission network, marking the transition from the construction phase to the operational phase.

2.4 Project Schedule

The proposed Project is planned to be operational by the fourth quarter (Q4) of 2028. The tentative Project schedule is provided in **Table 2.1**.

Table 2.1: Tentative Project Schedule

Project Schedule	Timeline											
	2026				2027				2028			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Site allocation												
Energy demand audit												
Front-End Engineering Design												
ESMP study and Approval												
Selection of EPC Contractor and contract signing												
Civil, electrical, and mechanical design												
Procurement (manufacturing and transportation)												
Preconstruction and construction Phase Activities												
Commissioning												
Commencement of operation												

CHAPTER THREE

RELEVANT POLICIES, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 Introduction

The proposed Project is part of the Federal Government of Nigeria's Energizing Education Programme, a component of the Nigeria Electrification Project being implemented by the Rural Electrification Agency. Several laws and regulations apply to the energy sector in Nigeria. In addition to the above, several laws, regulations, policies, and instruments have been established to support environmental and social management and the EIA process in Nigeria. This section provides an overview of the relevant statutory regulations, legislation, and guidelines for the proposed Project and the ESMP study. The project shall ensure compliance with the relevant and applicable local and international regulations, policies, and standards throughout its life cycle.

3.2 Policy and Legal Framework

3.2.1 FGN Requirements and Relevant Legislation

The Constitution of the Federal Republic of Nigeria (1999), as the national legal order, recognizes the importance of improving and protecting the environment and makes provision for it. The relevant sections are:

- **Section 20** makes it an objective of the Nigerian State to improve and protect the air, land, water, forest, and wildlife of Nigeria.
- **Section 12** establishes, though impliedly, that international treaties (including environmental treaties) ratified by the National Assembly should be implemented as law in Nigeria; and
- **Sections 33 and 34**, which guarantee fundamental human rights to life and human dignity, respectively, have also been argued to be linked to the need for a healthy and safe environment to give these rights effect.

The Policy, Legal, and Institutional Framework guiding the Environmental and Social Impact Assessment (ESMP) for the proposed project is anchored on applicable national policies, laws, and institutional arrangements, as well as relevant international standards. At the national level, the framework is defined by the Federal Ministry of Environment (FMEnv) regulations, including the Environmental Impact Assessment Act Cap E12 LFN 2004, FMEnv Procedural Guidelines (2017), and other sectoral environmental, social, health, and safety regulations. The assessment also aligns with the objectives of the Nigeria Electrification Project and the Rural Electrification Agency's implementation framework. At the international level, the ESMP is guided by the African Development Bank Integrated Safeguards System, alongside international good practice such as the IFC Performance Standards and relevant ISO standards, ensuring that the project complies with both national regulatory requirements and global environmental and social sustainability benchmarks.

3.2.2 Policy Framework

3.2.2.1 National Environmental Policy/ National Policy on the Environment (Revised 2016)

The national environmental policy launched by Government in November 1989 revised in 2016, prescribed guidelines for achieving sustainable development in fourteen vital sectors of the nation's economy, namely: Human Population; Land Use and Soil Conservation; Water Resources Management; Forestry, Wildlife and Protected Natural Areas; Marine and Coastal Area Resources; Sanitation and Waste Management; Toxic and Hazardous Substances; Mining and Mineral Resources; Agricultural Chemicals; Energy Production; Air Pollution; Noise in the Working Environment; Settlements; Recreational Spaces, Green Belts, Monuments, and Cultural Property.

It also contains Nigeria's commitment to ensuring that the country's natural and built environment is safeguarded for the use of present and future generations. This commitment demands that efficient resource management and minimization of environmental impacts be the core requirements of all development activities. Accordingly, this Policy seeks to promote good environmental practices through environmental awareness and education. The goal of the National Policy on the Environment is to 'ensure environmental protection and the conservation of natural resources for sustainable development'. Its strategic objective is to coordinate environmental protection and natural resources conservation for sustainable development.

3.2.2.2 Social Protection Policies

Social protection policy has been on the agenda since 2004, when the National Planning Commission, supported by the international community, drafted a social protection strategy. More recently, the National Social Insurance Trust Fund (NSITF) drafted a social security strategy. The social protection policy approached social protection using a life cycle and gender lens, recognizing both economic and social risks, including, for example, job discrimination and harmful traditional practices. The policy was organized around four main themes: social assistance, social insurance, child protection and the labour market.

However, only a few of the instruments of this approach were adopted in the national implementation plan, most notably the provision of specific and limited social assistance, social insurance (such as expanding national health insurance to the informal sector) and labour market programmes (such as developing labour-intensive programmes). Moreover, in practice, programmes to date have been focused largely on conditional cash transfers and two health financing mechanisms driven by the federal government with little inter-sectoral or state-federal coordination. A significant number of actors are involved in funding and implementing social protection, including those from government, donors, international non-governmental organisations and civil society. Federal government-led social protection includes three main programmes:

- The conditional cash transfer in Care of the People (COPE) (funded initially through the debt relief gains (DRG fund) targeted at households with specific social categories (those with children of school-going age that are female-headed or contain members who are elderly, physically challenged, or are fistula or HIV/ AIDS patients).
- The health fee waiver for pregnant women and children under five (financed through the debt relief gains (DRG fund); and
- The community-based health insurance scheme, which was redesigned in 2011 because the previous scheme had design challenges.

Other social assistance programmes are implemented in an ad hoc manner by various government ministries, departments and agencies at state level, and some are funded by international donors. These include conditional cash transfer programmes for girls' education (in three states), child savings accounts, disability grants, health waivers, education support (such as free uniforms) and nutrition support. HIV and AIDS programming at state level also include social protection sub-components (although not as the primary objective), including nutrition, health and education support. Labour market programmes include Federal and State level youth skills and employment programmes, and Nigeria also has agricultural subsidies/inputs.

3.2.2.3 National Policy on Climate Change/ National Climate Change Policy for Nigeria 2021-2030

Given Nigeria's status as a fossil-fuel dependent economy with a large climate sensitive agricultural sector, the development of a climate change policy and response strategy is critical, as climate change

presents a serious threat to poverty eradication and sustainable development in general. One of the key pillars of Vision 20:2020 is investment in low-carbon fuels and renewable energy. Achieving the goal of low carbon, high-growth and resilient socio-economic system for equitable and sustainable socio-economic and environmental development faces some challenges which include stability and sustainability of the enabling environment, adequate institutional and human resource capacity and availability of adequate resources to address mitigation and adaptation initiatives to address climate change. Thus, the Government needs to ensure that economic growth, resource management and climate change mitigation and adaptation can all happen simultaneously if this will be done effectively (Department of Climate Change 2017).

The National Climate Change Policy for Nigeria 2021-2030 was established to promote a low-carbon, climate-resilient and gender-responsive sustainable socio-economic development. The revised National Policy on Climate Change was to define a new holistic framework to guide the country's response to the development challenge of climate change.

3.2.2.4 The National Electric Power Policy (NEPP), 2001

In order to ensure a safe, steady, reliable and progressively improved electric power sector in Nigeria, the Electric Power Reform Implementation Committee (EPIC) was inaugurated by the BPE and resulted in Federal Executive Council (FEC) of Nigeria approving the National Electric Power Policy in September 2001, which recommended, amongst others: establishment of the electric power sector regulator and the privatisation of the electric power sector. The National Electric Power Policy (NEPP), 2001 outlines the realization of an adequate and reliable supply of electricity in three phases - the privatization of the state-own utility NEPA and the introduction of the Independent Power Producers (IPPs); increasing the competition between market participants, partial removal of subsidies, and sale of excess power to distribution companies (DISCOs); and the freedom to select suppliers by large consumers and the creation of a fully liberalized and competitive market.

In 2004, the National Integrated Power Project (NIPP) was initiated to boost power supply by the launch of gas-powered stations. The National Electric Power Policy (NEPP) of 2001 resulted in the Electric Power Sector Reform (EPSRA) Act of 2005, establishing the Nigerian Electricity Regulatory Commission (NERC). The EPSRA provided the statutory basis for the privatization of the power sector.

3.2.2.5 The National Energy Policy (NEP) 2013

The National Energy Policy (NEP) 2013 is a revised version of the NEP 2003, emphasizes the effective and efficient use of energy and proposes major areas to be considered for energy efficiency and conservation including amongst others: transportation, services/commercial sector, and energy efficient building designs.

3.2.2.6 The National Energy Efficiency Action Plans of Nigeria

The first version of the National Energy Efficiency Action Plans (NEEAP) for Nigeria (2015-2030) was approved on July 14, 2016, by the National Council on Power (NACOP). It has been formulated within the framework of United Nations' Sustainable Energy for All (SE4All) and adopted by the Inter-Ministerial Committee on Renewable Energy and Energy Efficiency (ICREEE). The NEEAP includes baseline data and information on energy efficiency activities and programmes in Nigeria, barriers to the development and promotion of energy efficiency in the country and suggested achievable energy efficiency targets, including gender disaggregated indicators, based on national potentials and socio-economic assessments. The implementation of the NEEAP is being monitored by the Federal Ministry of Power.

3.3 National Legal Framework

3.3.1 The Environmental Impact Assessment Act No. 86, 1992/Environmental Impact Assessment Act Cap E12 LFN 2004

The EIA Act makes it mandatory for any person, authority, corporate body private or public, to conduct EIA before the commencement of any new major development or expansion that may likely have significant effects on the environment. The Act sets out the EIA objectives and the procedures for consideration of EIA of certain public or private projects. The programme is a minor development, which is expected to have minimum impact on the environment. Hence, the programme is categorized as Category II (B) EIA. The EIA guidelines (procedural and sectoral) issued by the FMEnv derive from this Act and the programme proponents shall conduct their activities in conformance with these guidelines.

3.3.2 Electric Power Sector Reform Act 2005

The Electric Power Sector Reform Act No. 6 of 2005 provides for the licensing and the regulation of the generation, transmission, distribution and supply of electricity. Part IV of the Act contains requirements for licensing and stipulates that no person may construct, own or undertake any of the following activities without a license, unless the generating capacity and distribution capacity is below 1 MW and 100 kilowatts (KW), respectively for electricity generation, excluding captive generation, electricity transmission, system operation, electricity distribution and trading in electricity.

3.3.3 Energy Commission of Nigeria Act CAP 109 LFN 1990

The Act was promulgated to create the Energy Commission of Nigeria (ECN) with responsibility for coordinating and general surveillance over the systematic development of the various energy resources of Nigeria. Subject to this Act, the ECN is charged with responsibility for the strategic planning and co-ordination of national policies in the field of energy in all its ramifications. The mandates of ECN include statistical analysis of Electricity Generation, Transmission and Distribution.

3.3.4 Land Use Act of 1978 and Resettlement Procedures

The Land Use Act (Cap 202, 1990), now Cap L5 Laws of the Federation of Nigeria 2004, is the key legislation that has direct relevance to this project. Relevant sections of these laws that may relate to this project with respect to land ownership and property rights, resettlement, and compensation are summarized in this section.

The Land Use Act is the applicable law regarding ownership, transfer, acquisition, and all such dealings on Land. The provisions of the Act are vast on every parcel of Land, in every State of the Federation, under the Executive Governor of the State. He holds such parcels of land in trust for the people and government of the State.

The Act categorized the land in a state into urban and non-urban or local areas. The administration of the urban land is vested in the Governor, while the latter is vested in the Local Government Councils. At any rate, all land, irrespective of the category, belongs to the State, while individuals only enjoy a right of occupancy as contained in the Certificate of Occupancy, or where the grants are “deemed”.

The concept of ownership of land as known in the Western context is varied by the Act. The Governor administers the land for the common good and the benefit of all Nigerians. The law makes it lawful for the Governor to grant statutory rights of occupancy for all purposes, grant easements appurtenant to statutory rights of occupancy, and to demand rent. The Statutory Rights of Occupancy are for a

definite time (the limit is 99 years) and may be granted subject to the terms of any contract made between the state Governor and the Holder.

The Local Government Councils may grant customary rights of Occupancy for agricultural (including grazing and ancillary activities), residential and other purposes. But the limit of such grants is 500 hectares for agricultural purposes and 5,000 for grazing, except with the consent of the Governor. The local Government, under the Act, is allowed to enter, use, and occupy for public purposes any land within its jurisdiction that does not fall within an area compulsorily acquired by the Government of the Federation or of the relevant State, or subject to any laws relating to minerals or mineral oils.

The State is required to establish an administrative system for the revocation of the rights of occupancy and payment of compensation for the affected parties. So, the Land Use Act provides for the establishment of a Land Use and Allocation Committee in each State that determines disputes as to compensation payable for improvements on the land (Section 2 (2) (c)).

In addition, each Local Government is required to set up a Land Allocation Advisory Committee to advise the Local Government on matters related to the management of land. The holder or occupier of such revoked land is entitled to the value of the unexhausted development as at the date of revocation. (Section 6) (5). Where land subject to customary rights of Occupancy and used for agricultural purposes is revoked under the Land Use Act, the local government can allocate alternative land for the same purposes (section 6) (6).

If Local Government refuses or neglects, within a reasonable time, to pay compensation to a holder or occupier, the Governor may proceed to effect assessment under section 29 and direct the Local Government to pay the amount of compensation to the holder or occupier. (Section 6) (7).

Where a right of occupancy is revoked on the ground that the land is required by the Local, State or Federal Government for public purposes or for the extraction of building materials, the holder and the occupier shall be entitled to compensation for the value at the date of revocation of their unexhausted improvements. Unexhausted improvement has been defined by the Act as:

“anything of any quality permanently attached to the land directly resulting from the expenditure of capital or labour by any occupier or any person acting on his behalf, and increasing the productive capacity the utility or the amenity thereof and includes buildings plantations of long-lived crops or trees, fencing walls, roads and irrigation or reclamation works, but does not include the result of ordinary cultivation other than growing produce.”

Developed Land is also defined in the generous manner under Section 50(1) as follows: land where there exists any physical improvement in road development services, water, electricity, drainage, building, structure or such improvements that may enhance the value of the land for industrial, agricultural or residential purposes.

It follows from the foregoing that compensation is not payable on vacant land on which there exist no physical improvements resulting from the expenditure of capital or labour. The compensation payable is the estimated value of the unexhausted improvements at the date of revocation. Payment of such compensation to the holder and the occupier as suggested by the Act may appear confusing, as it raises the following question: Does it refer to the holder in physical occupation of the land or two different parties entitled to compensation, perhaps in equal shares?

The correct view appears to follow from the general tenor of the Act.

First, the presumption is more likely to be the owner of such unexhausted improvements. Secondly, the provision of section 6 (5) of the Act, which makes compensation payable to the holder and the occupier according to their respective interests, gives a pre-emptory directive as to who shall be entitled to what.

Again, the Act provides in section 30 that where any dispute arises as to the amount of compensation calculated in accordance with the provisions of section 29, such disputes shall be referred to by the appropriate Land Use and Allocation Committee. It is clear from section 47 (2) of the Act that no further appeal will arise from the decision of such a committee. If this is so, then the provision is not only retrospective but also conflicts with the fundamental principle of natural justice, which requires that a person should not be a judge in his own cause.

The Act must, in making this provision, have proceeded on the basis that the committee is a distinct body quite different from the Governor or the Local Government. It is submitted, however, that it will be difficult to persuade the public that this is so since the members of the committee are all appointees of the Governor. Where a right of occupancy is revoked for public purposes within the state of the Federation, or on the grounds of the land for the extraction of building materials, the quantum of compensation shall be as follows:

- *In respect of the land, an amount equal to the rent, if any, paid by the occupier during the year in which the right of occupancy was revoked.*
- *In respect of the building, installation or improvements therein, for the amount of the replacement cost of the building, installation or improvements to be assessed based on the prescribed method of assessment as determined by the appropriate officer; less any depreciation, together with interest at the bank rate for delayed payment of compensation. With regards to reclamation works, the quantum of compensation is such cost as may be substantiated by documentary evidence and proof to the satisfaction of the appropriate officer.*
- *In respect of crops on land, the quantum of compensation is an amount equal to the value as prescribed and determined by the appropriate officer.*

Where the right of occupancy revoked is in respect of a part of a larger portion of land, compensation shall be computed in respect of the whole land for an amount equal in rent, if any, paid by the occupier during the year in which the right of occupancy was revoked less a proportionate amount calculated in relation to the area not affected by the revocation; and any interest payable shall be assessed and computed in the like manner.

Where there are any building installations or improvements or crops on the portion revoked, the quantum of compensation shall follow that outlined in paragraph (ii) above, and any interest payable shall be computed in like manner.

3.3.5 The Nigerian Urban and Regional Planning Act CAP N138, LFN 2004

The Urban and Regional Planning Act is aimed at overseeing realistic, purposeful planning of the country to avoid overcrowding and poor environmental conditions. In this regard, the following sections are relevant:

- **Section 30 (3)** requires a building plan to be drawn by a registered architect or town planner.
- **Section 39 (7)** establishes that an application for land development would be rejected if such development would harm the environment or constitute a nuisance to the community.

- **Section 59** makes it an offence to disobey a stop-work order. The punishment under this section is a fine not exceeding ₦10,000 (Ten thousand naira) and in the case of a company, a fine not exceeding ₦50,000.
- **Section 72** provides for the preservation and planting of trees for environmental conservation.

3.3.6 Harmful Waste (Special Criminal Provisions) ACT CAP H1, LFN 2004

The Harmful Waste Act prohibits, without lawful authority, the carrying, dumping or depositing of harmful waste in the air, land or waters of Nigeria. The following sections are notable:

- **Section 6** provides for a punishment of life imprisonment for offenders as well as the forfeiture of land or anything used to commit the offence.
- **Section 7** makes provision for the punishment accordingly of any conniving, consenting or negligent officer where the offence is committed by a company.
- **Section 12** defines the civil liability of any offender. He would be liable to people who have suffered injury as a result of his offending act.

3.3.7 The Endangered Species Act, CAP E9, LFN 2004

This Act focuses on the protection and management of Nigeria's wildlife and some of their species in danger of extinction because of overexploitation. These sections are noteworthy:

- **Section 1** prohibits, except under a valid license, hunting, capture or trade in animal species, either presently or likely, in danger of extinction.
- **Section 5** defines the liability of any offender under this Act.
- **Section 7** provides for regulations to be made necessary for environmental prevention and control as regards the purposes of this Act.
-

Most of the proposed program locations are on virgin land that serves as wildlife habitats, which will be impacted by the programme. Hence, the programme activities shall be carried out to comply with the relevant provisions.

3.3.8 Inland Fisheries Act, Cap I10, LFN 2004

The Inland Fisheries focused on the protection of the water habitat and its species. The following section is relevant:

Section 6 prohibits the taking or destruction of fish by harmful means. This offence is punishable with a fine of ₦3,000 or an imprisonment term of 2 years, or both. One of the integral components of solar hybrid systems is battery storage. During the operational phase of the project, there may be the possibility of battery leakages, which may leach into water bodies for project locations with flowing rivers. The chemical contents of these batteries are toxic to aquatic life (fisheries), which necessitates the relevance of this Act.

3.3.9 National Commission for Museums and Monuments Act, Cap. N19, LFN 2004

The Act provides for the dissolution of both the Antiquities Commission and the Federal Department of Antiquities and to create a National Commission for Museums and Monuments, with the responsibilities to establish and administer national museums, antiquities and monuments, including antiquities, science and technology, warfare, African, Black and other antiquities, arts and crafts, architecture, natural history and educational services among others. Sections 12 to 18 provide the process/steps for the declaration of antiquities as national monuments, while section 19 deals with the restriction of excavations for the purpose of finding antiquities as well as the issuance of permits and section 20 deals with accidental discoveries. In case of any accidental find, the Commission shall be notified within seven (7) days.

3.3.10 The Factories Act, 1987 (Factory Act cap 126, LFN, 1990)

The Factories Act, as contained in the Laws of the Federation of Nigeria 1990, seeks to legislate and regulate the conduct of health and safety in the Nigerian work environment. It was enacted in June 1987 with the objective of protecting the workers and other professionals against exposure to occupational hazards. The Director of Factories at the Federal Ministry of Employment, Labour and Productivity is responsible for the administration of the provisions or requirements of this Act. Section 13 allows an inspector to take emergency measures or request that emergency measures be taken by a person qualified to do so, in cases of pollution or nuisances. This Act deals with working conditions at work sites, including construction sites, such as those to be undertaken under the EEP III. Hence, the occupational requirements applicable to construction sites, as well as other work sites to be used by the program, shall be subject to the provisions of this Act.

3.3.11 Labour Act, Cap. L1, LFN 2004

This Act deals with labour issues, including payment of wages, recruitment, discipline, employee welfare, employment of women and child labour. Sections 54 to 58 which deal with employment of women, prescribed period of absence from work for nursing mothers and allows her half an hour twice a day during her working hours to attend to the baby for a period of up to six months after she resumes work. Section 55 also exempted women from night work, except when they are employed as nurses. Sections 59-64 deal with the employment of young adults.

3.3.12. Wages Boards and Industrial Councils Act, Cap. W1, LFN 2004

Wages Boards and Industrial Councils Act, Cap. W1, LFN 2004 – provides the legal framework for establishing wages boards and industrial councils to regulate wages and conditions of employment and promote orderly employer–employee relations in Nigeria.

The Act provides for the establishment of a National Wages Board and Area Minimum Wages Committee for States and for Joint Industrial Councils for particular industries. It empowers the Minister to order or direct that an industrial wages board be established to perform, in relation to the workers described in the order and their employers, the functions specified in the provisions of this Act, including the minimum wage. The minimum wage is currently ₦100,000.00 per month, and all individuals contracted/employed in relation to this programme shall not earn less than the minimum wage.

3.3.13. Employees' Compensation Act, 2010

The Employees' Compensation Act, 2010 establishes a more comprehensive compensation scheme for employees who suffer work-related injuries, occupational diseases, disabilities or death arising out of or in the course of employment. It also provides benefits for dependants of deceased employees and is administered through the Nigeria Social Insurance Trust Fund (NSITF).

3.3.14 National Environmental Standards & Regulations Enforcement Agency (NESREA) Act, 2007

Administered by the Ministry of Environment, the National Environment Standards and Regulations Enforcement Agency (NESREA) Act of 2007, replaced the Federal Environmental Protection Agency (FEPA) Act. It is the embodiment of laws and regulations focused on the protection and sustainable development of the environment and its natural resources. The following sections are worth noting:

- **Section 7** provides authority to ensure compliance with environmental laws, local and international, on environmental sanitation and pollution prevention and control through monitoring and regulatory measures.
- **Section 8 (1)(K)** empowers the Agency to make and review regulations on air and water quality, effluent limitations, control of harmful substances, and other forms of environmental pollution and sanitation.
- **Section 27** prohibits, without lawful authority, the discharge of hazardous substances into the environment. This offence is punishable under this section, with a fine not exceeding 1,000,000 (One Million Naira) and an imprisonment term of 5 years. In the case of a company, there is an additional fine of ₦50,000 for every day the offence persists.

3.3.15 National Environmental Regulations:

Section 34 of the NESREA Act, 2007, empowers the Minister of Environment to make regulations for a safe and sustainable environment. In exercise of this power, the minister issued the national environmental regulations covering various environmental components and sectors of development. The regulations relevant to the programme are as follows:

- National Environmental (Energy Sector) Regulations, 2014. S.I. 63.
- National Environmental (Electrical/Electronic Sector) Regulations, 2011, S.I. No. 23
- National Environmental (Wetlands, Riverbanks and Lake Shores) Regulations, 2009. S. I. No. 26.
- National Environmental (Sanitation and Wastes Control) Regulations, 2009. S. I. No. 28.
- National Environmental (Watershed, Mountainous, Hilly and Catchment Areas) Regulations, 2009. S. I. No. 27.
- National Environmental (Sanitation and Wastes Control) Regulations, 2009. S. I. No. 28.
- National Environmental (Noise Standards and Control) Regulations, 2009. S. I. No. 35.
- National Environmental (Air Quality Control) Regulations, 2013, S. I. No. 64,
- National Environmental (Soil Erosion and Flood Control) Regulations, 2010. S. I. No. 12.
- National Environmental (Surface and Groundwater Quality Control) Regulations, 2010. S. I. No. 22.
- National Environmental (Control of Vehicular Emissions from Petrol and Diesel Engines) Regulations, 2010. S. I. No. 20.

3.3.16. EIA Procedural Guidelines:

This procedure prescribes the steps to be followed in the EIA process from project conception to commissioning and post-commissioning impact mitigation to ensure that the program is implemented

with maximum consideration of environmental factors. This ESMP study will be conducted in compliance with this guideline.

3.3.17 EIA Sectoral Guidelines (Infrastructures):

This provides general guidelines for EIA of projects in the infrastructure sectors of Nigeria, with specific details for sub-sectors.

3.3.18. FMEnv ESMP Guidelines for Solar Mini-Grid Projects in Nigeria

The ESMP Guidelines for Solar Mini-Grid Projects in Nigeria was developed as an abridged form of the EIA Procedures Guidelines with the aim of simplifying the method of preparing ESMPs for proposed solar mini-grid projects. The simplified method is to also optimize the mini-grid projects EIA timeline and the cost of development.

3.4 International Legislation

The International Conventions, to which Nigeria is a signatory, relevant to this programme are as follows:

- African Convention on the Conservation of Nature and Natural Resources
- Convention on Biological Diversity
- Endangered Species (Control of International Trade and Traffic)
- Conservation of Migratory Species of Wild Animals 1973
- Framework Convention on Climate Change 1992
- Convention to Combat Desertification 1994
- Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW)
- Human and Peoples' Rights on the Rights of Women in Africa 2005
- Civil and Political Rights Covenant
- Economic, Social and Cultural Rights Covenant
- Convention on the Elimination of All Forms of Violence Against Women
- Convention on the Rights of the Child

3.5 Institutional Framework

This section highlights the relevant institutions through which the planning and implementation of the program will be affected. Several institutions have been identified and will be involved in the overall implementation of this programme. These include:

- The Federal Government of Nigeria (FGN)
- Federal Ministry of Power
- Transmission Company of Nigeria (TCN)
- Federal Ministry of Environment (FMEnv)
- Nigerian Electricity Regulatory Commission (NERC)
- National Environmental Standards and Regulatory Enforcement Agency (NESREA)
- National University Commission (NUC)
- Relevant State Agencies: State Ministry of Lands, State Ministry of Environment and State Environmental Protection Agencies
- Local Government Authority (LGA)

3.5.1 The Federal Government of Nigeria

Section 20 of the Constitution of Nigeria makes it an objective of the Nigerian State to improve and protect the air, land, water, forest and wildlife of Nigeria. Sections 33 and 34 which guarantee fundamental human rights to life and human dignity, respectively, can also be linked to the need for a

healthy and safe environment to give these rights effect. The Executive Council of the Federation approves all national policies including the National Policy on Environment.

3.5.2 Federal Ministry of Environment

The Federal Ministry of Environment is responsible for the overall environmental policy of the country. It has the responsibility for EIA implementation, approval and issuance of certificates. It has developed certain guidelines and regulations to protect the environment and promote sustainable development. It will monitor the implementation of mitigation measures when the project commences. They can also issue directives to the project on specific actions related to the environment in the project area. The Ministry normally involves the states and sometimes local governments in this responsibility depending on the specific activity.

3.5.3 The National Environment Standards and Regulations Enforcement Agency (NESREA)

ensure the embodiment of laws and regulations focused on the protection and sustainable development of the environment and its natural resources are monitored and complied with. NESREA ensures that the operational phase of the solar power system Mini grid project complies with national environmental standards and regulations.

3.5.4 The National Universities Commission

The National Universities Commission (the Commission) was established in 1974 by the National Universities Commission Act CAP N81 to advise the Federal and state governments of all aspects of university education and the general development of universities in Nigeria. It is the dynamic regulatory agency acting as a catalyst for positive change and innovation for the delivery of quality university education in Nigeria. It is also the agency for channeling all external aid to the universities in Nigeria; To receive block grants from the Federal Government and allocate them as appropriate.

3.5.5 The Federal Ministry of Power

The Federal Ministry of Power is the policy-making arm of the Federal Government with the responsibility for the provision of power in the country. The Ministry is guided by the provisions of the Electricity Act No 28 of 1988, the National Electric Power Policy, 2001, the Electric Power Sector Reform Act, 2005, the Roadmap for Power Sector Reform, 2010, and the National Energy Policy, 2013 as described earlier in section 1.6.4. The following parastatals are under the ministry: Energy Commission of Nigeria (ECN) Nigerian Electricity Regulatory Commission (NERC) Power Holding Company of Nigeria (PHCN) Rural Electrification Agency (REA). The responsibilities of the Federal Ministry of Power are as follows:

- Initiating and formulating broad policies and programmes on the development of the power sector Initiating concessions in the power sector Licensing of electrical contractors and electric generating sets of 1MW capacity and below
- Conducting investigation on electrical accidents and to ensure safety in the electricity industry in Nigeria
- Conducting statutory tests and certification of electric poles (concrete, wooden, steel etc.) and other major electrical materials before they are used on the grid and networks in Nigeria
- Implementing renewable energy programmes/ initiatives (solar, wind, biomass, small hydro etc.) Coordinating activities of the power sector
- Handling policy matters relating to research and development in the power sector
- Promoting the development of hydro power plants through public-private partnership (PPP), participating in bilateral and multilateral relations affecting the power sector
- Facilitating the overall coordination of the activities of the parastatals under their supervision

3.5.6 Nigerian Electricity Regulatory Commission (NERC)

The Nigerian Electricity Regulatory Commission (NERC) is an independent regulatory agency. NERC was established in 2005 as part of the economic reform agenda of the Obasanjo administration. The Electric Power Sector Reform Act of 2005 was the legislation that led to the establishment of NERC.

The Commission is required to carry out the following, amongst others:

- i. Monitor and regulate the activities of the electricity industry in Nigeria.
- ii. Issue licenses to market participants; and
- iii. Ensure compliance with market rules and operating guidelines.

In order to create an enabling investment climate for rural electrification projects, NERC established the Mini-Grid Regulation in 2016; regulatory guidelines for mini-grids less than 100 kW and a light-handed regulation for mini-grids between 100 kW and 1 MW.

3.5.7 Transmission Company of Nigeria (TCN)

TCN emerged from the defunct National Electric Power Authority (NEPA) as a product of the merger of the Transmission and Operations sectors on April 1, 2004. TCN was incorporated in November 2005. Being one of the 18 unbundled Business Units under the Power Holding Company of Nigeria (PHCN), TCN was issued a transmission License on 1st July 2006. It was subsequently issued two licenses on June 10, 2013, for electricity transmission and system operations.

3.5.8 Rural Electrification Agency

The Rural Electrification Agency was set up by Section 88 of the Electric Power Sector Reform Act 2005 as the Implementing Agency of the FGN tasked with the electrification of rural and unserved communities. The mission is to provide access to a reliable electric power supply for rural dwellers irrespective of where they live and what they do, in a way that would allow for a reasonable return on investment through an appropriate tariff that is economically responsive and supportive of the average rural customer.

3.5.9 Federal Ministry of Women Affairs and Social Development

Promote actions to achieve the National Gender Policies and a gender budget among policymakers. The goals of the gender policy, among others, include:

- Eliminate cultural/religious gender-based biases and harmful cultural and religious practices which rise to inequalities in gender-role relations in Nigerian society. A culture that is amenable to development must be dynamic.
- Tap the potential of women for development.
- Eliminate all forms of gender-based violence.
- Ensure equal access to women, boys and girls to both formal and informal education. Women's education is a priority because it is the key to gender equity, justice, and poverty reduction, improved skills and technological knowledge, as well as the general socioeconomic development of the nation.

3.5.10 State Institutions

Kano State Ministry of Environment

The Ministry of Environment is currently responsible for environmental service matters and resources in the state. Other objectives include initiating formulation, execution, and monitoring of all issues relating to all environmental matters, solid waste management, and mineral resources. A recent law passed established the Kano State Environmental Law 2021.

Kano State Ministry of Women Affairs and Social Development

The ministry seeks to empower women and youth, promote the participation of women in governance, pay attention to women in rural areas, enhance the economic self-reliance of women, create awareness, and campaign against gender-based violence, etc.

Kano State Lands and Survey

This Ministry was created for the purpose of overseeing the land resources in the state. They are also charged with the responsibility to plan, devise and implement the state policies on land and its resources.

3.6 Funding Agency Requirements

This programme is funded by the World Bank. Therefore, the World Bank Environmental and Social safeguard Standards will be integrated in the project cycle as well as other national and international environmental and social protection requirements, to comply with the best international practices. Both the main environmental and social requirements that the project needs to comply with are described in the following sections.

3.6.1 The World Bank Environmental and Social Safeguard Standards

The World Bank policies on the environmental and social safeguard are the fulcrum of its support towards sustainable poverty reduction, particularly in developing countries. The policies aimed at preventing and mitigating undue harm to the people ESMP of the proposed Solar Hybrid Power Plant and Associated Infrastructure in POLAC. As indicated in Table 1.1, the compliance status of the proposed along the various phases are presented below.

The framework was developed in alignment with applicable national environmental regulations and relevant Environmental and Social Framework (ESF) Environmental and Social Standards (ESS), particularly ESS1 (Assessment and Management of Environmental and Social Risks and Impacts), ESS2 (Labour and Working Conditions), ESS3 (Resource Efficiency and Pollution Prevention and Management), ESS4 (Community Health and Safety), and ESS10 (Stakeholder Engagement and Information Disclosure).

3.7 Institutional Arrangements for Environmental and Social Management

REA is for selecting Engineering, Procurement and Construction (EPC) contractor (through competitive process) to build, operate and maintain the proposed power plant, and also build and equip the associated training center. The selected EPC will also be considered for a ten-year operation and maintenance (O&M) contract for the power plant. In the long run, the University will be responsible for operating and maintaining the Project responsible. REA has established a Project Management Unit (PMU) which includes experienced Environmental and Social Safeguard Specialists. The REA-PMU will provide oversight functions for the management of potential environmental and social issues associated with the Project throughout its life cycle. The PMU, in conjunction with the University's Department of Works and Physical Planning, will monitor the hired contractor's E&S performance. The implementation of mitigation measures for potential environmental and social impacts associated with the Project (at various stages) will also be monitored by FMEnv, NESREA, Kano State Ministry of Environment and other relevant regulatory agencies, as part of their statutory responsibilities. In addition, the World Bank will provide overall supervision, facilitation and coordination of the Project, and monitor Project performance indicators.

Table 3.1: Safeguards Compliance Matrix for the Power Project

Pre-construction Phase

Aspect	Nigeria Legal Requirements	World Bank Standards triggered	International Agreements	Key Compliance Actions
Environmental Assessment	EIA Act (Cap E12 LFN 2004)	ESS1: Assessment of Environmental & Social Risks	Paris Agreement	Conduct EIA/ESMP; obtain approval from the Federal Ministry of Environment
Land Acquisition	Land Use Act (1978)	ESS5: Land Acquisition & Resettlement	International Labour Organization (land & livelihood rights)	Secure land titles; compensate affected persons
Stakeholder Engagement	National environmental guidelines	ESS10: Stakeholder Engagement	Aarhus Convention (principles)	Public consultations; disclosure of project info
Biodiversity Screening	NESREA Act	ESS6: Biodiversity Conservation	Convention on Biological Diversity	Identify sensitive habitats; avoid critical areas
Permits & Licensing	NERC mini-grid regulation	ESS1 compliance	NA	Obtain generation/distribution permits

Construction Phase

Aspect	Nigeria Legal Requirements	World Bank Standards triggered	International Agreements	Key Compliance Actions
Occupational Health & Safety	Factories Act; Labour Act	ESS2: Labor & Working Conditions	International Labour Organization conventions	Provide PPE; enforce safety procedures
Waste Management	NESREA Regulations	ESS3: Resource Efficiency & Pollution Prevention	Basel Convention	Proper disposal of hazardous waste (e.g., batteries)
Community Health & Safety	Public Health Act	ESS4: Community Health & Safety	WHO guidelines	Traffic management; site safety measures
Noise & Air Pollution	NESREA Air Quality Regulations	ESS3: Resource Efficiency & Pollution Prevention	Paris Agreement	Control emissions, dust, and noise
Cultural Heritage	National Commission for Museums Act	ESS8: Cultural Heritage	UNESCO conventions	Chance finds procedures in place

Operation and Maintenance Phase

Aspect	Nigeria Legal Requirements	World Bank Standards triggered	International Agreements	Key Compliance Actions
Energy Efficiency	National Energy Policy	ESS3: Resource Efficiency	Paris Agreement	Optimize system performance; reduce losses
Waste (Batteries, Panels)	NESREA e-waste regulations	ESS3: Resource Efficiency	Basel Convention	Safe recycling/disposal systems

Labor Conditions	Labour Act	ESS2: Labor & Working Conditions	International Labour Organization	Fair wages, worker rights compliance
Community Relations	Local governance laws	ESS10: Stakeholder Engagement	NA	Maintain grievance redress mechanism
Safety & Risk Management	Nigerian Electricity Safety Code	ESS4: Community Health & Safety	NA	Routine inspection and maintenance

Decommissioning Phase

Aspect	Nigeria Legal Requirements	World Bank Standards triggered	International Agreements	Key Compliance Actions
Environmental Restoration	EIA Act (closure requirements)	ESS1: Assessment of Environmental & Social Risks	Convention on Biological Diversity	Site rehabilitation and restoration
Waste Disposal	NESREA Regulations	ESS3: Resource Efficiency	Basel Convention	Dispose of solar panels, batteries safely
Worker Safety	Labour Act	ESS2: Labor & Working Conditions	International Labour Organization	Safe dismantling procedures
Community Safety	Public Health Act	ESS4: Community Health & Safety	NA	Secure site; prevent hazards post-closure
Asset Removal & Land Return	Land Use Act	ESS5: Land Acquisition & Resettlement	NA	Restore land to its original or agreed condition

CHAPTER FOUR

BASELINE CONDITION OF THE PROJECT AREA

4.1 Overview of Project Environment

4.1.1 Climate and Meteorology

Climate of the area is tropical with dry and rainy seasons respectively characterized by the hot and wet conditions associated with the movement of the Inter-Tropical Convergence Zone (ITCZ) north and south of the equator. The ITCZ appears as a band of clouds, usually thunderstorms, circling the globe near the equator and Nigeria is located just north of the equator. When it is to the south of the equator, the north-east winds prevail producing the dry season and when in the Northern Hemisphere, the south-westerly wind prevails bringing rainfall and the rainy season. Climate of the area is tropical with the dry and rainy seasons. Its mean monthly rainfall is 14-242 mm characterized by annual level of 700 – 1800 mm and mean monthly relative humidity of 54 – 89%. The mean monthly minimum air temperature is 21.3 – 23.7 °C with maximum of 27 – 33.7 °C. Its mean monthly sunshine period is 3.2 – 8.4 hours per day with surface wind is 1 – 10 m/s having occasional calmness characterized by prevailing southwestern direction. All these agree with the measured meteorological data of the study area during this study.

The air temperature data shows a clear seasonal variation between the dry and wet periods. During the dry season, temperatures are notably higher, with values ranging from a minimum of 34.1°C to a maximum of 37.4°C. This indicates consistently hot conditions, with extreme daytime heat being a defining characteristic of this period. In contrast, the wet season records slightly lower air temperatures, ranging from 32.1°C at minimum to 33.4°C at maximum. Although still warm, these temperatures reflect a cooling effect associated with increased cloud cover and rainfall.

The atmospheric pressure data show a consistent pattern across both the dry and wet seasons, with only slight variations observed. During the dry season, atmospheric pressure ranges from a minimum of 1004.4 mbar to a maximum of 1017.2 mbar, indicating relatively stable conditions with no significant fluctuations. Similarly, in the wet season, pressure values range from 1004.1 mbar to 1017.8 mbar at maximum. This closely mirrors the dry season range, suggesting that seasonal changes have minimal impact on overall atmospheric pressure levels.

The wind speed data indicate generally light to moderate wind conditions across both the dry and wet seasons, with a noticeable increase during the wet period. In the dry season, wind speeds range from 1.3 m/s at minimum to 3.1 m/s at maximum. These relatively low speeds suggest calm atmospheric conditions, which are typical of stable, dry weather. During the wet season, wind speeds show a slight increase, ranging from 1.4 m/s to a higher maximum of 4.0 m/s. This reflects more active atmospheric conditions, likely influenced by rainfall events and seasonal weather systems.

Sunshine period in the study area is 3.2 – 8.4 hours per day, with the minimum in August and maximum in January (Figure 4.8). The short sunshine period in August is associated with its greater cloudiness and rainfall characteristics. Conversely, the higher January period is due to the prevalent clear skies when the ITCZ has once more started its Northward migration. The sunshine duration reflects the double maxima feature of the rainfall pattern.

4.1.2 The Local Geology

The geology of Wudil in Kano State is part of the broader geological structure of northern Nigeria, which is dominated by sedimentary formations of the Chad Basin. This region represents a low-lying sedimentary environment that developed over millions of years through the accumulation of materials

such as sand, silt, and clay. These materials were transported and deposited by ancient rivers, wind action, and other geological processes. As a result, the surface geology of Wudil is mainly composed of unconsolidated or weakly consolidated sediments, which give rise to the sandy and loamy soils commonly observed in the area.

Beneath these sedimentary deposits lies the Basement Complex, which consists of very old crystalline rocks such as granite, gneiss, and schist. These rocks are of Precambrian age and form the geological foundation of much of Nigeria. However, in Wudil, they are not usually exposed at the surface because they are buried under thick layers of sediment. The presence of these underlying rocks is important because they influence the structure and stability of the overlying sediments, as well as the occurrence of groundwater. The surface geology of Wudil is characterized by flat to gently undulating plains, which are typical of sedimentary basin environments. The soils derived from these sediments are generally sandy, porous, and low in organic matter. This explains why the area is prone to erosion and why vegetation cover is often sparse, especially during the dry season. In some areas, especially near seasonal rivers and drainage channels, alluvial deposits are present. These are more fertile and support limited irrigation farming.

A key aspect of the geology of Wudil is its hydrogeology, or groundwater system. The sandy layers within the sedimentary sequence act as aquifers, meaning they can store and transmit water. These aquifers are often separated by layers of clay, which are less permeable and act as barriers to water movement. This layered structure allows groundwater to accumulate and be accessed through wells and boreholes, making it an important resource for domestic use and agriculture in the area. Below is a simplified diagram illustrating the geological structure of Kano State:

4.1.3 The Topography

The topography of Wudil is characteristic of the Sudan savanna region in northern Nigeria. The area is generally low-lying and gently undulating, with broad plains that stretch across much of the landscape. Elevation in Wudil is relatively modest, and there are no major mountains; instead, the terrain is dominated by flat or slightly rolling land that supports agriculture and settlement. This gentle relief makes the area accessible and suitable for farming activities, which are central to the local economy.

The soil composition in Wudil is largely sandy to loamy, typical of savanna regions, with patches of clay in low-lying areas. This variation in soil types is influenced by both erosion and deposition processes over time. Vegetation is mainly grassland with scattered trees such as acacia, reflecting the semi-arid climate. The relatively open landscape allows for both farming and grazing, contributing to mixed land use patterns.

4.1.4 Project Location from Flood Level

The project location was selected in relation to flood levels to prioritize safety and long-term sustainability. The known floodplain level in Wudil is not defined by a single fixed number, because it varies depending on seasonal rainfall, river discharge, and local topography. However, Wudil lies within the floodplain of the Kano River system, and its low-lying areas are typically between about 5 to 15 meters above the normal river channel level. During the rainy season, especially between July and September, water levels can rise significantly and spread across these plains.

In practical terms, the “known floodplain level” refers to the highest-level water has historically reached in the area. In Wudil, local observations and regional hydrological studies suggest that seasonal flooding can extend across farmlands and settlements close to the riverbanks, particularly in years of heavy

rainfall. These flood levels are influenced by upstream water flow and releases from irrigation systems such as those connected to the Kano River Project.

For planning and construction purposes, engineers and planners usually adopt a safe elevation margin above the highest recorded flood level. In Wudil, this often means siting projects at least 1–2 meters above the observed maximum flood height. The result of the spot height mapping suggests that the proposed site is not vulnerable to flooding.

4.2 Description of Physical Environment

4.2.1 Air Quality and Noise Level

The environmental data for both dry and wet seasons indicate that most measured parameters remain within acceptable limits set by the Federal Ministry of Environment (FMEnv), with only minor variations between seasons. Noise levels during the dry season range from 56.5–58.3 dB(A), with a control value of 65.21 dB(A), while the wet season shows a wider range of 56.8–68.9 dB(A) and a slightly higher control value of 69.1 dB(A). All recorded values are well below the FMEnv limit of 90 dB(A), indicating no significant noise pollution concern. Hour standards of ambient air quality are shown in **Table 4.1** while **Table 4.2** shows the air quality data obtained during field survey.

Table 4.1: Hour Standards of Ambient Air Quality

Contaminant	Concentrations (ppm)	
	FMENV (FEPA, 1991)	World Bank (1999)
CO	10	-
NO _x	0.04 – 0.06	0.08
SO ₂	0.01	-
NH ₃	0.28	-
PM ₁₀	-	80 µg/m ³
TSP	250 µg/m ³	80 µg/m ³

All values remained below the FMENV limit of 90 dB(A), suggesting acceptable ambient noise conditions (see **Table 4.3**).

Table 4.2: Nigeria's Standard Noise Levels (FEPA, 1991)

Duration per Day, hour	Permissible Exposure Limit, dB (A)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

Table 4.3: Air Quality around the Project Area (Dry and Wet Seasons)

Parameters/Unit	Units	Dry Season		EA Cobalt 2014		FMENV Limits 8 h Average
				Wet Season		
		Range	Ctrl	Range	Ctrl	
Noise level	d(B) A (day)	56.5-58.3	65.21	56.8-68.9	69.1	90
SO _x	µg/m ³	0	0	0	0	26
NO _x	µg/m ³	0	0	0	0	75-113
SPM	µg/m ³	24-28	29	31	31.5	250
VOC	µg/m ³	0	0	0	0	60
CO	µg/m ³	0	0	0	0	11.4
O ₃	µg/m ³	23-35	37.29	34-40	10	NA
CO ₂	µg/m ³	231-410	458.29	437-500	455.5	NA
H ₂ S	µg/m ³	0	0	0	0	0.01
Air Temperature	°C	34-36	34.7	34-37.1	29.9	NA
Wind Speed	m/s	0.1-0.3	0.83	1.0-1.1	1.05	NA
Humidity	%	65-70.1	71.79	68.9-78.1	71.25	NA

For gaseous pollutants, SO_x, NO_x, VOCs, CO, and H₂S recorded values of zero in both seasons, remaining far below FMEnv limits (26 µg/m³ for SO_x, 75–113 µg/m³ for NO_x, 60 µg/m³ for VOCs, 11.4 µg/m³ for CO, and 0.01 µg/m³ for H₂S). This suggests an absence of detectable emissions from these pollutants at the monitoring site. Suspended Particulate Matter (SPM) levels ranged from 24–28 µg/m³ (control: 29 µg/m³) in the dry season and about 31–31.5 µg/m³ in the wet season, which are significantly below the FMEnv limit of 250 µg/m³, indicating good air quality with respect to particulates.

For other atmospheric parameters, ozone (O₃) levels ranged from 23–35 µg/m³ (control: 37.29 µg/m³) in the dry season and 34–40 µg/m³ (control: 10 µg/m³) in the wet season; however, no FMEnv limit is specified for comparison. Similarly, carbon dioxide (CO₂) concentrations ranged from 231–410 µg/m³ (control: 458.29 µg/m³) in the dry season and 437–500 µg/m³ (control: 455.5 µg/m³) in the wet season, with no regulatory limit provided. These values indicate slightly higher concentrations during the wet season but remain within typical environmental ranges.

Meteorological parameters show seasonal variation, with air temperature ranging from 34–36°C (control: 34.7°C) in the dry season and 34–37.1°C (control: 29.9°C) in the wet season. Wind speed is lower in the dry season (0.1–0.3 m/s; control: 0.83 m/s) compared to the wet season (1.0–1.1 m/s; control: 1.05 m/s), indicating more active atmospheric movement during the wet period. Relative humidity is slightly higher in the wet season (68.9–78.1%; control: 71.25%) compared to the dry season (65–70.1%; control: 71.79%), reflecting increased moisture content associated with rainfall.

4.2.2 Soil Quality

4.2.2.1 Physicochemical Parameters

The soil pH shows a clear seasonal variation across both depths. In the dry season, pH ranges from 5.4–5.67 (0–15 cm) and 4.5–5.65 (15–30 cm), indicating moderately acidic conditions. In the wet season, pH increases to 5.7–6.69 (0–15 cm) and 5.6–6.79 (15–30 cm), showing a shift toward near-neutral conditions. This suggests that soils are less acidic during the wet season compared to the dry season. The physicochemical properties are presented in **Tables 4.4 – 4.6**.

Electrical conductivity (EC) is lower in the dry season, ranging from 78–98 $\mu\text{S}/\text{cm}$ (0–15 cm) and 113–125 $\mu\text{S}/\text{cm}$ (15–30 cm), while in the wet season, it increases to 143–162.76 $\mu\text{S}/\text{cm}$ (0–15 cm) and shows wider variability at depth (44.56–1220.4 $\mu\text{S}/\text{cm}$). This indicates higher dissolved ion concentration and greater variability during the wet season.

Temperature remains fairly consistent throughout seasons. In the dry season, it ranges from 32.5–33.4°C (0–15 cm) and 31–32.2°C (15–30 cm), while in the wet season, it is slightly higher at the surface (32.8–34.63°C) and 32.5–34.32°C at depth, indicating minimal seasonal variation.

For nutrients, nitrate in the dry season ranges from 0.1–0.38 mg/kg (0–15 cm) and 0.11–0.7 mg/kg (15–30 cm), while in the wet season it increases to 0.4–0.63 mg/kg and 0.3–0.46 mg/kg, showing higher availability during the wet season. Ammonia also increases significantly from 0.2–0.8 mg/kg (dry surface) and 0.5–0.97 mg/kg (dry depth) to 1.9–2.13 mg/kg (wet surface) and 1.3–2.57 mg/kg (wet depth), indicating enhanced nitrogen presence in the wet season.

Phosphate shows low surface values in the dry season (0.1–0.56 mg/kg) but much higher values at depth (5.9–7.23 mg/kg). In the wet season, it increases to 0.8–1.14 mg/kg (surface) and 7.9–12.5 mg/kg (depth), confirming greater accumulation and mobility during the wet period. Sulphate ranges from 9.1–12.11 mg/kg (surface) and 0.0–0.12 mg/kg (depth) in the dry season, increasing to 12.7–14.04 mg/kg (surface) and 0.5–1.95 mg/kg (depth) in the wet season. Chloride also rises from 0.7–0.87 mg/kg and 0.79–0.8 mg/kg (dry) to 0.9–1.7 mg/kg and 2.1–3.11 mg/kg (wet), particularly at deeper levels.

Total Organic Carbon (TOC) increases slightly from 0.5–0.63% (dry surface) and 0.6–0.69% (dry depth) to 0.7–0.87% (wet surface) and 0.4–0.85% (wet depth), indicating improved organic matter during the wet season. Moisture content is lower in the dry season (5.7–6.74% surface; 5.4–6.37% depth) compared to the wet season (0.8–7.73% surface; 5.4–7.64% depth), showing greater variability and generally higher moisture during the wet period.

For cations, magnesium ranges from 12.9–22.75 mg/kg (dry surface) and 17.9–19.09 mg/kg (dry depth), increasing in the wet season to 12.9–31.59 mg/kg and 24.9–29.63 mg/kg. Potassium rises from 1.4–2.43 mg/kg and 1.5–2.75 mg/kg (dry) to 2.2–5.33 mg/kg and 4.3–5.41 mg/kg (wet). Sodium also increases from 4.4–9.1 mg/kg and 6.7–8.81 mg/kg (dry) to 9.1–12.25 mg/kg and 9.8–11.98 mg/kg (wet), indicating higher ion mobility in the wet season.

Among heavy metals, copper increases from 1.9–3.44 mg/kg (dry surface) and 1.4–3.63 mg/kg (dry depth) to 3.7–4.19 mg/kg and 2.4–3.98 mg/kg in the wet season. Iron shows a significant rise from 56.0–97.18 mg/kg and 78.9–94.62 mg/kg (dry) to 121.0–170.59 mg/kg and 153–160.41 mg/kg (wet). Lead increases slightly from 0.1–0.84 mg/kg and 0.8–0.89 mg/kg to 0.7–1.35 mg/kg and 0.9–1.38 mg/kg. Zinc rises from 4.2–5.17 mg/kg and 4.7–5.13 mg/kg (dry) to 4.6–7.05 mg/kg and 6.5–7.2 mg/kg (wet). Manganese also shows an increase from 0.1–1.3 mg/kg and 0.5–1.21 mg/kg to 0.7–1.97 mg/kg and 0.5–1.99 mg/kg.

Table 4.4: Physicochemical Characteristics of Soil Quality Around the Project Area (Wet and Dry Season)

Sample ID			Dry Season Ranges		EA Cobalt 2014		Control means		EA Cobalt 2014	
					Wet Season Ranges				Control means	
Description (Depth)			(0-15cm)	(15-30cm)	(0-15cm)	(15-30cm)	(0-15cm)	(15-30cm)	(0-15cm)	(15-30cm)
pH		APHA 4500-H+	5.4-5.67	4.5-5.65	5.7-6.69	5.6- 6.79	6.4	6.6	6.325	6.015
EC	µS/cm	APHA 2510 B	78-98	125-113	143-162.76	1220.4-44.56	107	147	131.5	167
Temperature	°C	ASTM E2877	32.5-33.4	31-32.2	32.8-34.63	32.5- 34.32	34.35	34.76	28.5	29.35
Nitrate	mg/kg	APHA 4500-NO ₃ -E	0.1-0.38	0.7-0.11	0.4-0.63	0.3-0.46	0.86	0.49	0.745	0.8
Ammonia	mg/kg	APHA 4500-NH ₃ C	0.2-0.8	0.5-0.97	1.9-2.13	1.3- 2.57	0.96	0.2	2.415	0.985
Phosphate	mg/kg	APHA 4500-PE	0.1-0.56	5.9-7.23	0.8-1.14	7.9-12.5	1.62	1.5	7.83	1.62
Sulphate	mg/kg	EPA375.4 (600/4-79-020)	09.1-12.11	0.0-0.12	12.7-14.04	0.5- 1.95	10.67	12.67	1.34	10.67
Chloride	mg/kg	APHA 4500-Cl-B	0.7-0.87	0.8-0.79	0.9-1.7	2.1-3.11	2.06	1.03	0.97	2.06
TOC	%	APHA 2340 A	0.5-0.63	0.6-0.69	0.7-0.87	0.4-0.85	1.16	1.4	1.23	1.145
Moisture Content	%	ASTM D2216-05	5.7-6.74	5.4-6.37	0.8-7.73	5.4-7.64	8.66	6.5	9.24	8.605
CATIONS										
Magnesium	mg/kg	APHA 3111B	12.9-22.75	17.9-19.09	12.9-31.59	24.9-29.63	27.16	6.16	25.26	27.165
Potassium	mg/kg	APHA 3111B	1.4-2.43	1.5-2.75	2.2-5.33	4.3-5.41	4.6	4.4	6.08	4.755
Sodium	mg/kg	APHA 3111B	4.4-9.1	6.7-8.81	9.1-12.25	9.8-11.98	6.365	12.6	12.52	12.365
HEAVY METALS										
Copper	mg/kg	APHA 3111B	1.9-3.44	1.4-3.63	3.7-4.19	2.4-3.98	2	2	1.825	2
Iron	mg/kg	APHA 3111B	56.0-97.18	78.9-94.62	121.0-170.59	153-160.41	153.62	123.7	184.8	183.62
Lead	mg/kg	APHA 3111B	0.1-0.84	0.8-0.89	0.7-1.35	0.9-1.38	1.6	1.4	0.955	1.09
Zinc	mg/kg	APHA 3111B	4.2-5.17	4.7-5.13	4.6-7.05	6.5-7.2	9.075	10.04	8.715	10.075
Manganese	mg/kg	APHA 3111B	0.1-1.3	0.5-1.21	0.7-1.97	0.5-1.99	1.88	1.83	1.975	1.83

4.3 Vegetation Studies

Wudil, located in Wudil in Kano State, lies within the Sudan Savanna ecological zone of northern Nigeria. This zone represents a transitional belt between the arid Sahel to the north and the more humid Guinea savanna to the south. The ecological setting is characterized by a tropical wet-and-dry climate, with a distinct seasonal pattern. The rainy season is relatively short, typically lasting from June to September, while the dry season extends from October to May and is often influenced by the dry, dusty Harmattan winds. Annual rainfall is moderate, generally ranging between 600 and 1000 mm, and temperatures are high throughout the year. The soil in this region is usually sandy to loamy, with relatively low organic content, which affects the type and density of vegetation that can grow.

The natural vegetation of Wudil is best described as Sudan savanna vegetation, which consists mainly of open grassland interspersed with scattered trees and shrubs. Grasses form the dominant ground cover, especially during the rainy season when they grow rapidly and turn the landscape green. These grasses are typically short to medium in height and include species such as *Andropogon* and *Hyparrhenia*. However, during the long dry season, the grasses dry out, becoming brown and sparse, and are often subject to bush burning and grazing by livestock. This seasonal variation gives the landscape a markedly different appearance at different times of the year.

The tree component of the vegetation is generally sparse and consists of drought-resistant species that are well adapted to harsh climatic conditions. Common trees found in this ecological zone include acacia species, which are usually thorny and have small leaves to reduce water loss; the baobab tree (*Adansonia digitata*), known for its thick trunk that stores water; and the locust bean tree (*Parkia biglobosa*), which is economically important to local communities. Many of these trees are deciduous, shedding their leaves during the dry season to conserve moisture. Shrubs are also present and are often scattered across the landscape, contributing to soil stability and providing additional vegetation cover.

Human activities have significantly modified the natural vegetation in Wudil. Much of the original savanna has been cleared for agricultural purposes, as the area supports the cultivation of crops such as millet, sorghum, maize, and groundnuts. In areas close to water sources, especially along seasonal rivers, irrigation farming is practiced, allowing for the cultivation of crops like rice and vegetables even during the dry season. Additionally, widespread grazing by livestock such as cattle, goats, and sheep has reduced grass cover in some areas, while the cutting of trees for fuelwood and construction has contributed to deforestation. As a result, the present-day vegetation is largely a mixture of natural savanna and human-modified landscapes.

Wildlife and Conservation Status

Table 4.7: Wildlife and Conservation Status (Sudan Savanna – Wudil Area)

Common Name	Scientific Name	Group	Conservation Status (IUCN)	Remarks
West African Lion	<i>Panthera leo senegalensis</i>	Mammal	Critically Endangered	Extremely rare in West Africa; locally extinct in many areas
African Wild Dog	<i>Lycaon pictus</i>	Mammal	Endangered	Declining due to habitat loss and human conflict
Caracal	<i>Caracal caracal</i>	Mammal	Least Concern (locally threatened)	Still present but under pressure from hunting

Common Name	Scientific Name	Group	Conservation Status (IUCN)	Remarks
Patas Monkey	<i>Erythrocebus patas</i>	Mammal	Near Threatened	Population decreasing, habitat degradation
African Golden Wolf	<i>Canis lupaster</i>	Mammal	Least Concern	Adaptable but affected by habitat changes
Spotted Hyena	<i>Crocuta crocuta</i>	Mammal	Least Concern	Declining in populated regions
Denham's Bustard	<i>Neotis denhami</i>	Bird	Vulnerable	Threatened by hunting and habitat loss
Secretary Bird	<i>Sagittarius serpentarius</i>	Bird	Vulnerable	Declining due to agricultural expansion
Northern Ground Hornbill	<i>Bucorvus abyssinicus</i>	Bird	Vulnerable	Sensitive to habitat disturbance
Hooded Vulture	<i>Necrosyrtes monachus</i>	Bird	Critically Endangered	Rapid decline due to poisoning and human activity
African Grey Hornbill	<i>Lophoceros nasutus</i>	Bird	Least Concern	Common but affected by deforestation
Nile Monitor Lizard	<i>Varanus niloticus</i>	Reptile	Least Concern	Found near water bodies
African Rock Python	<i>Python sebae</i>	Reptile	Near Threatened	Threatened by hunting and habitat loss
Senegal Coucal	<i>Centropus senegalensis</i>	Bird	Least Concern	Common in savanna and farmland
Grasshopper (various spp.)	Various	Insect	Not Evaluated	Important for ecosystem food chain

Plants Conservation Status

Table 4.8: Plants and Conservation Status (Sudan Savanna – Wudil Area)

Common Name	Scientific Name	Plant Type	Conservation Status (IUCN)	Remarks / Uses
Baobab	<i>Adansonia digitata</i>	Tree	Least Concern (declining locally)	Stores water; food, medicine, cultural value
Gum Arabic Tree	<i>Acacia senegal</i>	Tree	Least Concern	Arabic source of gum; drought-resistant
Umbrella Thorn Acacia	<i>Acacia tortilis</i>	Tree	Least Concern	Common savanna tree; prevents desertification
Locust Bean Tree	<i>Parkia biglobosa</i>	Tree	Vulnerable (regional decline)	Produces food condiment ("dawadawa")
Neem Tree	<i>Azadirachta indica</i>	Tree (introduced)	Not Evaluated	Widely planted; medicinal and shade
Shea Tree	<i>Vitellaria paradoxa</i>	Tree	Vulnerable	Produces shea butter; threatened by land clearing
Desert Date	<i>Balanites aegyptiaca</i>	Tree	Least Concern	Highly drought-tolerant; food and medicine
African Birch	<i>Anogeissus leiocarpa</i>	Tree	Least Concern	Used for timber and fuelwood

Common Name	Scientific Name	Plant Type	Conservation Status (IUCN)	Remarks / Uses
Bush Willow	<i>Combretum spp.</i>	Shrub/Small tree	Not Evaluated	Common in degraded savanna
Spear Grass	<i>Imperata cylindrica</i>	Grass	Least Concern (invasive in some areas)	Dominant grass; colonizes disturbed land
Guinea Grass	<i>Panicum maximum</i>	Grass	Least Concern	Important for grazing livestock
Andropogon Grass	<i>Andropogon gayanus</i>	Grass	Least Concern	Typical savanna grass species
Hyparrhenia Grass	<i>Hyparrhenia spp.</i>	Grass	Not Evaluated	Seasonal grass; grows during rainy season

Plant Pathology

Plant pathology in the Sudan savanna environment of Wudil is largely influenced by the region's harsh climatic conditions and increasing human disturbance. The vegetation observed in the image characterized by dry grasses, scattered trees, and sparse shrubs shows clear signs of environmental stress. Many of the plants appear withered, with reduced foliage and stunted growth, which are typical indicators of plant health problems in semi-arid regions. These conditions are not only seasonal but are also linked to deeper pathological issues affecting plant survival and productivity.

A major factor influencing plant pathology in this area is abiotic stress, particularly drought and high temperature. The long dry season in Wudil leads to severe water deficiency, causing plants to lose moisture rapidly through transpiration. As a result, grass dries out completely, and many trees shed their leaves to conserve water. Prolonged exposure to high temperatures further intensifies this stress, often leading to leaf scorching and reduced photosynthetic activity. In addition, the soils in this region are typically sandy and low in organic matter, which limits nutrient availability. This results in weak plant growth, poor root development, and symptoms such as yellowing of leaves and reduced biomass.

In addition to environmental stress, biotic factors such as pathogens and pests also contribute to plant diseases. During the short rainy season, fungi become more active and may cause diseases like leaf spots and root rot, especially in crops and young plants. Bacterial infections can also occur, leading to wilting and tissue decay. Viral diseases, particularly in cultivated crops like maize and sorghum, can cause stunted growth and abnormal leaf coloration. Although these pathogens are not directly visible in the image, their effects are often reflected in the poor condition of vegetation in such environments.

Pests and herbivory play a significant role in plant pathology in Wudil. Termites are especially common in savanna ecosystems and can damage plant roots and stems, weakening or killing trees and shrubs. Grasshoppers and locusts feed on grasses and crops, leading to defoliation and reduced plant cover. Additionally, overgrazing by livestock such as cattle, goats, and sheep is a major problem. Continuous grazing prevents grass from regenerating and exposes the soil, contributing to land degradation and making plants more vulnerable to disease and environmental stress.

Human activities further exacerbate plant health problems in the area. The clearing of land for agriculture and construction reduces vegetation cover and disrupts natural ecosystems. Bush burning, which is often practiced to clear land, destroys young plants and beneficial soil organisms. Soil compaction from human movement and livestock reduces the ability of roots to penetrate the soil and

access nutrients. These activities collectively weaken the resilience of vegetation and increase susceptibility to both abiotic and biotic stress factors.

Flora and Fauna

The bio-ecological environment of Wuldi, Kano reflects the broader characteristics of the Sudan savanna ecological zone in northern Nigeria. This region is defined by a semi-arid climate, marked by distinct wet and dry seasons, relatively high temperatures, and moderate to low rainfall. Such environmental conditions strongly influence the distribution, structure, and adaptation of both flora and fauna. Vegetation is generally less dense than in southern Nigeria, and biodiversity is shaped by water availability, soil type, and human land use such as farming and grazing.

Flora in Wuldi is typically composed of savanna vegetation, including scattered trees, shrubs, and grasses adapted to drought and seasonal changes. Common tree species include drought-resistant varieties such as Acacia species, Baobab, and Neem tree, many of which have deep root systems and small or waxy leaves to reduce water loss. Grasses dominate the ground layer during the rainy season, growing rapidly and providing forage for animals, but they often dry out in the dry season, contributing to a brown and sparse landscape. Human activities such as agriculture (e.g., millet, sorghum, and maize cultivation) and fuelwood collection have also influenced vegetation patterns, sometimes leading to reduced tree cover and land degradation.

Fauna in this environment is adapted to the open savanna and seasonal resource availability. Typical animal species include small to medium-sized mammals such as rodents, hares, and occasionally antelopes in less disturbed areas. Reptiles like lizards and snakes are common due to the warm climate, while birds such as weaver birds, doves, and ground-dwelling species are abundant and play important roles in seed dispersal and insect control. Insects, including grasshoppers, termites, and beetles, are particularly significant in this ecosystem, contributing to nutrient cycling and serving as a key food source for many animals. Domestic animals such as cattle, goats, and sheep are also prominent and form an important part of the local agro-pastoral system.

Seasonality plays a critical role in shaping ecological dynamics in Wuldi. During the rainy season, increased moisture leads to rapid vegetation growth, higher food availability, and increased animal activity and reproduction. In contrast, the dry season brings water scarcity, reduced plant cover, and migration or behavioral adaptation among animals to cope with harsh conditions. Some species rely on burrowing, nocturnal activity, or drought resistance strategies to survive the extreme heat and limited water supply.

Terrestrial Ecosystem in Wuldi, Kano

The terrestrial ecosystem of Wuldi, Kano is characteristic of the Sudan savanna biome, which is dominated by open grasslands interspersed with scattered trees and shrubs. This ecosystem is shaped by a combination of low to moderate rainfall, high temperatures, and prolonged dry seasons, resulting in vegetation that is drought-resistant and widely spaced. The soil is generally sandy to loamy, supporting seasonal grasses and hardy plant species. Ecological processes such as nutrient cycling, grazing, and fire (both natural and human-induced) play significant roles in maintaining the structure and function of this ecosystem.

Primary producers in this terrestrial system include savanna grasses and woody plants like Acacia species and Baobab, which provide food and shelter for herbivores. These, in turn, support a food web consisting of primary consumers (e.g., rodents, grazing livestock), secondary consumers (e.g., reptiles and small carnivores), and decomposers such as fungi and termites that recycle nutrients back into the

soil. The ecosystem is dynamic, with productivity peaking during the rainy season and declining sharply during the dry season.

Protected Areas

Although Wuldi does not host a formally designated conservation site, it lies within a region influenced by nearby protected areas such as Kano Zoological Garden and Challawa Gorge Dam and Forest Reserve. These areas play an important role in biodiversity conservation, environmental education, and habitat protection within Kano State.

The Kano Zoological Garden serves as a conservation and research center, housing various native and exotic animal species while promoting awareness about wildlife protection. On the other hand, Challawa Gorge Dam and Forest Reserve provides a semi-natural habitat that supports vegetation cover, protects watersheds, and offers refuge for local wildlife species. Such protected areas are essential in regions facing increasing pressure from urbanization, agriculture, and deforestation.

Red Book Species (Threatened Flora and Fauna)

In the Sudan savanna region, several species are considered threatened or vulnerable according to conservation assessments such as the IUCN Red List (often referred to as the “Red Book”). While specific records for Wuldi may be limited, species commonly associated with northern Nigeria include:

- African Elephant – Vulnerable due to habitat loss and poaching.
- West African Lion – Critically endangered in West Africa due to shrinking habitats and human-wildlife conflict.
- African Wild Dog – Endangered, largely due to habitat fragmentation and disease.
- Hooded Vulture – Critically endangered, affected by poisoning and habitat disturbance.

For flora, certain economically important trees such as Shea tree and African Mahogany are under pressure due to overexploitation for timber, fuelwood, and agricultural expansion.

4.4 Socio-economic and Health Study

This chapter presents the results and analysis of the survey questionnaire conducted as part of the Environmental and Social Impact Assessment (ESMP) for the proposed hybrid solar power plant at POLAC. A total of 40 respondents completed and submitted the questionnaire, providing comprehensive information on socioeconomic and demographic characteristics, health status, standard of living, gender-based violence concerns, environmental and cultural resources, project impact perceptions, and grievance redress mechanisms.

The data collected has been analyzed and presented using various visualization techniques including pie charts and bar charts to facilitate better understanding of the survey findings. The results are organized according to the survey sections: Household Data, Health Status, Standard of Living, Gender-Based Violence/Sexual Exploitation and Abuse, Resources/Cultural Property, Project Activities Impact Evaluation, Grievance Redress Mechanism, and World Bank Environmental and Social Standards (ESS).

4.4.1 Household Data

This section presents the demographic and socioeconomic characteristics of the respondents, including gender distribution, age groups, marital status, occupation, residential status, ethnic composition, religious affiliation, household relationships, duration of residence, and educational attainment.

4.4.2 Age Distribution

The age distribution shows that most respondents (65%) fall within the 18-45 years age bracket, representing 26 individuals. This is followed by 30% in the 46-65 years category (12 respondents), and 5% below 18 years (2 respondents). This distribution indicates a predominantly young to middle-aged population, which is typical for a university community.

4.4.3 Marital Status

The study population showed that 55% of the respondents were married, the single population represented 45% while no respondent indicated divorce or widowed as their marital status. A significant population of the students were single as expected of undergraduate, while the married population were predominantly staffs and business operators within the campus community.

4.4.4 Occupation Distribution

The occupation distribution in Wuldi, Kano reflects the broader socio-economic structure of rural and peri-urban communities in northern Nigeria, where livelihoods are largely shaped by environmental conditions, cultural practices, and access to resources. The economy is predominantly informal and agrarian, with most residents engaged in primary production and small-scale enterprises.

Agriculture is the dominant occupation in Wuldi, employing a large proportion of the population. Farmers cultivate staple crops such as millet, sorghum, maize, and groundnuts, which are well adapted to the semi-arid Sudan savanna climate. Farming is mostly rain-fed and seasonal, with increased activity during the rainy season and reduced productivity during the dry period. In addition to crop farming, many households practice subsistence agriculture, producing mainly for local consumption with limited surplus for sale. Pastoral and agro-pastoral practices are widespread, with herders moving animals in search of pasture and water, especially during the dry season. This occupation plays a crucial role in supporting household livelihoods and food security.

Trade and commerce form another significant component of occupation distribution. Many inhabitants engage in petty trading, selling agricultural produce, grains, livestock products, and household goods in local markets. Small-scale businesses such as kiosks, food vending, and craft sales are common, particularly among women and youth. These activities provide daily income and support the circulation of goods within the community.

Artisan and vocational occupations are also present, though on a smaller scale. These include blacksmithing, tailoring, carpentry, leatherwork, and weaving, which are traditional skills passed down through generations. Such occupations contribute to local economic diversity and provide essential goods and services to the community.

A portion of the population is involved in public and private sector employment, including teaching, civil service, healthcare work, and security services. However, these formal jobs are relatively limited compared to agricultural and informal activities. Youth employment may also include casual labor, transportation services (such as motorcycle riding), and construction work.

4.5 Health Status

This section examines the health management practices, healthcare access patterns, common ailments, and perceptions about potential health impacts of the proposed infrastructure project.

4.5.1 Health Management Practices

An overwhelming majority of respondents (90%) indicated that they attend hospitals or clinics when sick, demonstrating good health-seeking behavior. Only 10% reported buying drugs from nearby chemists without professional consultation. This pattern suggests adequate awareness of the importance of professional medical care and likely indicates reasonable access to healthcare facilities.

4.5.2 Hospital/Clinic Visit Frequency and Common Ailments and Sicknesses

The most commonly reported ailments are Malaria (45%) and Typhoid fever (30%), which are endemic diseases in Nigeria. High Blood pressure/ Hypertension (10%), Diarrhea affected 10% and 5% of respondents had Eye pain. These disease patterns are typical of tropical regions and do not indicate any unusual health burden that would be exacerbated by the proposed solar power project.

4.5.3 Perceived Health Impact of Proposed project

The perception of respondents on the perceived health implications of the proposed solar power plant project was positive. All the respondents indicated that they do not believe their health conditions will be affected by the proposed infrastructure intervention. This unanimous perception suggests strong confidence in the project's safety and minimal anticipated health risks from the solar power installation.

4.6 Standard of Living/Socioeconomic Activities

This section analyzes the living conditions, housing characteristics, utility services, income levels, and perceptions about changes in standard of living among respondents.

4.6.1 Housing Characteristics

The most common house types within Wuldi are bungalows (ranging from 2-bedroom to 4-bedroom), which are popular for being easier to build and maintain. Other prevalent residential building types include blocks of flats (apartments), duplexes (fully detached and semi-detached), and terraced houses. However, the predominant housing type in the study areas were constructed with cement, blocks and plastered walls, indicating good quality housing infrastructure. The interior compartments each household consist of an average of 3-4 rooms, which represent 55%, while 1-2 rooms households represent 35%. Majority of the students occupies single rooms hostel apartment on campus while others share 2-bedroom apartments usually off campus.

4.6.2 Sanitation Facilities

Sanitation facilities are systems and infrastructure designed to safely separate human excreta from human contact, preventing disease transmission and ensuring public health. Improved, safe options include flush/pour-flush toilets connected to sewers or septic tanks among others. Water closet toilet facilities are available in 90% of households, demonstrating good sanitation infrastructure. However, 10% use toilet facilities (pit latrine) located outside their dwellings while others engage in open defecation.

4.6.3 Housing and Land Tenure

Housing tenure shows that 65% of respondents rented their accommodation while 25% own their homes while 10% did not indicate their housing tenure. The land tenure distribution mirrors this pattern exactly, with 65% renting and 25% owning land.

Table 4.9: Distribution of land tenure in the study area

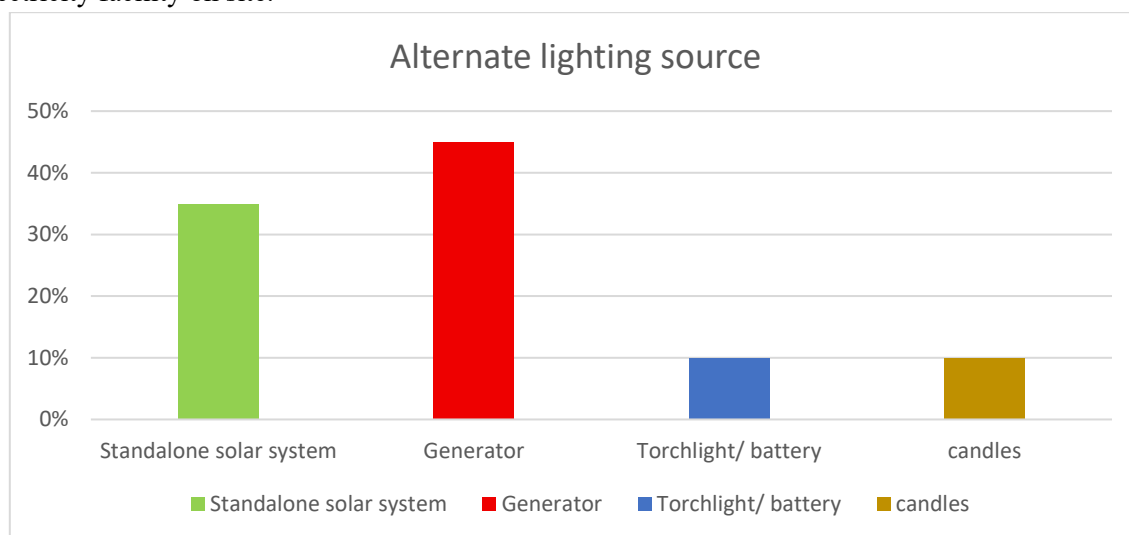
S/No	Land Tenure	Percentage distribution
1	rented	75%
2	Owned	25%

4.6.4 Refuse Disposal Methods

The study area had a mixed household solid waste disposal method, they range from disposal at Community refuse pit/dumpsite, burning, depositing at the backyard of residence, collection by waste contractors among others. The predominant solid waste disposal method was by burning which represent 40 %, this was followed by deposition at the backyard which represent 25% and waste collection by registered waste contractors representing 25%. Dumping at community dumpsite represents 10%. However, within the community, Solid wastes are collected and disposed off by waste contractors, unfortunately, students engage in indiscriminate dumping of waste behind their hostels. Therefore, it is pertinent that waste segregation at source, reuse and recycling be prioritized in the study areas.

4.6.5 Source of Lighting

All respondents (100%) indicated access to electricity from the nation grid, through the existing Distribution Company, although the duration and quality of supply vary due to the Band scheme which specify the number of hours of electricity available to users per day. Alternative lighting sources include torchlight/battery (10%), standalone Solar system (35%) candles (10%), and generators (45%). The reliance on multiple backup sources suggests unreliable electricity supply from the national grid, hence the proposed solar power project will mitigate the power gap within the community. **Figure 4.1** shows electricity facility on site.

**Figure 4.10: Alternative Source of Electricity**

4.6.6 Energy Sources for Cooking

The predominant energy for cooking is gas, which represent 45%, kerosene stove represents 25% and firewood represent 10%, Coal represents 15% while electricity users constitute 5%. This heavy reliance on biomass fuels (coal and firewood) indicates significant potential for environmental impact and

suggests that improved electricity access could lead to cleaner cooking practices. **Figure 4.2** shows firewood for cooking in the study area.

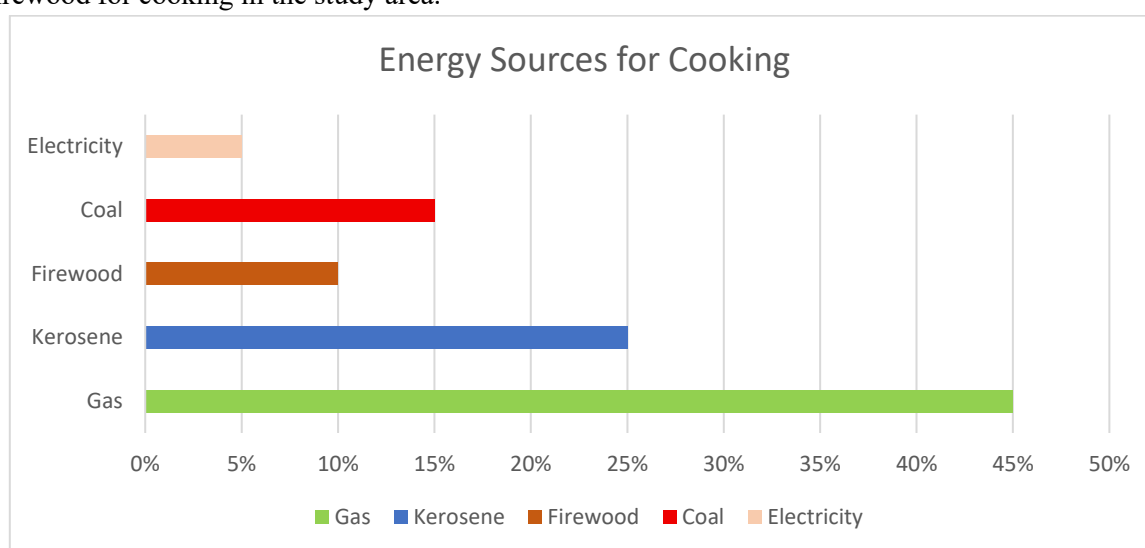


Figure 4.2: Energy Sources for Cooking

4.6.7 Income Distribution

Income distribution measures the spread of income across different groups (households, individuals, or income sources) within an economy, rather than just the average income. Unfortunately, 40% of the respondents refused to disclose their monthly income for personal reasons. However, 20% of the respondents earn a monthly income of 200,000 only, 25% earns less than 150,000 monthly while 15% earn 100,000 and below. Table 4.12 shows the income distribution of the study area.

Table 4.10: Income Distribution of the study Area

S/No	Monthly income	Percentage distribution
1	100,000 and below	15%
2	101,000 – 150,000	25%
3	200,000 and above	20%
4	Non-disclosure	40%

4.6.8 Changes in Standard of Living

When asked about changes in standard of living over the previous three years, 50% indicated that it had nosedive tremendously impacting livelihood negatively. 35% of the respondent reported marginal improvement (better), while 15% indicated similar situation (same). This mixed response suggests varying economic experiences within the community, which could be attributable to the earning opportunities peculiar to the different respondents.

4.6.9 Electricity's Role in Living Standards

Access to reliable and affordable electricity has a multiplier effect in enhancing economic prosperity and improve the standard of living due to lower cost of generating power individually and spurring small and medium-scale businesses. However, 35% percent of respondents reported that their standard of living changed positively due to improved electricity supply, while 65% attribute changes to other factors. This indicates that while electricity is important, it is not the sole determinant of living standards

in the community. **Figure. 4.3** shows the contribution of electricity supply to the change in the standard of living of respondents in the study area.

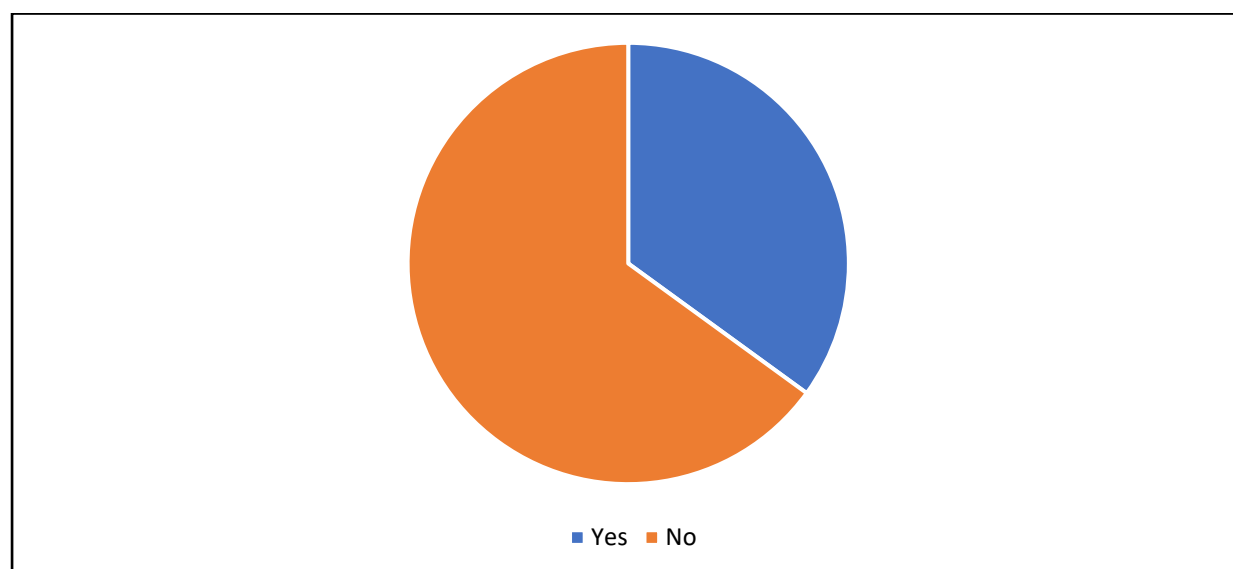


Figure 4.3: Role of Electricity Supply in Improved Living Standards

4.7 Gender-Based Violence/Sexual Exploitation and Abuse

Gender-Based Violence (GBV) and Sexual Exploitation and Abuse (SEA) remain critical concerns in many parts of northern Nigeria, including communities such as Wuldi in Kano State. These issues are often driven by deeply rooted gender inequalities, poverty, and social norms that limit the rights and voices of women and girls. In such settings, GBV manifests in various forms, including domestic violence, early and forced marriage, denial of education, and sexual abuse. Cultural silence and stigma frequently discourage survivors from speaking out, which allows cases to go unreported and unaddressed.

In Wuldi-Kano, vulnerability to Sexual Exploitation and Abuse is heightened by economic hardship and unequal power dynamics. Individuals in positions of authority such as employers, community leaders, or service providers may take advantage of vulnerable women, girls, or even boys by demanding sexual favors in exchange for assistance, employment, or protection. This form of exploitation is particularly harmful because it abuses trust and deepens the cycle of poverty and dependency. Limited awareness of rights and weak reporting mechanisms further compound the problem, making it difficult for survivors to seek justice.

The impact of GBV and SEA on individuals and the community is severe and long-lasting. Survivors may suffer physical injuries, psychological trauma, social exclusion, and loss of educational or economic opportunities. In Wuldi-Kano, as in many similar communities, survivors often face blame or rejection, which discourages others from reporting abuse. This not only affects individual well-being but also hinders community development, as fear and inequality prevent full participation in social and economic life.

Efforts to address GBV and SEA in Wuldi-Kano require a multi-sectoral approach. Community sensitization programs are essential to challenge harmful norms and promote gender equality. Strengthening local institutions such as healthcare centers, law enforcement, and social services is

necessary to provide safe, confidential, and survivor-centered support. Additionally, enforcing existing laws and ensuring accountability for perpetrators can help deter abuse. Collaboration between government agencies, non-governmental organizations, religious leaders, and community members is crucial to creating a safer environment where human rights are respected and protected.

4.7.1 Provisions Restricting Women's Access to Health Services

The survey showed that there is no restriction on women's access to health and social services requiring male consent for medical treatment, 70% responded yes, 5% no, and 10% did not respond. Regarding parental consent for adolescents' access to contraceptives, 60% responded yes, 10% no, and 30% no response. For medical practitioners refusing services based on conscientious objection, 60% said yes, 10% no, and 25% did not respond. These responses indicate significant awareness of restrictive practices that may affect women's health access.

4.7.2 Gender Equity in the Community

The Nigeria Constitutional Provisions (Section 42): Nigeria's Constitution guarantees freedom from discrimination on the basis of sex, gender, or religion, providing a legal foundation for equality. Nigeria's primary framework for gender equality is the National Gender Policy (2021–2026), which aims to bridge gender gaps, promote women's empowerment, and achieve 35% affirmative action in political and decision-making roles. When asked how gender equity is ensured, 30% of respondents indicated that Women are elected to public office, 25% indicated that quotas on genders are ensured in leadership of community-based organizations, while 45% of the respondent indicated that females are given equal opportunity and access to education and employment.

4.7.3 Vulnerable Group

Vulnerable groups are individuals or populations who, due to certain conditions or circumstances, are at a higher risk of harm, discrimination, or exclusion from social, economic, educational, or health opportunities. They often need special protection, support, or attention in policies, institutions, and community programs to ensure fairness and inclusion. At a university level, vulnerable groups may include Students with disabilities, Students from extremely poor backgrounds, Female students facing gender-related challenges, international students or minorities, Students with mental health difficulties. The Command's does not have any cadet with disabilities.

4.8 Resources/Cultural Property

This section assesses environmental challenges in the community and potential impacts of the proposed project on natural and cultural resources.

4.8.1 Expected Environmental Problems from Project Construction

Remarkably, 100% of respondents indicated that they do not expect any of the listed environmental problems (soil infertility, poor drainage, bad roads, low visibility, erosion, flooding, environmental degradation, infrastructure destruction, land encroachment, or pollution) to result from the proposed solar power project during construction. This unanimous perception reflects strong confidence in the project's environmental safety and proper management.

4.8.2 Impact on Valued Cultural/Archaeological Property

All respondents (100%) indicated that the proposed Solar power plant infrastructure project will not affect any valued resource, cultural, or archaeological property in their area. Rather, it will enhance the appeal of the community and its valued resources. This is consistent with the project being located on a virgin land belonging to the university that is not currently in use and has no known cultural or archaeological significance.

4.9 Intervention Project Activities Impact Evaluation

This section evaluates awareness of the proposed solar power project, information sources, potential for community restiveness, expected impacts, and community expectations from the project.

4.9.1 Proposed Project Awareness

Project awareness involves educating stakeholders or the public about a project's goals, impact, or existence, crucial for fostering community support, compliance, and successful implementation. Unfortunately, the level of awareness of the proposed intervention was abysmally low, only a handful of persons are aware among the management team of the Command. 10% of respondents indicated awareness of the proposed solar power project, while 90% were not aware. This low awareness level highlights the importance of enhanced stakeholder engagement and communication about the project to ensure community understanding and participation.

4.9.2 Positive Impacts of the Proposed Project

Respondents identified multiple positive impacts expected from the project, including constant power supply, increased productivity and efficiency, enhanced research and academic output for lecturers and students, promotion of economic development and prosperity, and reduction of noise and global warming. No negative impacts were identified by respondents, further demonstrating strong community support.

4.9.3 Community Expectations from the Project

The survey revealed several key expectations from the community. Employment of locals and contracting opportunities during construction was expected by 80% of respondents, capacity building for maintenance during implementation by 90%, and community input into final engineering design by 20% (see **Figure 4.4**). Additionally, respondents emphasized the importance of durability, proper maintenance, and adequate security to protect against theft and robbery.

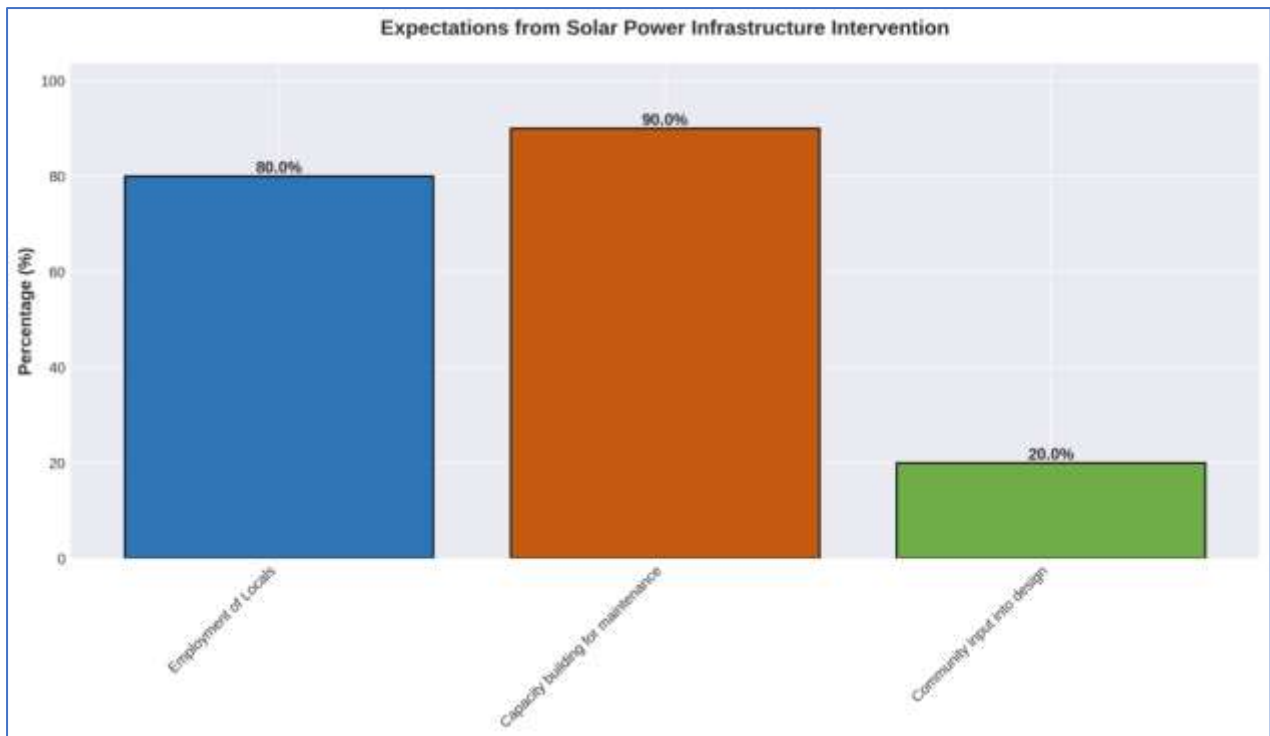


Figure 4:13: Expectations from Solar Power Infrastructure

4.10 Grievance Redress Mechanism

A grievance refers to any complaint, dissatisfaction, or concern an individual (staff or student) has regarding: Academic issues (e.g., grading, supervision, examination results), Administrative matters (e.g., delays, misconduct). Workplace conditions (for staff): Harassment, discrimination, or unfair treatment. The Grievance Redress Mechanism (GRM) at POLAC provides a structured process for students and staff to seek resolution when they encounter unfair treatment, academic issues, or administrative problems. The Command ensures that the GRM is guided by: Fairness and impartiality, Confidentiality, Timeliness, Non-retaliation (no punishment for filing a genuine complaint), and documentation of every step for accountability.

4.10.1 Step-by-Step Process of Grievance Redress

Informal Resolution

The complainant (cadets or staff) is encouraged to first discuss the issue informally with the person directly involved, such as a lecturer, supervisor, or department officer. Many issues can be resolved at this level through communication and clarification.

Departmental / Faculty Level

If the issue is not resolved informally, the complainant submits a written complaint to the Head of Department (HOD) or Dean of Faculty. The commandant investigates the matter, possibly holding a meeting with all parties involved. A decision or recommendation is then communicated to the complainant.

4.10.2 Grievance Committee

If the complainant is unsatisfied with the departmental resolution, the case is escalated to the Cadets Grievance Redress Committee. This committee reviews the complaint, conducts hearings if necessary,

and ensures due process is followed. Both parties may be invited for clarification or presentation of evidence.

4.10.3 Appeal to the Commandant

If the complainant still feels dissatisfied with the outcome, they can appeal to the Command. The Command reviews the entire process and may make a final decision or direct further investigation.

4.10.4 External Resolution

Statistically, 75% of grievances were reported to the university authority for resolution, 15% were reported to the law enforcement agency (Police) while 10% were reported to the landlords/ CDA. Overall, 80% satisfactory grievance resolution rate were reported. This section examines the community's experience with grievances, reporting mechanisms, and satisfaction with resolution processes.

4.10.5 Grievances in the Last Three Years

40% of respondents indicated that they have had grievance issues in the community in the last three years, while 50% reported not to have had any major grievance issues within the community. However, 10% of the respondent did not indicate because they could not remember and did not want to give a misleading view on the question.

4.10.6 Grievance Reporting Channels

When asked where they would report grievances, 75% indicated they would approach the school authority/management, 10% would go to the landlord/ CDA, and 15% would approach the law enforcement agency. This distribution shows that the university administration is seen as the primary authority for addressing concerns, which is appropriate given the institutional context.

4.10.7 Satisfaction with Grievance Resolution

The level of satisfaction derived from the grievance resolution mechanism varied in the study area, 80% of respondents indicated that grievances are satisfactorily addressed or resolved by the chosen reporting channels while 20% objected and were dissatisfied with the outcome of the grievance resolution. However, there are opportunities for improvement in the existing redress mechanism.

4.10.8 Specific Concerns about the Project

Concerns and fears about developmental projects are part of every developmental process. Concerns and fear stem from little knowledge about the project design, its impacts, and scope, among others. However, the beneficiaries of the proposed projects and respondents expressed specific concerns regarding the proposed intervention project, primarily focusing on the durability and proper maintenance of the solar power plant. They emphasized the need for adequate security measures to protect against theft and vandalism.

CHAPTER FIVE

DESCRIPTION OF ENVIRONMENTAL AND SOCIAL IMPACTS

5.1 Introduction

The basis for identification of potential environmental and social impacts that may be associated with the proposed Solar Power project was formed during field inspections and observations, issues arising from stakeholder consultations as well as project description and designs. Highlights of the ESMP as the primary instrument for ensuring that a project's commitment to sustainability is maintained throughout its lifecycle, bridging the gap between theoretical impact prediction and practical field execution is presented here. By establishing a rigorous system of governance, the ESMP ensures that project activities remain in strict alignment with national regulatory requirements, international lending standards, and the fundamental principles of corporate social responsibility. It provides a systematic blueprint for the mitigation of environmental and social risks and as well delineates the institutional framework, clearly assigning roles and responsibilities to project developers, contractors, and environmental consultants to ensure accountability at every stage of development. It also integrates specific mitigation measures, monitoring protocols, and reporting requirements designed to protect natural ecosystems, minimize pollution, and safeguard the well-being of local communities.

5.2 Project Area of Influence

The immediate geographical area of influence of work for the proposed project is the land area allocated for the project while the larger geographical area of influence covers the Nigeria Police Academy and a section of Ilorin metropolis.

5.2.1 Physical Environmental Media Influence

The physical environmental media to be potentially influenced by the activities of the proposed project are land (landscape), air quality, groundwater and any adjacent drain to any of the project sites. The landscape features include soil, flora and fauna at the proposed project site, which will be impacted by the project activities. Any adjacent drain to any of the project sites will be the recipient of runoff water from the project site. Any percolation of fuels through the soil may impact on groundwater resources. The air quality may also be impacted by dust and gaseous emissions from construction activities.

5.3 Impacts of the Project Activities on Environmental and Social Components

Activities of potential environmental and social impacts identified with the proposed project are outlined under the four phases of the project activities; namely pre-construction; construction; operations/maintenance and decommissioning phases. The activities are discussed below

Pre-construction Phase Activities

- Siting of workers camp, where necessary
- Assessment of existing project location, selection of beneficiary institutions, field studies and environmental screening;
- Preparation of environmental and social screening reports;
- Statutory permitting activities from appropriate authorities.

Construction Phase Activities

- Site clearing and excavation works;
- Identification of storage area for construction material;

- Transportation and handling of materials and equipment;
- Civil, mechanical and electrical works
- Construction of waste bin bays (where applicable); and
- Disposal of construction waste/rubble and waste in general.

Decommissioning activities after construction works will involve:

- Removal of construction equipment
- Disposal of construction spoil and waste in general; and

Operations and Maintenance Phase Activities

- Housekeeping;
- Waste management (collection and disposal);
- Maintenance and repair works; and
- Materials management and storage (including personal protective equipment, etc.).

Decommissioning Phase

Decommissioning issues under this project will occur after construction and will cover the following:

- Dismantling of temporary work camp of the contractor;
- Waste management; and
- Restoration of landscape around construction site

5.4 Evaluation of Potential Positive Impacts

Table 5.1: Evaluation of potential positive impacts.

Activity	Receptor	Associated Impact	Significance
Reliable Power supply to the University community through solar energy source	POLAC community	Improve the quality of education and other services within the institution as there will be longer hours available with better illumination for studying and will also contribute to the achievement of Nigeria's carbon emission reduction targets (20% reduction by the year 2030) in fulfilment of the nation's Nationally Determined Contributions (NDC) to climate change	Major DESC
Reduced noise and pollutants from	POLAC community	Human health will be protected from	Moderate

Activity	Receptor	Associated Impact	Significance
generator sets, and natural habitats		pollution arising from the use of fossil fuels	
Construction of renewable energy training centre	POLAC Community members.	Provide capacity development through learning renewable energy technologies and practices in the University and consequently, the certification of trained individuals	Moderate
The installation of streetlights	POLAC Community members	improve safety by reducing hazards associated with flammable fuels and candles and enhance security within the school.	Moderate
Stimulate economic activities and offer new opportunities for small businesses in the University premises	POLAC and nearby Communities	Improve social cohesion and community development and generate new income	Moderate
The employment opportunities for skilled, semi-skilled, and unskilled labour	University and nearby communities	Multiply job creation, especially during construction to facilitate overall socioeconomic development	Moderate

5.5 Evaluation of Potential Adverse Impacts Associated with the Proposed Project

The potential adverse impacts from project activities are grouped into the following subjects and discussed further according to the different applicable phases – Preconstruction, Construction, Operation and Decommissioning phase as presented in **Table 5.2**.

Table 5.2: Evaluation of Potential Adverse Impacts

Activity	Receptor	Associated Impact	Significance
Pre-construction Phase			
Site Selection/ land	Existing crop farming on site	- Loss of land for farming activities due to land - Take for the Project	Moderate
Site clearing and preparation	Terrestrial flora and fauna	- Vegetation loss - Direct impacts on vegetation and soil-dwelling organisms; indirect impacts on	Minor

Activity	Receptor	Associated Impact	Significance
		fauna species in the immediate surroundings of the Project site	
	Soil	- Loss of topsoil - Soil compaction and degradation - Increased erosion potential - Reduction in structural stability and percolative ability of soil	Minor
	Air Quality and Noise	- Air quality impacts due to emissions from site clearing equipment - Increase in ambient noise levels	Minor
	Workers Safety	Injuries and accidents to workers during site clearing and preparation.	Minor
Mobilization of construction equipment and materials to site	Air Quality and Noise	- Air quality impacts from vehicular emissions (TSP, NOx, CO, SOx) - Increase in noise levels	Minor
	Infrastructure (road)	Increase in vehicular movement and traffic including potential for road accident	Minor
	Workers Safety	Injuries and accidents to workers during loading and offloading of construction materials.	Minor
Construction Phase			
Movement of Equipment, Personnel and Plant Materials	Air Quality	- Vehicular emissions (CO, SO₂, NO₂) from exhaust - Contribution to global warming and ozone layer depletion - Dust emissions from construction activities	Minor
	Social System (Road)	Increased traffic from heavy-duty trucks en route to project site	Minor
	Health & Safety	Risk of accidents involving personnel and assets due to vehicle movement	Minor
Civil and Electrical Works / Installation Activities	Air Quality	- Emissions from construction equipment (SPM, NOx, CO, SOx) - Dust from land clearing and stockpiles	Minor
	Ambient Noise	Increased noise levels from construction activities	Minor
	Soil	- Increased erosion from excavation - Reduced soil stability and permeability due to compaction	Moderate

Activity	Receptor	Associated Impact	Significance
	Terrestrial Flora and Fauna	• Loss of plant species due to invasive species • Loss of fauna due to human activity and noise	Minor
	Groundwater	• Depletion of groundwater from abstraction (e.g., concrete mixing, washing) • Increased sediment load from erosion • Increased runoff and drainage formation from hard surfaces	Minor
	Gender	• Potential discrimination against women and GBV risks	Moderate
	Socio-economic & Health	• Influx of people leading to increased risk of sexually transmitted diseases	Moderate
	Infrastructure (Road)	• Road damage, traffic congestion, and safety concerns	Minor
	Construction Workers Safety	• Risk of injury during construction activities	Moderate
	Soil	• Soil contamination from construction waste (solid and liquid)	Minor
Commissioning Phase			
Waste Generation and Disposal	Groundwater	• Contamination from liquid construction waste streams	Minor
	Infrastructure (Waste Management Facility)	• Disposal of waste at existing facilities in project area	Negligible
Plant Testing	Ambient Noise	• Increase in ambient noise levels during testing activities	Minor
	Workers	• Occupational health and safety hazards (e.g., injuries, electrocution) due to incorrect electrical connections	Moderate
	Campus Occupants' Safety	• Risk of electrocution from wrong electrical connections	Minor
	Population Influx	• Temporary increase in population during commissioning phase	Negligible
	Infrastructure (Road)	• Increased traffic and risk of road accidents	Negligible
Operational Phase			
Power Generation and Distribution	Noise	• Noise from batteries and inverters during power generation and evacuation	Negligible
	Gender	• Discrimination of women during employment • GBV (sexual harassment, assault, poor working conditions)	Minor

Activity	Receptor	Associated Impact	Significance
	Socio-economic (Visual)	• Landscape alterations causing unpleasant visual changes in the area	Negligible
	Socio-economic (Health Issues)	• Community health and safety concerns due to electromagnetic field (EMF) radiation	Negligible
	Health, Safety and Welfare of Staff (Plant Operation)	• Electric shock and injuries during plant operation • Work-related issues (discrimination, denial of rights, unfair treatment, poor working conditions)	Moderate
Routine Maintenance	Soil	• Soil contamination from spent batteries and inverters	Minor
	Groundwater	• Groundwater abstraction from cleaning of PV panels	Minor
Waste Generation and Disposal	Soil & Groundwater	• Soil and groundwater contamination from waste streams	Negligible
	Health, Safety and Welfare of Staff (Maintenance)	• Electric shock and injuries during maintenance activities	Minor

CHAPTER SIX

ENVIRONMENTAL AND SOCIAL MITIGATION AND MANAGEMENT PLAN

6.1 Introduction

The Environmental and Social Management Plan (ESMP) is a detailed plan and schedule of measures necessary to minimize, mitigate or control any potential negative environmental and social impacts identified under this project. This ESMP consists of a set of mitigation, monitoring and institutional measures to be taken during the implementation and operation of the proposed project to eliminate negative environmental and social impacts, offset them or reduce them to acceptable levels.

The ESMP also incorporates the actions needed to implement these measures, including the following features:

- Mitigation measures based on the potential environmental and social impacts describing with technical details each mitigation measure;
- The ESMP also includes monitoring objectives that specifies the type of monitoring activities that will be linked to the mitigation measures. Specifically, the monitoring section of the ESMP provides:
 - A specific description, and technical details, of monitoring measures that includes the parameters to be measured, frequency of measurements and definition of thresholds that will signal the need for corrective actions;
 - Monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and to furnish information on the progress and results of mitigation.
- The ESMP provides a description of institutional arrangements i.e. who is responsible for carrying out the mitigating and monitoring measures (for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training);
- Additionally, the ESMP includes an estimate of the costs of the measures and activities recommended; and
- The ESMP is required all through the implementation stage of the project or sub-project.

6.2 Mitigation/Action Plan

Mitigation and management measures for the significant adverse impacts (rated as moderate or major) identified from the analysis and evaluation of the potential impacts from the proposed project activities are provided in Table 6.1.

Table 6.1: Mitigation Measures/actions for Potential Significant Adverse Environmental Impacts

No	Project Activities	Potential Environmental and Social Impacts	Proposed Mitigation Measures/Actions	Responsibility	Cost (N)
Pre-construction Phase					
1	Site selection/Land	Loss of land for farming activities	REA shall: • Engage affected communities through consultation and participation	Director of Works and Physical Planning/PIU	550000
2	Site clearing and preparation	- Vegetation loss - Direct and indirect impacts on flora and fauna	REA shall: i. Minimize clearing footprint ii. Conduct pre-clearance ecological surveys iii. Avoid clearing during breeding seasons iv. Implement biodiversity management plan	Site Engineer	NA
		- Loss of topsoil - Soil compaction and erosion - Reduced soil stability	REA shall: • Strip and store topsoil • Restrict heavy machinery movement • Implement erosion control (mulching, silt fences) • Progressive restoration	Site Engineer	NA
		- Air emissions from equipment - Increased noise levels	REA shall: • Maintain machinery regularly • Apply dust suppression (water spraying) • Limit work to daytime • Provide PPE for noise protection	Site Engineer	540,000
		Injuries and accidents	REA shall: • Implement OHS procedures (ILO standards)	HSE	540,000

No	Project Activities	Potential Environmental and Social Impacts	Proposed Mitigation Measures/Actions	Responsibility	Cost (N)
			• Provide PPE • Conduct safety training/toolbox talks • Enforce supervision		
3	Mobilization of Construction Equipment & Materials	• Vehicular emissions (TSP, NO_x, CO, SO_x) • Increased noise levels	REA shall: • Maintain vehicles to emission standards • Optimize logistics • Enforce speed limits and reduce idling • Use low-sulfur fuels	Site engineer	550,000
Construction Phase					
1	Movement of Equipment, Personnel & Materials	• Vehicular emissions (CO, SO₂, NO₂) • Dust emissions	REA shall: • Maintain vehicles regularly • Use low-sulfur fuels • Apply dust suppression (water spraying, covering trucks) • Limit idling and enforce speed limits	Site Engineer	NA
		• Increased traffic and congestion	REA shall: • Implement Traffic Management Plan • Schedule deliveries off-peak • Use designated routes • Community awareness and signage	Site Engineer/Traffic Control Officer	NA
		• Risk of accidents	REA shall: • Train drivers • Enforce speed limits • Conduct vehicle inspections • Use traffic marshals and signage	Site Engineer/HSE	500,000

No	Project Activities	Potential Environmental and Social Impacts	Proposed Mitigation Measures/Actions	Responsibility	Cost (N)
2	Civil & Electrical Works / Installation	• Air emissions and dust generation • Increased noise levels	REA shall: • Maintain equipment • Apply dust suppression • Limit work during high winds • Provide PPE REA shall: • Restrict work to daytime • Use silencers • Provide hearing protection • Establish buffer zones	Site Engineer	1.5M
		• Soil erosion and compaction	REA shall: • Install silt fences and drainage • Restrict machinery movement • Rehabilitate progressively • Proper grading	Site Engineer	500,000
		• Loss of flora and fauna	REA shall: • Minimize clearing • Control invasive species • Restrict worker movement • Implement biodiversity plan	Site Engineer	NA
		• Groundwater depletion and contamination	REA shall: • Use water efficiently • Monitor abstraction • Install sediment traps • Prevent contamination	Site Engineer	NA
		• GBV and discrimination risks	REA shall: • Implement Gender & GBV Action Plans • Enforce code of conduct • Awareness training • Grievance mechanism	State Ministry of Women's Affairs & Social Development (GBV/SEA Service Provider)	NA
		• Spread of STDs	REA shall: • Carry out Health awareness programs	Director of Physical planning/PIU	NA

No	Project Activities	Potential Environmental and Social Impacts	Proposed Mitigation Measures/Actions	Responsibility	Cost (N)
			• Provide testing access • Enforce worker conduct • Collaborate with health agencies		
		• Road damage and congestion	REA shall: • Traffic management plan • Maintain roads • Control vehicle loads • Coordinate with authorities	Site Engineer	NA
		• Worker injuries and accidents	REA shall: • Implement OHS system (ILO aligned) • Provide PPE • Conduct training • Emergency preparedness	SITE Engineer/HSE	550,000
Commissioning Phase					
	Plant Testing	• Increase in ambient noise levels during testing activities	REA shall: • Restrict testing to daytime hours • Use well-maintained equipment with noise suppression features • Notify nearby occupants in advance • Provide hearing protection (PPE) to workers	Director of Physical planning/PMU	550,000
		• Occupational health and safety hazards (injuries, electrocution due to incorrect connections)	REA shall: • Implement electrical safety procedures (lockout/tagout) • Use certified personnel only • Provide PPE (insulated gloves, boots) • Conduct safety checks and supervision • Ensure emergency response readiness	Site Engineer/HSE	550,000
		• Risk of electrocution to campus occupants	REA shall: • Restrict access to testing areas • Install warning signage and barriers • Ensure proper grounding and insulation • Supervise all testing activities	Site Engineer	NA
Operational Phase					

No	Project Activities	Potential Environmental and Social Impacts	Proposed Mitigation Measures/Actions	Responsibility	Cost (N)
1	Power Generation & Distribution	• Discrimination of women in employment • GBV (sexual harassment, assault, poor working conditions)	REA shall: • Implement Gender Action Plan & GBV prevention (World Bank aligned) • Enforce equal opportunity employment • Worker code of conduct & training • Confidential grievance mechanism	PMU/Site Engineer	NA
		• Electric shock and injuries • Workplace discrimination	REA shall: • Implement OHS system (ILO aligned) • Install LOTO systems & signage • Provide PPE (insulated gloves, boots) • Conduct training & audits • Enforce fair labor practices	PMU/Site Engineer/Director of Physical works	NA
2	Routine Maintenance	• Soil contamination from batteries and inverters	REA shall: • Store hazardous materials in sealed/labeled containers • Implement hazardous waste plan • Use certified waste handlers • Install secondary containment & spill response	PMU/Site Engineer	NA
		• Groundwater use for panel cleaning	REA shall: • Use water-efficient/dry-cleaning methods • Harvest/reuse rainwater • Monitor abstraction & comply with permits • Apply water conservation measures	Site Engineer	NA
3	Waste Generation & Disposal	• Electric shock and injuries during maintenance	REA shall: • Enforce LOTO procedures • Provide PPE & insulated tools • Conduct competency-based training • Routine inspection & supervision	Site Engineer	500,000
Decommissioning Phase					
1	Dismantling of Plant & Equipment	• Dust emissions • Emissions from machinery and vehicles	REA shall: • Apply dust suppression (water spraying) • Use low-emission equipment • Cover haulage trucks	Director of Public Works/ Site Engineer	NA

No	Project Activities	Potential Environmental and Social Impacts	Proposed Mitigation Measures/Actions	Responsibility	Cost (N)
			• Limit idling		
		• Increased noise levels	REA shall: Restrict daytime hours • Use silencers • Provide hearing PPE • Notify nearby communities	Director of Public Works/ Site Engineer	450,000
		• Injuries and electrocution risks	REA shall: • Implement OHS procedures (ILO aligned) • Apply LOTO systems • Provide PPE • Use trained personnel • Emergency preparedness	Director of Public Works/ Site Engineer	450,000
2	Removal of Foundations & Civil Works	• Soil disturbance, erosion, compaction	REA shall: • Minimize excavation footprint • Implement erosion controls • Reinststate topsoil • Progressive rehabilitation	Director of Public Works/ Site Engineer	NA
		• Groundwater contamination risks	REA shall: • Proper storage of fuels/chemicals • Spill prevention & response plan • Prevent contaminant discharge • Regular inspections	Director of Public Works/ Site Engineer	NA
3	Waste Generation & Disposal	• Soil & groundwater contamination from waste	REA shall: • Implement waste management plan • Use licensed contractors • Secure hazardous waste storage • Comply with regulations	Director of Public Works/ Site Engineer	NA
		• Pressure on waste infrastructure	REA shall: • Coordinate with approved facilities • Schedule transport efficiently • Promote recycling and recovery	Director of Public Works/ Site Engineer	NA
4	Transportation of Decommissioned Materials	• Emissions and noise from vehicles	REA shall: • Maintain vehicles • Optimize logistics	Director of Public Works/ Site Engineer	NA

No	Project Activities	Potential Environmental and Social Impacts	Proposed Mitigation Measures/Actions	Responsibility	Cost (N)
			• Enforce speed limits • Use designated routes		
		• Traffic congestion and road safety risks	REA shall: • Traffic Management Plan • Trained drivers & signage • Off-peak scheduling • Repair road damage	Director of Public Works/ Site Engineer	NA
		• Community accident risks	REA shall: • Community awareness programs • Warning signs and barriers • Escort oversized loads • Enforce safety protocols	Director of Public Works/ Site Engineer	NA
5	Site Restoration & Rehabilitation	• Habitat loss prior to restoration	REA shall: • Re-vegetate with native species • Restore habitat conditions • Monitor ecological recovery • Prevent invasive species	Director of Public Works/ Site Engineer	NA
		• Loss of employment post-closure	REA shall: • Worker transition programs • Skills training	Director of Public Works/ Site Engineer	NA

6.3 Environmental and Social Monitoring

Environmental and Social monitoring is an important aspect of an ESMP during project implementation. It is a way of systematically monitoring both effects and compliance of the proposed project to existing regulations throughout the entire life cycle and shall oversee the effectiveness of impact mitigation measures, including the extent to which mitigation measures are successfully implemented. Particularly, monitoring shall:

- Improve environmental and social management practices;
- Check the efficiency and quality of the ESMP processes;
- Establish the scientific reliability and credibility of the ESMP for the project (as well as the quality of specialists providing ESMP consultancy services
- Provide the opportunity to report the results on safeguards and impacts and proposed mitigation measures implementation.

Methods for monitoring the implementation of mitigation measures or environmental impacts should be as simple as possible, consistent with collecting useful information, so that the implementation process can easily be applied.

These indicators could be used to ensure participation process involved in project activities:

- Number and percentage of affected households/individuals/institutions consulted during the planning stage;
- Levels of decision-making of affected people;
- Level of understanding of project impacts and mitigation;
- Effectiveness of local authorities to contributing and making relevant decisions;
- Frequency and quality of public meetings; with community heads and general public;

The environmental and social monitoring plan is shown in **Table 6.2**.

Table 6.2: Environmental and Social Monitoring Plan

No.	Environmental/ Social Component	Monitoring Parameters	Monitoring Site	Frequency	Responsibility (Implementation/ Supervision)	Cost Estimate/ Year (NGN)
1.	Soil impacts	• Presence of habitats or vegetation at the site	Construction site	Daily (throughout the construction period)	PIU Safeguards Specialist, Project Contractor/ Engineering Consultant	
2.	Air quality/ Noise	• Observation of air borne particulates (dust) and exhaust fumes • Records of dust level measurements (dust concentration should be below 150µg/m³) • Records of dampening of construction sites and routes for vehicles/trucks • Daily noise levels.	• Construction site • Immediate environs	Daily During Peak construction period	PIU Safeguards Specialist, Project Contractor/ Engineering Consultant	500,000.00
3.	Vibration and noise nuisance	• Complaints on noise nuisance	• Construction site • Immediate environs	Daily (during construction)	PIU Safeguards Specialist, Project Contractor/ Engineering Consultant	
4.	Visual Intrusion	• Hoarding in place • Condition of areas around construction site	• Construction site • Immediate environs	Daily (during construction)	PIU Safeguards Specialist, Project Contractor/ Engineering consultant	No additional costs
5.	Waste Management	• Transportation for monitoring of the provision and use of bins in project area	Construction site	Monthly (during construction)	PIU Safeguards Specialist, Project Contractor/	500,000.00

No.	Environmental/ Social Component	Monitoring Parameters	Monitoring Site	Frequency	Responsibility (Implementation/ Supervision)	Cost Estimate/ Year (NGN)
		Records on frequency and location of waste disposal site of domestic and construction waste			Engineering Consultant,	
6.	Occupational Health and Safety	- Transportation for monitoring workers' awareness of Contractor's health and safety policy - Availability and proper use of PPEs - Availability and proper use of warning signs - Availability of first aid kit - Adherence to health and safety procedures - Records on frequency, type and source of illness/accident/injury - Records on non-compliances - Absence of unauthorized persons at active construction sites	Construction site	Daily (during construction)	PIU Safeguards Specialist, Project Contractor/ Engineering Consultant	
7.	Public safety and traffic issues	- Transportation for monitoring availability and proper use of warning signs - Hoarding of site - Use of caution tape around trenches/excavations - Records on frequency, type and source of illness/accident/injury - Absence of unauthorized persons at active construction sites	Construction Site	Daily (during construction)	PIU Safeguards Specialist, Project Contractor/Engineering consultant	150,000

No.	Environmental/ Social Component	Monitoring Parameters	Monitoring Site	Frequency	Responsibility (Implementation/ Supervision)	Cost Estimate/ Year (NGN)
8.	Sanitation issues, health and safety impacts	• Availability and use of bins • Records on frequency and location of waste disposal site of domestic and construction waste • Mobile toilet facilities in place • Presence of stagnant water in trenches	Construction site	Daily (during construction)	PIU Safeguards Specialist, Project Contractor/ Engineering Consultant	
9.	Public Complaints/ Grievances Redress	Transportation for monitoring of Grievance Redress issues, which will include such elements as: • Lodging and registration of PAPs grievance by grievance redress committee; • Redress decision, feedback and implementation; • Dissatisfaction and alternative action; and • Monitoring and evaluation	Project host community	Weekly (during construction)	PIU Safeguards Specialist, Project Contractor/ Engineering Consultant/school heads/medical director of hospital	150,000.00
10.	Monitoring of Social Impacts	• Transportation to monitor impacts such as, labor influx, GBV and SEA, VAC and STDs. Potential temporary physical or economic displacement, if any and provide	Project host Community	Weekly (during construction)	PIU Safeguards Specialist, Project Contractor/ Engineering Consultant/ medical director of hospital, Community Liaison Officer/Health centers	

No.	Environmental/ Social Component	Monitoring Parameters	Monitoring Site	Frequency	Responsibility (Implementation/ Supervision)	Cost Estimate/ Year (NGN)
11	Routine Maintenance	- Implementation of hazardous waste plan - Implementation of Gender Action Plan and GBV prevention - Worker code of conduct and training - Provide PPE (insulated gloves, boots)	Project site and host community	Quarterly (during operation)	PIU and PMU	350,000
TOTAL						1,650,000.00

Table 6.3: Specific Environmental Monitoring Plan

Impact Parameter	Project Phase	Impact Indicator	FMEnv Limits	Sampling Location	Sampling Frequency	Sampling Method	Monitoring Duration	Monitoring Personnel
Ambient Air Quality	Site preparation, Construction and Operation and decommissioning	TSP	600µg/m ³	Receiving air - upwind and downwind of site	Daily, during site preparation, construction; Quarterly during operation	Air Sampler	Short-term Long-term	PMU-REA Contractor
		NO ₂	100 µg/m ³					
		SO ₂	300 µg/m ³					
		CO	20 ppm					
Noise	Site Preparation and Construction	Noise Level	80 dBA (8-hr)	Work Site and 200m away	Daily (During site preparation, construction)	Decibel oise Meter	Short-term	PIU-REA Contractor
Soil	Site Preparation and construction.	Particle Size, TOC, Oil and Grease Heavy Metals, Nutrients,	As specified in FMEnv Guidelines	Within and around construction area.	Once, before and after construction	Visual Inspection and Soil auger	Short-term	PIU-REA Contractor
Socio-economics	Construction stage	Absence of Contractor/com	National/ World Bank	Host POLAC community	Monthly during construction	Socio-economic	Short term	PIU-REA Contractor

Impact Parameter	Project Phase	Impact Indicator	FMEEnv Limits	Sampling Location	Sampling Frequency	Sampling Method	Monitoring Duration	Monitoring Personnel
		munity conflict, increase/decrease in economic activities	guidelines and procedures			survey, observations and interviews		FMEEnv
Health	Construction and operation	Presence/absence of alien diseases	National health survey guidelines	Host POLAC community	Monthly at construction and bi-annually at operation stages	Interview and medical examinations and records	Long term	PIU-REA

6.4 Capacity Building for Implementation of ESMP and Permit Conditions

REA shall identify, plan, monitor, and record training needs for personnel whose work may have a significant adverse impact on the environmental or social conditions. Employees at each relevant phase of the project must be aware of the potential environmental impacts of their activities and the occupational hazards associated with the work; as well as their roles and responsibilities in achieving conformance with the management documented in this report. Thus, a formal training process will be organized for employees on environmental management programs, plans and procedures associated with the project.

All staff employed will be trained in the following:

- General operation of the plant.
- Environmental management.
- Specific job roles and procedures.
- Occupational health and safety; and
- Contingency plans and emergency procedures. Training will include:
- Induction training on appointments.
- Specialist training (as required for specific job roles); and
- Refresher training as required.

Training for the local community on general environmental awareness and ESMP mitigation measures on community health, safety, and security shall also be provided.

Objectives of the training

The main objective of the capacity building and training activities is to create, enhance and develop the necessary skills and abilities for successful implementation of the proposed project.

It is recommended that the site meetings to discuss the ESMP issues and any health and safety issues identified in the course of the month. Non-compliances identified during monitoring should reviewed and corrective actions taken. The capacity building plan proposed to achieve this is provided in **Table 6.3**.

Table 6.3: Capacity building plan for implementation of the ESMP.

No.	Activity	Target Group/Participants	Timeline/Duration	Proposed Facilitator	Cost USD
1.	Specialized Training on Environmental & Social Management (ESM) (ESMP, safeguards, monitoring, reporting)	PMU, Environmental & Social Safeguard Officers	3 days (annually)	Consultant / PMU	4,500
2.	ESMP Implementation Training (mitigation measures, roles &	Project Team (PMU, Site Engineer, Supervisors)	3 Days (annually)	Consultant / PMU	1,500

No.	Activity	Target Group/Participants	Timeline/Duration	Proposed Facilitator	Cost USD
	responsibilities, monitoring procedures)				
3	Contractor Training on ESMP Compliance (mitigation measures, Code of Conduct, OHS requirements)	Contractor's management, workers, HSE Officers	1 day (annually)	Consultant / PMU	1,500
4	Driver & Traffic Management Training (fleet management, road safety, traffic control within project area)	Drivers, Transport Officers, HSE Officers, Security Personnel	1 day (quarterly)	Transport/Traffic Specialist / PMU	1,200
5	GBV/SEA/SH Prevention & Response Training (Code of Conduct, reporting channels, survivor-centered approach)	Project Team, Safeguard Officers, Contractors	3 Days (biannually)	GBV Specialist / Consultant / PMU	2,500
6	Grievance Redress Mechanism (GRM) Training (complaint handling, documentation, resolution process)	GRC Members (project & management levels), PMU	3 days (biannually)	Consultant / PMU	2,000
Total					13,000

Table 6.4: Description of cost breakdown

Description	Cost (USD)
Professional fee for 2 Consultants	3,500
Rent/Hiring of venue	4,500
Feeding of participants - tea break	2,000
Feeding of participants (4 days)	3,200
Total	13,200

Output of the training

An efficient capacity building programme takes into consideration the health, safety, environmental and social management measures as provided in this chapter. The focus is to ensure the effective implementation of the ESMP and the permit conditions. All monthly and progress reports shall capture health, safety and environment capacity building activities carried out.

6.5 Institutional Arrangements

Institutional arrangement for the implementation of the Framework of this ESMP shall comprise:

- REA Project Office
- The Federal Government of Nigeria (FGN)
- Federal Ministry of Power
- Transmission Company of Nigeria (TCN)
- Federal Ministry of Environment (FMEnv)
- Nigerian Electricity Regulatory Commission (NERC)
- National Environmental Standards and Regulatory Enforcement Agency (NESREA)
- National University Commission (NUC)
- Kano State Ministry of Lands
- Wudli Local Government Area (LGA)

Roles and responsibilities for the implementation of the Framework ESMP

The Rural Electrification Agency Project Management Unit (REA-PMU) supervises the implementation of the ESMP throughout the project life span while conformance with the mitigation measures will be ensured by the Engineering, Procurement and Construction (EPC) contractor during the construction phase and by the operations and maintenance (O&M) contractor during the operational phase of the project. **Table 6.4** indicates the roles and Responsibilities of the Stakeholders in the Implementation, Monitoring and Review of the ESMP.

Table 6.4: The Roles and Responsibilities of the Stakeholders in the Implementation, Monitoring and Review of the ESMP					
Stakeholder	Pre-Construction Phase	Construction Phase	Commissioning Phase	Operational Phase	Decommissioning Phase
Director of Works / Physical Planning	• Approve site and land use • Review ESMP and ensure institutional commitment • Appoint & train Site Engineer • Ensure livelihood restoration before mobilization	• Supervise ESMP implementation • Ensure contractor compliance • Address grievances and enforce corrective actions	• Oversee safe plant testing • Ensure stakeholder communication • Confirm readiness for operation	• Review ESMP reports • Recommend improvements to PMU/O&M • Ensure safeguards (OHS, GBV, environment)	• Oversee decommissioning activities • Ensure site restoration • Support livelihood transition
REA – PMU	• Approve ESMP and integrate into contracts • Coordinate stakeholders and regulators • Allocate ESMP budget	• Monitor compliance and conduct audits • Report to regulators • Enforce corrective actions	• Ensure compliance during testing • Approve transition to operation	• Oversee ESMP implementation • Ensure monitoring, audits, reporting • Address non-compliance	• Supervise dismantling compliance • Ensure waste management • Prepare closure reports
Site Engineer	• Support ESMP planning • Participate in training	• Implement ESMP daily on-site • Monitor EHS compliance	• Supervise testing • Ensure safety procedures (LOTO, PPE)	• Monitor operations & maintenance • Ensure ESMP compliance	• Supervise dismantling • Monitor waste handling

		Maintain records and reports	• Report incidents	Report environmental & safety issues	• Support site rehabilitation
NESREA / FME Representatives	• Review and approve ESMP/ESMP• - Issue environmental permits	• Monitor ESMP implementation (environmental compliance) • Conduct inspections and enforce regulations • Engage stakeholders on compliance issues	• Monitor compliance during commissioning • Verify environmental and safety readiness	• Monitor ESMP implementation (environmental compliance) • Conduct periodic audits and inspections • Discuss ESMP improvements with PMU, Director, and O&M Contractor to address non-compliance and emerging risks	• Monitor decommissioning activities • Verify environmental restoration • Approve closure compliance • Recommend corrective actions where necessary
State Ministry of Women's Affairs & Social Development (GBV/SEA Service Provider)	• Review Gender/GBV Action Plans• - Support stakeholder engagement on GBV risks	• Monitor implementation of gender and GBV mitigation measures• - Provide GBV/SEA support services• - Conduct awareness programs	• Monitor GBV risk during commissioning activities• - Ensure reporting and response mechanisms are active	• Monitor Gender Action Plan implementation • Handle GBV/SEA cases confidentially • Provide survivor support services • Engage with PMU, Director, and Gender Officer on improvements	• Monitor GBV risks during workforce demobilization • Support vulnerable groups and affected persons • Ensure proper closure of GBV cases and services

6.6 Estimated Budget for ESMP Implementation

Table 6.2 provides a summary of the cost estimate required to effectively and efficiently implement the recommended mitigation measures and management plans required to address the potential and associated impacts of the proposed project. The total cost of implementing the ESMP is estimated at US\$ **57,300** with the current Naira value of 1,3500 to 1 dollar.

Table 6.5: Cost of ESMP

S/N	ESMP Activity	Cost (USD)	Key Cost Components	Justification
1	Pre-Construction Phase	8,000	Stakeholder engagement, ESMP disclosure, livelihood restoration planning, training of safeguards staff	Required to address social risks early, prevent conflicts, and ensure readiness before project mobilization
2	Construction Phase	13,000	Daily monitoring, mitigation measures (dust, erosion, OHS), PPE, inspections, reporting	Most impact-intensive phase requiring continuous supervision and high resource allocation
3	Commissioning Phase	800	Testing supervision, safety monitoring, stakeholder notification	Short-term phase with limited activities but critical safety requirements
4	Operational Phase	13,500	Routine monitoring, OHS audits, waste management, GBV/SEA implementation, reporting	Long-term phase requiring sustained compliance, monitoring, and system maintenance
5	Decommissioning Phase	4,000	Dismantling supervision, waste disposal, site restoration, livelihood transition	Ensures safe closure, environmental restoration, and social safeguards at project end
6	Mitigation & Monitoring	7,000	Environmental sampling, inspections, compliance audits, documentation	Dedicated funding ensures effective tracking of impacts and regulatory compliance
7	Capacity Building	11,000	ESMP training, OHS training, GBV/SEA awareness, GRM training	Builds stakeholder capacity for effective ESMP implementation and sustainability
	TOTAL	57,300		Cost reflects full lifecycle ESMP implementation aligned with international standards

CHAPTER SEVEN

INCIDENT REPORTING AND EMERGENCY RESPONSE PLAN

7.1 Introduction

For a project of this nature, Incident Reporting and Emergency Response Plan (ERRP) is a specialized component of the ESMP that addresses the unique risks associated with large-scale photovoltaic (PV) installations, such as electrical hazards, chemical spills from battery energy storage systems (BESS), and fire risks. The primary objective of the ERRP is to establish a clear protocol for the identification, notification, and mitigation of emergencies. The plan must be structured around a tiered response system.

7.2 Key Components

The key component of ERRP include:

1. The plan must define the "Emergency Coordinator" role, who holds the authority to halt site operations. This individual is responsible for maintaining communication with local emergency services, such as fire departments and medical facilities, which is critical given the remote locations often chosen for solar farms.
2. Solar projects require specific protocols for:
 - **Electrical Hazards:** Procedures for de-energizing arrays during maintenance or fire events to prevent arc flash injuries.
 - **Battery Energy Storage System (BESS) Safety:** If the project includes lithium-ion battery storage, the plan must detail thermal runaway mitigation, including specialized fire suppression techniques and hazardous material containment to prevent toxic gas release.
 - **Natural Disasters:** Protocols for high-wind events (e.g., stowing trackers in a "park" position) and flood mitigation for inverter stations.
 -
3. **Reporting and Investigation:** Every incident, including "near misses," must be documented in an Incident Log. The reporting process follows a strict timeline: initial notification within 2 hours, and a detailed Root Cause Analysis (RCA) report within 48 hours. This data is used to calculate the incident frequency rate, ensuring that the project remains within the safety thresholds defined during the design phase.
4. **Communication and Training:** The ERRP mandates regular emergency drills—such as fire evacuation and spill response—to ensure that all personnel, including subcontractors, are familiar with assembly points and alarm signals

CHAPTER EIGHT

REMEDIATION AND ABANDONEMENT PLAN

8.1 Remediation Plan After Decommissioning/ Closure

Upon the completion of useful life cycle of a project, there is a need to abandon and/or decommission such project if it no longer becomes economically viable either as a result of depleted feed stock or competing technology. The proposed solar project is expected to have a life span of 25 years. It is envisaged that technology and environmental policies could have changed so drastically by then, hence a definite decommissioning plan cannot be put in place for now. However, it is of importance that abandonment activities be planned in advance in accordance with the Nigerian regulatory requirements.

8.2 Decommissioning Activities

Decommissioning refers to the process of removing all the operating assets of a project after completion of its life cycle. The average life span of the solar Photovoltaic (PV) power plant to be provided as part of the proposed Project is 25years (which can be extended through regular maintenance), while the training center can last for 40 years or more. Even after 25 years, the PV panels can still generate up to 90% of the design capacity.

During decommissioning, REA shall ensure that the project sites are returned to a safe and environmentally acceptable condition. The decommissioning activities will typically include the following:

- ✚ Dismantling and removal of PV panels and associated infrastructure (mounting structure, power evacuation cable, inverters, transformers, batteries, etc.);
- ✚ Removal of any sub-surface installations (e.g. underground cables);
- ✚ Waste generation and management;
- ✚ Restore the environment to allowable baseline conditions and monitor the process in line with legislative and regulatory requirements and best industry standards; and
- ✚ Assess the residual impacts, if any, that the project has on the environment; and specifically, if there are any future restrictions for other activities.

8.3 Management of Decommissioning Activities

In the event of decommissioning, REA, in conjunction with the leadership of the Academy, shall ensure that the Project site is left in a safe and environmentally acceptable condition. A standard decommissioning, abandonment, and closure programme shall be invoked. The tasks will include, amongst others:

- Evacuation of the dismantled PV panels and other related items (such as inverters and control devices) to the manufacturers for recycling.
- Transportation of spent batteries to recycling facilities;
- Monitoring the abandoned project environment as necessary.

Decommissioning activities will only begin after due consultation with the relevant stakeholders, including the regulatory authorities. The decommissioning activities shall be carried out in line with the relevant provisions of the National Guidelines for Decommissioning of Facilities in Nigeria (2017) issued by the FMEnv.

Typically, the following actions shall be undertaken for decommissioning:

- An updated plan which takes into account the most cost-effective and best practicable methods.
- Legal requirements and industry practices at that time for the facility decommissioning shall be developed and submitted to the FMEnv and other relevant regulatory authorities for approval.
- The plan shall include, but not limited to the following:
 - ✚ Description of the site
 - ✚ Components to be decommissioned.

Description of the decommissioning scope, objectives, end state and strategy;

- Activities to be performed during the decommissioning;
- Schedule of decommissioning activities; o Estimate of the decommissioning cost;
- Estimated inventory of waste streams to be generated during the decommissioning and handling techniques;
- Decommissioning team (qualifications, roles and responsibilities)
- To ensure that due consideration is given to all options a detailed evaluation of facility decommissioning options shall be carried out.
- The options will include facility mothballing, partial facility decommissioning or complete site decommissioning. The evaluation will consider environmental issues in conjunction with technical, safety and cost implications to establish the best practicable environment friendly options for the Project decommissioning.
- A risk assessment shall be conducted to ensure that nothing, which could be constituted as a hazard for other users of the site or for the environment in general, will be left at the site.
- The Project site shall be left in a safe and environmentally acceptable condition.
- Hazard identification and analysis shall be conducted to determine special safety concerns to be addressed.
- An appropriate Health, Safety and Environment (HSE) plan shall be implemented to ensure that the decommissioning activities are carried out in an environmentally sound manner and in conformity with relevant laws and regulations guiding such operations
- Third-party notifications should be carried out before any demolition and should be conducted in a phased sequence.
- Socio-economic considerations of facility decommissioning shall be carried out. These will include assessment of potential effects associated with termination of employment (at the end of the operational phase) and measures to minimize the effects by:
- Ensuring that employees are fully informed about the decommissioning and how it will affect them before the project finally closes.
- Building community capacity to manage opportunities and impacts arising from the decommissioning and post-decommissioning phase of the Project.
- Providing training to build local skills tailored to project decommissioning and post-decommissioning activities (e.g. equipment dismantling, rehabilitation activities, monitoring, etc.).

- Providing training to transfer project-learned skills to alternative and secondary industries tailored to respond to market economy.
- An effective waste management plan shall be developed for the decommissioning activities. The decommissioning options for redundant structures and equipment will include: the complete dismantling of structures and equipment and the return of all components to the equipment manufacturer for recycling. A detailed record of all suitable recycling materials shall be maintained.

8.4 Abandonment Plan

Before site abandonment, REA shall establish a standard procedure for incorporating the following practices:

- Identification of the components of the power plant that will be abandoned and/or removed;
- The proposed methods for abandonment or re-use of the plant equipment/material are applicable;
- Processes put in place to mitigate potential environmental impacts associated with the abandonment process; and
- Appropriate site rehabilitation programs (including re-vegetation of the site with native plant species) to return the Project site to its original status (as much as possible).

In the event of the project being abandoned, this shall be done in accordance with strict compliance with legislative requirements and international best practices. The decommissioning, abandonment and/or closure programme shall generally be managed by a team of competent personnel from the REA-Project Management Unit, the Department of Works and Physical Planning Department of the Academy. The abandonment process shall be carried out as follows:

- Relevant stakeholders shall be duly informed;
- Physical Asset Verification (PAV) of the facilities shall be carried out;
- National Sectoral Regulations, as they affect the abandonment of the project, shall be strictly complied with to ensure:
- Restoration and rehabilitation of the environment.
- Management of residual impacts of the project in strict compliance with extant
- National/ FMEnv sectoral regulations.

In addition, a site close-out permit shall be obtained as appropriate and a close-out report shall be prepared and archived for future reference.

CHAPTER NINE

STAKEHOLDERS ENGAGEMENT AND GRIEVANCE REDRESS MECHANISM

9.1 Preamble

Consultations play a crucial role in identifying the key environmental and social issues that are central to the preparation of this ESMP. A Stakeholder Engagement Plan (SEP) was developed to support the effective and sustainable implementation of all phases of the Project lifecycle, including pre-construction, construction, operation, and decommissioning.

The SEP outlines the methods used to identify stakeholders, the approaches adopted for engaging them, and the outcomes of consultations conducted to date. It also details the measures taken by the Project to ensure that relevant information was appropriately disclosed to stakeholders.

9.2 Stakeholder Engagement

A Stakeholder Engagement Plan (SEP) is the process of managing stakeholder expectations which influences project decisions throughout the life cycle of the project. This process provides a plan to interact effectively with stakeholders and support the project interest. It is very important to plan these activities well so that they appraise the contribution of stakeholders on projects, manage their expectations also achieve project objectives. The stakeholder engagement process emphasized free, prior, and informed consultation (FPIC) with affected communities and other relevant stakeholders, while considering appropriate approaches for involving vulnerable and marginalized groups. Consultations included early disclosure of information in formats that are accessible and easily understood, as well as key informant interviews, focus group discussions (segmented by men, women, and youth), and broader public meetings.

Table 9.1: Stakeholders Engagement Plan (SEP)

No.	Activity	Identified Stakeholders	Focus of Consultation/ Engagement	Timelines/ Frequency	Forms of communication	Facilitator
1.	Preparation of ESMP/ Project design	- State Project Coordinating Unit - Federal Ministry of Environment - State Ministry of Environment - Community and Community Based Organisations - FMF - World Bank	Large scale forum Key stakeholders' interviews Mapping of community interests and concerns Communities need to know what the project is all about.	Throughout the ESMP study period	- Focus Group Discussion/workshops - Phone calls - One on one interview - Distribution of pamphlets - Public meetings - Newspapers/magazines	REA
2.	Site preparation prior to excavation, construction & pipe laying work	- SPIU - Contractor - Supervising Engineers - Consultant - FME	Information Disclosure at Federal Ministry of Environment, State Ministry of Environment and Local Government level.	Two weeks prior to construction	Through Radio and Newspapers	REA Federal Ministry of Environment
3.	Start of excavation, construction & pipe laying work	- SPIU - Contractors - Supervising Engineers - Consultant - Suppliers - Businessmen - NGOs/vulnerable groups - Communities	- Affected Communities - Government Officials - World Bank	Throughout the construction period	- Phone calls - Newspapers - Radios - Pamphlets - One on One	REA FMF WORLD BANK
4.	End of excavation, construction &	- SPIU - Government Officials - Affected Communities	- Government Officials - Affected Communities	Decommissioning phase	- Phone calls - Televisions - Radios	Government Officials REA

No.	Activity	Identified Stakeholders	Focus of Consultation/ Engagement	Timelines/ Frequency	Forms of communication	Facilitator
	pipe laying work / Decommissioning of construction equipment and machinery	World Bank			- Newspapers - Emails - Pamphlets	
5.	Commissioning and handing over	- Government Officials - SPIU - Beneficiary Communities	- Government Officials - Benefitting Communities	Prior to operation of the facility	- Newspapers - Television - Radio	REA
6.	Operation and maintenance of facility	Beneficiary Communities	Beneficiary Communities	During operation and maintenance period	- One on one - Workshops/FGD - Television - Radio	REA
		REA	POLAC Community	3 times a week	Visits	REA
		REA	POLAC Community	Fortnightly	Visits	
		Government Officials	POLAC Community	3 times a week	Visits	
		World Bank	Beneficiary communities	Once a term	Visits	REA

All consultation activities were properly documented, including relevant data, supporting evidence, participant lists with contact information, and photographic records. Information disclosure was in compliance with the provisions of national regulations, including the EIA Act No. 86 of 1992 (as amended under Cap E12 LFN 2004), as well as the World Bank's Environmental and Social Safeguards Standards (ESSS).

9.3 Objectives of Stakeholder Engagement

The purpose of public participation in an ESMP is to ensure that potentially affected and interested stakeholders are provided with adequate, clear, and accessible information in an objective manner. This enables them to identify key concerns, contribute meaningful input, and propose options for improving project benefits and considering alternatives.

The stakeholder engagement process has been structured in line with the requirements of the Nigerian EIA Act as well as applicable international standards. For this Project, the main objectives of stakeholder engagement are as follows:

- Identify key stakeholders that can influence the Project and its activities;
- Inform and educate stakeholders about the proposed Project;
- Gather local knowledge to improve the understanding of the environmental and social context;
- Better understand the locally-important issues;
- Identify the most effective methods and structures through which to disseminate project information, and to ensure regular, accessible, transparent and appropriate consultation;
- Provide a means for stakeholders to have input into the Project planning Process;
- Take into account the views of stakeholders in the development of effective mitigation measures and management plans; and
- Lay the foundation for future stakeholder engagement.

9.4 Disclosure and Participation Plan

Information disclosure is a critical activity, not only as a means of engagement but also as a foundation for enabling other engagement processes to be carried out in an informed and participatory manner. This section outlines the procedures to be followed for information disclosure and stakeholder participation as part of the implementation of the EEP.

In accordance with the World Bank Safeguards requirements, the REA is expected to disclose the environmental and social assessment, along with a documented record of stakeholder engagement. This record should include details of the stakeholders consulted, a summary of the feedback received, and a clear explanation of how the feedback was incorporated into the Project, or the reasons why it was not adopted.

Disclosure Mechanism

The process of information disclosure can be undertaken in two ways: either voluntary disclosure or disclosure as part of the regulatory requirements (EIA requirements, public hearing). While regulatory disclosure involves the provisioning of information as required by the authorities and agencies involved in the project, voluntary disclosure refers to the process of disclosing information to the various stakeholders in a voluntary manner. This disclosure not only allows for trust to be built amongst the stakeholders through the sharing of information, but

it also allows for more constructive participation in the other processes of consultation and resolution of grievances due to availability of accurate and timely information.

Process for Disclosure of Information

As a standard practice, this ESMP will be released for public review according to the AfDB disclosure procedures, and for a period of 21 days in accordance with Nigerian Regulatory Frameworks. Distribution of the disclosure material will be done by making them available at venues and locations convenient for the stakeholders and places to which the public have unhindered access. The language of the ESMP is in English. The report will be made accessible for the general public at the following locations:

- The EA Department of the Federal Ministry of Environment;
- The Kano State Ministry of Environment,
- The Nigeria Police Academy
- Other designated public locations to ensure wide dissemination of the materials.

Electronic copies of the ESMP report will be made available on the websites of the World Bank and FMEnv, enabling stakeholders with internet access to review information on the proposed development and participate in the public consultation process. Stakeholder input will be facilitated through various mechanisms, including press releases and media announcements, as well as notifications to local, regional, and national NGOs, relevant professional bodies, and other interested parties regarding the disclosed materials.

9.5 Stakeholder Identification/Mapping and Analysis

The stakeholders were identified based on the direct project beneficiaries, adversely impacted groups, project supporters /proponents, regulatory/ planning, However, the stakeholders covered are;

- Rural Electricity Agency (REA)
- Federal Ministry of Environment (FMEnv)
- Kano State Ministry of Environment
- Wudli Local Government Area
- Nigeria Police Academy /community

Major Points of the Initial Consultation Key agenda points included:

1. Introduction of Stakeholders
2. Opening Remarks
3. Description of the Proposed Project by REA/Consultant
4. Overview of The ESMP and Public Consultation by Consultant
5. Questions, Comments and Remarks by other stakeholders
6. Closing Remark

Key feedback received during Stakeholder Consultations are presented below

Table 9.2: Engagement with Staff of Nigeria Police Academy

S/N	Comments	Response
1	What is the objective of the REA solar project?	The objective of the REA solar project is to improve access to reliable, clean, and sustainable electricity in underserved and off-grid communities, thereby supporting economic growth and improving quality of life.
2	Who is funding and implementing the project?	The project is funded by development partners (World Bank) and implemented by the Rural Electrification Agency (REA)
3	What is the expected timeline for construction and operation?	Construction is expected to commence following all necessary approvals and will typically last a few months. The operational phase will begin immediately after commissioning and is expected to last for 20–25 years.
4	How will noise, dust, and waste be managed during construction?	Mitigation measures will include controlled working hours, regular water sprinkling to reduce dust, proper maintenance of equipment to minimize noise, and implementation of a waste management plan in line with environmental regulations.
5	Are there any risks to nearby communities?	Potential risks are minimal and largely limited to the construction phase. These will be managed through strict adherence to health, safety, and environmental management plans to ensure community safety.
6	Will land acquisition be required?	Yes, land may be required for the installation of solar panels and associated infrastructure. The process will follow legal guidelines and ensure fair and transparent acquisition.
7	Will anyone be displaced due to the project?	The project is designed to avoid physical displacement where possible. If any economic displacement occurs, affected persons will be compensated in accordance with applicable laws and standards.
8	How will the project improve electricity access in the area?	The project will provide stable and renewable power supply to homes, businesses, and public institutions, reducing reliance on diesel generators and improving energy reliability.
9	Will the project operate 24 hours a day? If yes, will there be any generating set and who will provide the diesel?	The project is designed to operate continuously using solar power supported by battery storage systems. Backup generators may be used only in rare cases, and fuel supply (if required) will be managed by the project operator.
10	What is the capacity of the proposed project?	The exact capacity will depend on site-specific design but is typically in the range of mini-grid or utility-scale solar installations designed to meet local demand.
11	What is the total land take required?	Land requirements depend on the project capacity, but solar projects generally require several hectares. The exact size will be determined during detailed design and site planning.

Table 9.3: Local Government Representatives

S/N	Comments	Response
1	How does the project align with local government development plans?	The project is aligned with local and national electrification strategies and supports economic development goals by improving access to reliable power.
2	What role will the local government play in project implementation?	The local government will support community engagement, facilitate coordination
3	Will the project generate revenue or economic benefits for the local government?	Yes, the project is expected to stimulate local economic activities, increase business productivity, and indirectly enhance local revenue generation.
4	How will environmental compliance be ensured?	The project will comply with all applicable environmental regulations and implement the Environmental and Social Management Plan (ESMP) throughout its lifecycle.
5	What measures are in place to manage community grievances?	A structured Grievance Redress Mechanism (GRM) will be implemented, ensuring timely and transparent resolution of complaints.
6	Will local contractors or suppliers be engaged?	Where feasible, local contractors and suppliers will be prioritized to promote local economic participation.
7	How will security of the project site be managed?	Security arrangements will be coordinated with local authorities and community leaders to ensure safety without disrupting community relations.
8	What is the sustainability plan for the project?	The project includes long-term operation and maintenance plans, including capacity building and possible private sector involvement.
9	Will there be training or capacity building for local personnel?	Yes, the project will include training programs aimed at building local technical and operational capacity.
10	How will the project be monitored and evaluated?	Regular monitoring and reporting mechanisms will be established in collaboration with relevant authorities to track performance and compliance.

Table 9.4: Host Community

S/N	Comments	Response
1	Will the project provide electricity directly to our homes?	Yes, the project is designed to improve electricity access for households, businesses, and public facilities within the community.
2	Will community members get employment opportunities?	Priority will be given to qualified local residents for available jobs during construction and operation phases.
3	Will our land be taken, and how will compensation be handled?	Any land acquisition will follow due process, and affected persons will be fairly compensated in line with applicable laws and standards.
4	Will the project affect our farming activities?	Efforts will be made to minimize impacts on livelihoods, and any affected farmers will be supported through compensation or livelihood restoration measures.
5	Is the project safe for our health?	Yes, solar projects have minimal health risks, and safety measures will be implemented to protect both workers and the community.
6	Will there be noise or disturbance during construction?	Some temporary disturbance may occur, but mitigation measures will be implemented to minimize noise, dust, and disruptions.
7	How can we report complaints or concerns?	A grievance redress mechanism will be established, allowing community members to easily report concerns and receive timely feedback.
8	Will electricity be affordable?	Tariffs will be designed to be fair and affordable while ensuring sustainability of the system.
9	What happens if the system breaks down?	Maintenance plans will be in place, and technical teams will respond promptly to ensure minimal downtime.
10	Will the project benefit our schools and health centers?	Yes, improved electricity supply will support better services in schools, clinics, and other public institutions.

9.6 Grievance Redress Mechanism (GRM)

This section outlines the grievance redress mechanism (GRM) established to address both general project-related grievances and sensitive issues such as gender-based violence (GBV) and sexual exploitation and abuse (SEA), including the implementation of a dedicated GBV Action Plan. The GRM is designed to provide a safe, accessible, and transparent process through which affected communities and stakeholders can raise concerns related to project activities. While the standard GRM of the Rural Electrification Agency (REA) provides overarching guidance, it is intended to complement not replace the site-specific mechanisms that are developed and implemented at the subproject level to reflect local contexts and needs.

The GRM serves as a structured framework that enables stakeholders to lodge complaints, track their progress, and receive timely feedback on resolutions. It ensures that grievances are handled in a fair, consistent, and efficient manner, thereby strengthening accountability and trust between project implementers and host communities. The mechanism covers a wide range of issues, including environmental impacts, social concerns, land-related matters, and labor issues. Clear procedures are established for receiving, recording, assessing, and resolving grievances, with defined timelines and responsibilities at each stage.

To ensure effectiveness, the GRM will be widely communicated to all stakeholders throughout the project lifecycle. This includes raising awareness during consultations, community meetings, and through information disclosure channels. Stakeholders will be informed about how to access the mechanism, the types of grievances that can be reported, and the expected timelines for resolution. In addition, a grievance register will be maintained to document all complaints received, actions taken, and outcomes achieved, ensuring transparency and enabling continuous improvement of the system.

Special provisions are included within the GRM to address GBV/SEA-related grievances in a confidential, survivor-centered, and ethically appropriate manner. These cases will be handled with strict confidentiality, and referral pathways to appropriate support services will be established. The GRM will remain operational throughout the entire project lifecycle, ensuring that stakeholders have continuous access to a reliable platform for raising concerns and seeking redress, thereby contributing to the overall sustainability and social acceptability of the project.

9.6.2 Publicizing and Disclosure of the GRM

The GRM will be disclosed to the stakeholders through written and verbal communication. The mediums to be used for this purpose are public meetings, group discussions. The GRM disclosure will be done along with the disclosure of other management plans.

9.6.3 Receiving and Recording Grievances

As part of the GRM, the grievances from the stakeholder or their representatives may be communicated verbally (in person or over a telephonic conversation) or in written form to the project representatives or to the designated Grievance Officer (GO) directly. If the grievance is received directly by the GO or other project representatives, it will be recorded directly into the Grievance Form as soon as the personnel return to site. A sample grievance form is as follows:

Table 9. 5: Grievance Recording Form

GRIEVANCE REGISTRATION	
Case No.:	Date:
Name:	
Office Location:	Unit:
Phone no:	
Details of grievance:	
Name of person recording grievances:	
Designation of recording person:	
Proposed date of response to grievance:	
Signature of recording person	Signature of complainant
GRIEVANCE REDRESSAL RESPONSE	
Decision of GO (give full details):	
Claimant accepts the outcome:	
Accepted	Not accepted
Signature of claimant:	
Signature of GO:	

All project staff will be made aware of their responsibility to promptly forward any grievances or related communications they receive to the designated Grievance Officer at the project site. This ensures that no concern raised by stakeholders is overlooked or delayed. Staff are required to document key details, including the identity and contact information of the complainant (where provided), as well as the nature of the grievance, and submit this information as soon as possible. This approach promotes accountability and ensures that grievances enter the formal system without unnecessary delay.

Once the grievance is received, the Grievance Officer will serve as the central point for recording and coordinating responses. The officer will review the information provided and ensure that all grievances are properly documented and tracked. Subsequently, the Grievance Officer will forward the complaint to the Social Safeguard Officer, who is responsible for assessing the issue and facilitating an appropriate resolution in collaboration with relevant project teams and stakeholders. To make the grievance process accessible and inclusive, a grievance register will be established and maintained at both the project office and the site camp. This register will serve as a formal log where individuals or groups can submit their complaints in person. The availability of this register at easily accessible locations ensures that all stakeholders, including those without access to digital communication channels, have an opportunity to raise concerns directly.

The use of a grievance register also enhances transparency and consistency in handling complaints. Each entry will capture essential details such as the date of submission, nature of the grievance, actions taken, and status of resolution. This systematic documentation supports effective monitoring and follow-up, helps identify recurring issues, and contributes to improving overall project management and stakeholder relations.

9.6.4 Maintaining a Grievance Register

Each grievance thus received, shall be recorded in a grievance register. This grievance register shall be updated at each stage of the grievance redressal. Once the grievance is recorded in the register, a preliminary analysis shall be undertaken by the social standard officer/ manager to ensure that the grievance is within the scope of the GRM.

9.6.5 Acknowledgment of Grievance

Once the grievance has been recorded, the stakeholder will receive an acknowledgment of receipt along with a summary of the complaint.

9.6.6 Site Inspection and Resolution

Site inspections may not be necessary for all grievances during the verification and resolution process. The need for a site visit will be determined based on the nature and sensitivity of the issue.

9.6.7 Resolution, Escalation, and Closure

Based on the understanding developed, the Social Safeguard Officer, in consultation with relevant departments, shall determine an appropriate resolution to the issue. This may include providing information to clarify the situation, implementing corrective actions to address identified problems, offering compensation; either financial or in kind for any damage caused, and introducing mitigation measures to prevent recurrence. The agreed resolution shall be communicated to the complainant within 10 working days after completion of the site investigation. Where the issue falls outside the mandate of the Social Safeguard Officer, it shall be escalated to the Head of the PMU under the NEP, and the complainant shall be duly informed of the escalation. The Head of the PMU shall make efforts to resolve the grievance within 10 working days of receiving it.

If the grievance remains unresolved and no adequate solution can be identified by the Head of the PMU, a formal response shall be provided to the complainant, along with guidance on alternative avenues for redress. This may include referral to a citizens' rights mediation centre for resolution prior to pursuing legal action.

At any stage, if the complainant is dissatisfied with the proposed resolution, they may request that the grievance be escalated to the next level. In cases where a grievance is determined to be unfounded, a clear and reasoned explanation shall be provided to the complainant.

9.6.8. Update of Records

The grievance register shall be updated on a weekly basis to reflect the current status of each complaint. Once a grievance has been resolved and the outcome communicated to the complainant, it shall be formally closed in the register. The register should also document how each grievance was addressed, providing a clear record of the resolution process. These records will serve as useful references for handling similar grievances in the future. Where there is evidence of recurring issues or repeated grievances, such matters should be escalated to the Head of the PMU under the NEP for assessment, to determine whether modifications to the project design are necessary.

CHAPTER TEN

CONCLUSION AND RECOMMENDATION

10.1 Conclusion

The Environmental and Social Impact Assessment (ESMP) for the proposed solar power plant at the Nigeria Police Academy, Wudil, Kano, was conducted to comply with applicable government policies, regulatory requirements, financiers' standards, and stakeholder expectations. The objective is to ensure that proactive environmental and social considerations are integrated into the project design and implementation. This study was carried out in accordance with Nigeria's regulatory framework for environmental and social management, particularly the Nigerian EIA Act Cap E12 LFN 2004, which mandates EIAs for projects with the potential to cause significant environmental impacts. Additionally, the ESMP aligns with the World Bank's Environmental and Social Standards.

The ESMP process is intended to provide comprehensive information to support informed decision-making and promote environmentally sound and socially sustainable development. Stakeholder consultations have been conducted and will continue throughout the project lifecycle. These engagements ensured that concerns and questions regarding the proposed project were adequately addressed to the satisfaction of stakeholders.

Baseline environmental and social conditions covering both biophysical and socio-economic aspects were established through field surveys and sampling, supported by literature reviews, maps, and other secondary data sources. This baseline information will serve as a reference point for future monitoring and evaluation. The assessment examined interactions between the project activities and existing environmental and socio-economic conditions to identify, characterize, and evaluate potential impacts. Appropriate mitigation measures and recommendations were subsequently developed based on the mitigation hierarchy of avoiding impacts where possible, minimizing unavoidable impacts, restoring affected resources, and compensating for residual impacts where necessary. These measures were informed by industry best practices, available technologies, and health, safety, and environmental (HSE) considerations.

An Environmental and Social Management Plan (ESMP) was also developed to guide the management of potential adverse impacts during project implementation and operation. The ESMP outlines procedures for implementing environmental and social commitments and includes a monitoring framework to track changes in environmental conditions over time. In this regard, the Rural Electrification Agency (REA) will ensure that parameters such as air quality, noise levels, and groundwater conditions are monitored in compliance with the Federal Ministry of Environment (FMEnv) and World Bank standards. Mitigation measures implemented under the ESMP followed the hierarchy of avoid, minimize, restore, and compensate.

10.2 Recommendation

The ESMP study recommends the following:

- Ensure full implementation of the Environmental and Social Management Plan (ESMP) throughout the project lifecycle.
- Conduct regular environmental monitoring for air quality, noise, groundwater, and waste management.
- Maintain continuous stakeholder engagement and effective community communication.
- Prioritize local employment, capacity building, and renewable energy training opportunities.
- Implement strong occupational health and safety measures, including emergency response systems.
- of Establish and maintain an efficient Grievance Redress Mechanism (GRM) for timely resolution complaints.
- Promote proper waste management, including safe disposal of hazardous and electronic waste.
- Ensure compliance with regulatory requirements through continuous oversight by the Rural Electrification Agency and relevant authorities.

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Appendix – Laboratory Report -Soil



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15th April 2026

Client: CHALTON
Sample Type: SOIL
Sample Analysis: E&S Compliance Audit Kano

Soil Physicochemical Properties

Parameter	Unit	SS1 (0-15 cm)	SS1 (15-30 cm)	SS2 (0-15 cm)	SS2 (15-30 cm)	SS3 (0-15 cm)	SS3 (15-30 cm)	Control (0-15 cm)	Control (15-30 cm)
pH	—	5.67	5.65	6.34	6.23	6.69	6.79	6.33	6.02
EC	µS/cm	98.00	162.76	105.40	101.40	162.76	144.56	167.00	131.50
Temperature	°C	28.40	30.63	30.60	27.90	30.63	29.99	29.35	28.50
Nitrate	mg/kg	0.38	0.63	0.45	0.39	0.63	0.46	0.90	0.75
Ammonia	mg/kg	0.80	1.13	0.76	0.67	1.13	2.57	0.99	2.42
Phosphate	mg/kg	0.56	1.14	1.16	1.10	1.14	12.50	1.62	7.83
Sulphate	mg/kg	12.11	14.04	13.09	12.09	14.04	1.95	10.67	1.34
Chloride	mg/kg	0.87	1.70	1.40	1.50	1.70	3.11	2.06	0.97
TOC	%	0.63	0.87	0.78	0.75	0.87	0.85	1.15	1.23
Oil & Grease	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
THC	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
TPH	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
PAHs	mg/kg	ND	0.02	ND	ND	0.02	0.01	ND	ND
BTEX	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND

Soil Physical Properties (PSD)

Parameter	Unit	SS1 (0-15 cm)	SS1 (15-30 cm)	SS2 (0-15 cm)	SS2 (15-30 cm)	SS3 (0-15 cm)	SS3 (15-30 cm)	Control (0-15 cm)	Control (15-30 cm)
Moisture Content	%	6.74	6.37	7.72	7.61	7.73	7.64	8.61	9.24
Porosity	%	27.36	26.42	32.34	33.31	32.92	33.84	32.42	29.38
Sand	%	6.81	5.71	19.35	23.20	19.47	23.21	27.00	24.72
Silt	%	1.57	0.66	18.04	21.50	18.07	21.70	10.81	18.46
Clay	%	24.94	28.93	62.43	55.02	62.46	55.09	62.20	56.81

Cations

Parameter	Unit	SS1 (0-15 cm)	SS1 (15-30 cm)	SS2 (0-15 cm)	SS2 (15-30 cm)	SS3 (0-15 cm)	SS3 (15-30 cm)	Control (0-15 cm)	Control (15-30 cm)
Magnesium	mg/kg	22.75	19.09	31.32	29.16	31.59	29.63	27.17	25.26
Potassium	mg/kg	2.43	2.75	5.06	5.12	5.33	5.41	4.76	6.08
Sodium	mg/kg	9.10	8.81	12.14	11.12	12.25	11.98	12.37	12.52

Heavy Metals

Parameter	Unit	SS1 (0-15 cm)	SS1 (15-30 cm)	SS2 (0-15 cm)	SS2 (15-30 cm)	SS3 (0-15 cm)	SS3 (15-30 cm)	Control (0-15 cm)	Control (15-30 cm)
Copper	mg/kg	3.44	3.63	4.14	3.22	4.19	3.98	2.00	1.83
Chromium	mg/kg	1.32	1.23	1.33	1.23	1.53	1.52	1.01	1.21
Cadmium	mg/kg	0.68	0.62	1.01	0.21	1.03	0.95	0.83	0.85
Nickel	mg/kg	0.69	0.67	1.43	1.14	1.45	1.31	0.77	0.72
Arsenic	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Iron	mg/kg	97.18	94.62	170.89	160.43	170.89	160.41	183.62	184.80
Mercury	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND
Lead	mg/kg	0.84	0.89	1.12	1.14	1.35	1.38	1.09	0.96
Zinc	mg/kg	5.17	5.13	5.12	5.32	7.05	7.20	10.08	8.72
Manganese	mg/kg	1.30	1.23	1.32	1.32	1.97	1.99	1.83	1.98

Thank you for your patronage.

Bayo Lawal
Managing Director



QUESTIONNAIRES

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PLAN (ESIA) PHASE III: ENERGIZING EDUCATION PROGRAM (EEP) PROJECT

NOTE:

Please read each question carefully. Your answers are completely confidential and will be included only in summaries where individual answers cannot be identified. Unless otherwise instructed, please tick appropriate answer category that best describes your opinion. It will take approximately 20 minutes to complete this questionnaire.

SECTION A: Household data

Location/Name of School.....

1. Gender of Respondent: (a) Male (b) Female
2. Age: (a) Below 18 yrs (b) 18-45 yrs (c) 46-65 yrs (d) Above 66 yrs
3. Marital Status: (a) Single (b) Married (d) Divorced/Separated (e) Widowed
4. Occupation: (a) Civil Servant (b) Daily Labourer (c) Trading & Shop Keeping (d) Artisans (e) Employed (salary)(f) Retired (g) Farmer (h) Unemployed (i) Others specify.....
5. Residential Status: (a) Permanent Resident (b) Back Home (Returnee) (c) Nonresidents, Visiting
6. Ethnic Group: (a) Epira (b) Igala (c) Hausa-Fulani (d) Igbo (e) Hausa Yoruba (f) others.....
7. Religion: (a) Islam (b) Christianity (c) Traditional
8. Relationship to Household Head (HH): (a) Self (b) Spouse (c) Child (d) Parent (e) Other, specify.....
9. Size of the HH
10. How long have you been living/working in this area? (a) 0-2 yrs (b) 3-5 yrs (c) 6-9 yrs (d) 10 yrs and Above
11. Education: (a) NO formal education (b) Primary School (c) Secondary School (d) Tertiary (Excluding University) (e) University Graduate (f) University Postgraduate

SECTION B: Health Status

1. How do you manage your health conditions when sick? (a) Attend hospital/clinic (b) Buys drugs from nearby chemist (c) Traditional medicine (d) None (e) Others Specify.....
2. If you do attend hospital/clinic, when last did you visit one? (a) last six months (b) last one year (c) last five years (d) more than five years ago (e) Never visited one.
3. Please tick one or more of the under-mentioned ailment/sicknesses, you suffer from most accordingly?
- 4.
7. Do you think your health condition will be affected by the proposed Infrastructure intervention? (a) Yes (b) No
8. If yes, how?

9. Please suggest how this can be averted during construction and implementation.....

SECTION C. Standard of Living /Socioeconomic Activities

1.0 Assets

- 1.2 Indicate household refuse disposal for solid waste? (Multiple options) (a) Depositing refuse at backyard of the house (b) Dumping in water body (c) Dumping in community refuse/garbage pit/dumpsite (d) Burning after gathering together (e) Waste collector (f) Other specify.....

2.0 Household Services

- 2.1 Rank in order of availability and usability the source(s) of lighting for the household? (Please use 1, 2, in hierarchical order with 1 indicating the most available and used source)

- 2.2 Using the method in 2.1, indicate major source of energy for cooking?

3.0 Sources of Water

.1 Remittances

5. In your opinion, how has the standard of living of your household changed over the previous three years? (a) Same (b) Better (c) Worse
6. Is the option in 5 propelled by the state of the electricity provision/availability? (a) Yes (b) No
7. If 6 is YES, do you think the proposed infrastructure intervention will improve the situation? (a) Yes (b) No
8. If 7 is YES specify how the project will improve the situation

SECTION D: Gender-Based Violence/Sexual Exploitation and Abuse

1. Are there any provisions which restrict women's access to health and other social services? In particular which: *(Please specify in the space provided for this purpose "yes" or "no")*

- () require the consent of a male relative/husband for a married woman's medical examination or treatment or access to contraceptives or abortion,
- () require parental consent in case of adolescents' access to contraceptives abortion;
- () allow medical practitioners to refuse provision of a legal medical service on grounds of conscientious objection
- () prohibit certain medical services, or require that they be authorized by a physician, even where no medical procedure is required; in particular:
- () IUDs (intrauterine devices) or hormonal contraceptives
- () Emergency contraceptives, including the morning-after pill, () Sterilization on request;
- () Early abortion (in first trimester of pregnancy) at the pregnant woman's request
- () Medically assisted reproduction (e.g., in vitro fertilization)

Are the following acts criminalized?

(Please specify in the space provided for this purpose "yes" or "no")

() adultery

() prostitution

(If yes, who is criminally responsible? (a) the sex worker (b) the procurer and/or the customer) (c) both

3. Are there any measures and programs put in place in order to increase women's participation safety e.g. in public urban spaces, in public transportation, etc.? (a) Yes (b) No (c) No idea

4. Are there specific training programs for medical and legal professionals on the issue of gender-based discrimination in the area of health and safety? (a) Yes (b) No (c) No idea

5. How do you ensure gender equity in the community? (a) Women are elected in public office (b) Females are given equal opportunity and access to education and employment (c) Quotas on genders are ensures in leadership of community-based organizations (d) Others specify.....

SECTION E: Resources/ Cultural Property

1. Please indicate the environmental problems which your community experiences? (a) Soil infertility (b) Poor drainage system (c) Bad road (d) Bad lands (e) environmental degradation (f) Degraded land (i) Destruction of infrastructures (j) Others

(specify)

2. Please indicate the environmental problems which your community would likely experience and whose cause can be linked to the proposed Infrastructure intervention project during construction?

(a) Soil infertility (b) Poor drainage system (c) Bad road (d) Low visibility

(e) Erosion Problems (f) Flooding (g) Environmental degradation

(h) Destruction of infrastructures (i) encroachment of land properties (j) Pollution (air, surface water, ground water, noise) (k) others (specify)

.....

3. Do you think the proposed Infrastructure intervention project will affect any valued resource/cultural/archaeological property in your area? (a) YES (b) NO

4. If yes mention the name(s) of the valued resource/cultural/archaeological property

.....

5. How will valued resource/cultural/archaeological property be affected? (a) Displacement of such valued cultural properties (b) Vandalization of sacred items/locations (c) Possible theft of sacred/archaeological items (d) Others,

specify:.....

SECTION F: Intervention Project Activities Impact Evaluation

1. Are you aware of the proposed Solar Power Project? (a) Yes (b) No

2. If yes, from which source (a) Community meetings (b) Media (TV, Radio, Newspaper, Internet) (c) Others specify.....

3. Do you think the proposed Infrastructure intervention project can cause restiveness in your community? (a) YES (b) NO

4. If 3 is yes how will the proposed Infrastructure intervention result in restiveness? (a) Disrespect of norms and culture by contractors (b) loss of farmland / Property (c) Possible theft of sacred/archaeological items (d) local people not employed during

construction (e) Others, specify:

5. How will the proposed Infrastructure intervention project impact on your livelihood and environment?

6. Can you name some of the animals and other habitat that may be affected by the proposed Infrastructure intervention project?

7. What do you expect from the activities of solar power Infrastructure intervention? (a) employment of Locals during construction (b) compensation for those whose properties will be affected (c) capacity building for maintenance during implementation (d) community input into final engineering design (e) Others please specify.....

Section G: Grievance Redress Mechanism

1. Have you had grievances issue in this community in the last three years? (a) Yes (b) No

2. If 1 is yes, what was the cause of the grievance? (a) Land issue (b) theft of valuables (c) vandalization of property (d) Others, please specify.....

3. Who do you report your grievances in this community to? (a) School authority/management (b) Law enforcement (c) My landlord/CDA (d) traditional/community leader (e) Others, please specify.....

4. Are grievances satisfactorily addressed or resolved by option(s) chosen in question 3 above? (a) Yes (b) No

5. Are there any other issue(s) of concerned as regards the proposed intervention project in your area, please state clearly?.....

STAKEHOLDER ENGAGEMENT AND THE GRIEVANCE REDRESS MECHANISM

Stakeholder engagement and the grievance redress mechanism as key elements of the ESIA process. It explains that stakeholder consultations are essential for identifying environmental and social concerns and ensuring that the project is implemented in an inclusive and transparent manner. A Stakeholder Engagement Plan (SEP) guides how stakeholders are identified, informed, and engaged throughout the project lifecycle. This process includes consultations such as meetings, interviews, and focus group discussions, with special attention given to vulnerable groups to ensure their voices are heard. The engagement process aims to inform stakeholders about the project, gather their input, and incorporate their views into project planning and decision-making. Information disclosure is a major part of this process, with ESIA documents made publicly available both physically and online in line with regulatory requirements. This ensures stakeholders can review the project details, provide feedback, and contribute meaningfully, thereby promoting transparency and trust between the project team and the community.

Consultations revealed that stakeholders generally support the project because of its potential to improve electricity access, enhance economic opportunities, and strengthen public services. However, concerns were raised about land acquisition, compensation, environmental impacts during construction, and the need for local employment. These concerns have been incorporated into mitigation strategies and project design improvements.

Stakeholders Engagement Plan (SEP)

Groups and individuals	Date	Type of Engagement	Discussion
The Commandant of the Police Academy		Consultation /homage	Overview of the ESIA, benefits of the proposed REA Solar project
Representatives of the Wuldi LGA, Kano State		Focal Group Discussion,	An overview of the ESIA and the benefits of the proposed REA solar project.
Representatives of the Various department of POLAC		General Group Discussions; Focus Group Discussions; Interviews.	ESIA overview, benefits, energy requirement, safeguard requirements, Land ownership and use, livelihoods, income levels and expenditure pattern. Housing and infrastructural development, housing conditions and availability of utilities etc

Stakeholder Feedback Summary

Nigeria Police Academy Staff

Key Concern	Response
Objective of project	Improve access to clean, reliable electricity
Funding & implementation	Funded by World Bank, implemented by REA
Timeline	Construction: few months; Operation: 20–25 years
Environmental impacts (noise, dust)	Managed through mitigation measures
Community risks	Minimal and controlled with safety plans
Land acquisition	Required with fair compensation
Displacement	Avoided where possible; compensation if needed
Electricity improvement	Reliable power for homes and institutions
Operation (24 hrs)	Solar + battery; backup generators rarely used
Capacity & land size	Depends on design; several hectares required

Local Government Representatives

Key Concern	Response
Alignment with development plans	Supports local and national goals
Role of local government	Facilitate engagement and coordination
Economic benefits	Boosts business and revenue indirectly
Environmental compliance	ESMP and regulations will be followed
Grievance handling	Structured GRM will be implemented
Local participation	Preference for local contractors/suppliers
Security	Coordinated with authorities
Sustainability	Long-term operation and maintenance plans
Capacity building	Training programs included
Monitoring	Regular reporting and evaluation systems

Host Community

Key Concern	Response
Electricity access	Yes, for homes and businesses
Employment	Priority for local residents
Land & compensation	Fair and lawful compensation
Impact on farming	Minimized; support if affected
Health & safety	Minimal risk with safeguards
Construction disturbance	Temporary; mitigation measures applied
Reporting complaints	Through GRM system
Affordability	Tariffs designed to be fair
System failure	Maintenance teams will respond quickly
Community benefits	Improved schools, clinics, and services

The socioeconomic assessment further shows that the host communities largely depend on agriculture and small-scale trading, with limited access to basic infrastructure such as electricity, healthcare, and clean water. Vulnerable groups, including women and low-income households, were identified, and the project aims to ensure equitable access to its benefits.

[illegible]