|  |
| --- |
| **Electricity Distribution and Supply Authority Ministry of Energy**  **Government of the Republic of Sierra Leone**    **Regional Emergency Solar Power Intervention (RESPITE) Project (P179267)**    **Environmental and Social Impact Assessment (ESIA)/ Environmental and Social Management**  **Plan (ESMP) for the Construction of a 13 MWp (10 MWac) Solar PV Facility in Lungi, Port Loko**  **District, Northern Sierra Leone**  **Final**        **March 2025**  **Freetown, Sierra Leone** |

**Table of Contents**

ACRONYMS/ABBREVIATIONS .............................................................................................................................................. VIII

EXECUTIVE SUMMARY.................................................................................................................................................. XII

BACKGROUND TO THE PROJECT ............................................................................................................................................ XII

POLICY, LEGAL, AND INSTITUTIONAL FRAMEWORKS ................................................................................................................. XIII

STAKEHOLDERS' PARTICIPATION AND CONSULTATION ...............................................................................................................XIX

PROJECT ALTERNATIVES ......................................................................................................................................................XXI ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN ...............................................................................................................XXV

AS THE SUCCESSFUL EPC CONTRACTOR IS ONBOARD, WILL PROVIDE A WORK PLAN (AS PART OF C-ESMP) INCORPORATING THE

FOLLOWING: .................................................................................................................................................................. XXXI

BUDGET .................................................................................................................................................................... XXXVIII

CONCLUSION AND RECOMMENDATIONS ........................................................................................................................... XXXVIII

1. **CHAPTER ONE: INTRODUCTION ......................................................................................................................... 1**
   1. BACKGROUND ...................................................................................................................................................... 1
   2. THE PROPONENT .................................................................................................................................................. 3 1.3. NEED FOR THE PROJECT ......................................................................................................................................... 3
   3. PURPOSE OF THE ESIA STUDY ................................................................................................................................. 3
   4. ESIA METHODOLOGY ............................................................................................................................................ 4
      1. *Field Inspections and Transect Walk ........................................................................................................... 4*
      2. *Review of Available Relevant Literature...................................................................................................... 4*
      3. *Environmental and Social Baseline Studies ................................................................................................. 5*
      4. *Stakeholder Consultations ........................................................................................................................... 5*
      5. *Data Analysis and Reporting ....................................................................................................................... 6*
2. **CHAPTER TWO: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK ................................................................... 7**
   1. LEGISLATIONS AND REGULATIONS ............................................................................................................................ 7
      1. THE CONSTITUTION OF SIERRA LEONE 1991 ......................................................................................................... 7 2.1.2. THE SIERRA LEONE ENVIRONMENTAL PROTECTION AGENCY ACT, 2022 ..................................................................... 7
      2. NATIONAL ELECTRICITY ACT OF 2011 .................................................................................................................. 8
      3. THE SIERRA LEONE ELECTRICITY AND WATER REGULATORY COMMISSION (SLEWRC) ACT, 2011 ................................... 8
      4. THE CUSTOMARY LAND RIGHT ACT 2022 ............................................................................................................. 9
      5. LOCAL GOVERNMENT ACT, 2004 AND AMENDED ACT OF 2017 AND 2022................................................................ 9
      6. SIERRA LEONE ROADS AUTHORITY (AMENDMENT) ACT OF 2010 .............................................................................. 9
      7. THE SIERRA LEONE ROAD SAFETY AUTHORITY ACT 1996 (AMENDED 2003,2016) .................................................... 10 2.1.9. ROAD TRAFFIC ACTS, 2007 ............................................................................................................................. 10
      8. PUBLIC ORDER ACT, 1965............................................................................................................................... 11
      9. FACTORIES ACT,1974 ..................................................................................................................................... 11
      10. EMPLOYERS AND EMPLOYED ACT, CONSOLIDATED TO 1960. .................................................................................. 11
      11. CHILD RIGHTS ACT, 2007 ................................................................................................................................ 11
      12. THE SEXUAL OFFENCES ACT, 2012 AS AMENDED IN 2019. .................................................................................... 12
      13. THE DOMESTIC VIOLENCE ACT 2007 ................................................................................................................. 12 2.1.16. THE GENDER EQUALITY AND WOMEN’S EMPOWERMENT ACT 2022 ....................................................................... 12
   2. NATIONAL POLICY FRAMEWORK ............................................................................................................................ 12
      1. THE ENERGY EFFICIENCY POLICY OF SIERRA LEONE 2016 ....................................................................................... 12
      2. RENEWABLE ENERGY POLICY OF SIERRA LEONE 2016 ........................................................................................... 13 2.2.3. THE NATIONAL LANDS POLICY, 2015 ................................................................................................................. 13

2.2.4. THE NATIONAL ENVIRONMENTAL POLICY (2013) ................................................................................................. 13 2.2.5. NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN ......................................................................................... 14 2.2.6. THE NATIONAL CLIMATE CHANGE POLICY 2021 .................................................................................................. 14

* + 1. NATIONAL LOCAL CONTENT POLICY (2013) ........................................................................................................ 15
    2. LAND OWNERSHIP STRUCTURE ......................................................................................................................... 15
  1. RELEVANT PERMITS ............................................................................................................................................. 16
  2. INTERNATIONAL ENVIRONMENTAL AND SOCIAL INSTRUMENTS/OBLIGATIONS FOR SIERRA LEONE ....................................... 17

ECOWAS ENERGY EFFICIENCY POLICIES (EEEP) .................................................................................................................... 17

THE AFRICA RENEWABLE ENERGY INITIATIVE (AREI) ................................................................................................................ 17

SUSTAINABLE DEVELOPMENT GOAL 7 ................................................................................................................................... 18

UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC) .......................................................................... 19

THE MONTREAL PROTOCOL ................................................................................................................................................ 19

THE INTERNATIONAL LABOUR ORGANIZATION (ILO), 1919 ...................................................................................................... 19

INTERNATIONAL LABOUR ORGANISATION ORDINANCE NO148 .................................................................................................. 20

THE STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS ....................................................................................... 20

AFRICAN CONVENTION ON NATURE AND NATURAL RESOURCES ................................................................................................. 20

THE AFRICAN CHARTER ON HUMAN AND PEOPLES' RIGHTS (ACHPR) FROM 1981 TO 1986 .......................................................... 21

PROTOCOL TO THE AFRICAN CHARTER ON HUMAN AND PEOPLES' RIGHTS ON THE RIGHTS OF WOMEN IN AFRICA, 2003. ..................... 21

THE AFRICAN CHARTER ON THE RIGHTS AND WELFARE OF THE CHILD (ACERWC), 1990 ............................................................... 21

UNITED NATIONS CONVENTION ON THE RIGHTS OF THE CHILD, 1989 ......................................................................................... 22

CONVENTION ON THE RIGHTS OF PERSONS WITH DISABILITIES (CRPD) ........................................................................................ 22

CONVENTION ON THE ELIMINATION OF ALL FORMS OF DISCRIMINATION AGAINST WOMEN (CEDAW) 1979..................................... 22 INTERNATIONAL COVENANT ON ECONOMIC, SOCIAL AND CULTURAL RIGHT .................................................................................. 22

2.5. INTERNATIONAL CONVENTIONS RATIFIED OR ACCEPTED BY THE GOSL ........................................................................... 22

2.6. INTERNATIONAL LENDING INSTITUTIONS' POLICIES, STANDARDS AND GUIDELINES ........................................................... 24

2.6.1. WORLD BANK (WB) GUIDELINES: ENVIRONMENTAL, HEALTH, AND SAFETY GUIDELINES, GENERAL EHS GUIDELINES, 2007

24

2.6.2. WORLD BANK ENVIRONMENTAL, HEALTH, AND SAFETY GUIDELINES FOR ELECTRIC POWER TRANSMISSION AND DISTRIBUTION25

2.6.3. WORLD BANK ENVIRONMENTAL AND SOCIAL STANDARDS (ESS) ............................................................................. 25

2.6.4. COMPARISON OF SIERRA LEONEAN REGULATIONS AND WORLD BANK’S ESF ............................................................. 55

2.7. INSTITUTIONAL FRAMEWORK ................................................................................................................................ 71

2.7.1. THE MINISTRY OF ENERGY (MOE) ..................................................................................................................... 71

2.7.2. THE ELECTRICITY DISTRIBUTION AND SUPPLY AUTHORITY (EDSA) ........................................................................... 71

2.7.3. THE MINISTRY OF THE ENVIRONMENT ................................................................................................................ 73

2.7.4. ENVIRONMENT PROTECTION AGENCY – SIERRA LEONE .......................................................................................... 74

2.7.5. THE SIERRA LEONE ROADS AUTHORITY ............................................................................................................... 74

2.7.6. PORT LOKO DISTRICT COUNCIL ......................................................................................................................... 74

1. **CHAPTER THREE: PROJECT DESCRIPTION ......................................................................................................... 82**
   1. PROJECT DESCRIPTION AND LOCATION .................................................................................................................... 82
      1. SOLAR PV, BESS AND ANCILLARY FACILITIES SITE................................................................................................. 82
      2. 11KV TRANSMISSION ROUTE ............................................................................................................................ 83 3.2. PROJECT FACILITIES AND COMPONENTS ................................................................................................................... 84

3.2.1. THE SOLAR PV FACILITY .................................................................................................................................. 85 3.2.2. BESS SYSTEM DESIGN .................................................................................................................................... 87

* + 1. CONTROL AND SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) ............................................................... 88
    2. 11KV TRANSMISSION LINE ............................................................................................................................... 89
    3. ACCESS ROADS .............................................................................................................................................. 91 3.2.6. BALANCE OF PLANT (BOP) FACILITIES ................................................................................................................ 92 3.2.7. SANITARY FACILITY ......................................................................................................................................... 94
    4. WASTEWATER TREATMENT AND DISPOSAL SYSTEM .............................................................................................. 94
    5. WASTE DISPOSAL ........................................................................................................................................... 95 3.2.10. ACCOMMODATION ......................................................................................................................................... 97
  1. PROJECT PHASES AND ACTIVITIES ........................................................................................................................... 97

*Phase I: Pre-construction (Preparatory Phase Activities) ........................................................................................ 97*

*Phase II: Construction Phase ................................................................................................................................... 98*

*Phase III: Operations and Maintenance Phase ........................................................................................................ 99*

*Phase IV: Decommissioning/Closure ..................................................................................................................... 100*

* 1. RESOURCE REQUIREMENT .................................................................................................................................. 100 *Land ....................................................................................................................................................................... 100*

*Manpower Requirement........................................................................................................................................ 101*

*Water Requirement ............................................................................................................................................... 101*

*Energy Requirement .............................................................................................................................................. 101*

*Raw Material Requirement ................................................................................................................................... 102*

* 1. PROJECT IMPLEMENTATION SCHEDULE .................................................................................................................. 105

1. **CHAPTER FOUR: STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE ........................................ 106**

A. STAKEHOLDER ENGAGEMENT PROCESS DURING THIS ESIA PREPARATION ......................................................................... 106

* + - * 1. MEETING INVITATION PROCEDURE ............................................................................................................................ 106
        2. PLACES AND DATE OF MEETINGS .............................................................................................................................. 106
        3. OBJECTIVES OF THE CONSULTATION PROCESS .............................................................................................................. 107 IV. STAKEHOLDER PROFILING ................................................................................................................................... 108 B. GBV DISCUSSIONS ................................................................................................................................................. 113 C. PUBLIC DISCLOSURE ............................................................................................................................................... 115 D. GRIEVANCE REDRESS MECHANISM (GRM) ................................................................................................................. 115

E. THE WORLD BANK GROUP GRIEVANCE REDRESS SERVICE .............................................................................................. 117

1. **CHAPTER FIVE: ENVIRONMENTAL AND SOCIAL BASELINE .............................................................................. 118**
   1. ENVIRONMENTAL COMPONENTS .......................................................................................................................... 118
      1. TOPOGRAPHY .............................................................................................................................................. 118
      2. CLIMATE AND HYDROLOGY............................................................................................................................. 119 5.1.3. SOIL PROPERTIES AND QUALITY....................................................................................................................... 122
      3. WATER QUALITY .......................................................................................................................................... 126
      4. NOISE ........................................................................................................................................................ 144
      5. AIR QUALITY ............................................................................................................................................... 146
      6. TRAFFIC MONITORING .................................................................................................................................. 148
      7. ECOLOGY AND BIODIVERSITY .......................................................................................................................... 149 5.1.9. VEGETATION DESCRIPTION AND BOTANIC CHARACTERISTICS ................................................................................. 151
   2. SOCIO-ECONOMIC BASELINE OF THE PROJECT AREA ................................................................................................ 159
      1. COMMUNITY DEMOGRAPHIC, HOUSING, AND INFRASTRUCTURE ........................................................................... 161
      2. LAND TENURE AND LAND USE ........................................................................................................................ 162
      3. TYPICAL HOUSING UNIT TYPE ......................................................................................................................... 162
      4. NUMBER HOUSEHOLDS IN A DWELLING UNIT .................................................................................................... 163
      5. LIVELIHOOD AND ECONOMY ........................................................................................................................... 164
      6. LITERACY AND EDUCATION ............................................................................................................................. 165
      7. MEDICAL FACILITY ........................................................................................................................................ 167
      8. COMMUNICATION AND TRANSPORTATION FACILITIES .......................................................................................... 169
      9. DRINKING WATER FACILITY ............................................................................................................................ 169
      10. SANITATION AND WASTE MANAGEMENT .......................................................................................................... 171 5.2.11. POWER SUPPLY ........................................................................................................................................... 174
      11. VULNERABLE GROUPS ................................................................................................................................... 174
      12. LANGUAGE AND ETHNICITY ............................................................................................................................ 175
      13. ARCHAEOLOGICAL AND CULTURAL HERITAGE ..................................................................................................... 175
      14. LAND OWNERSHIP, TENANCY STATUS AND HOUSING/DWELLING TYPE ................................................................... 176
      15. RESPONDENT'S AWARENESS AND PERCEPTION OF THE PROPOSED ENERGY PROJECT ................................................. 177

(N=529) ....................................................................................................................................................................... 178

1. **CHAPTER SIX: ENVIRONMENTAL & SOCIAL RISKS AND IMPACTS AND MITIGATION MEASURES .................... 179**
   1. POSITIVE E&S IMPACTS ..................................................................................................................................... 179 6.2. E&S IMPACT ASSESSMENT AND ANALYSIS ............................................................................................................. 182 6.3. NEGATIVE ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS ................................................................................... 183
      1. PRE-CONSTRUCTION /PROJECT PLANNING PHASE RISKS AND IMPACTS ................................................................... 183
      2. CONSTRUCTION PHASE ENVIRONMENTAL AND SOCIAL RISKS/IMPACTS ................................................................... 187
      3. OPERATIONAL AND MAINTENANCE PHASE IMPACTS ............................................................................................205
      4. DECOMMISSIONING PHASE IMPACTS................................................................................................................ 208

6.4. SUMMARY OF RESPITE’S E&S IMPACT ASSESSMENT AND ANALYSIS .......................................................................... 212

1. **CHAPTER SEVEN: PROJECT ALTERNATIVES ..................................................................................................... 214**
   1. THE NO PROJECT ALTERNATIVE ........................................................................................................................... 214
   2. LOCATION ALTERNATIVES ................................................................................................................................... 214
   3. TECHNOLOGY AND EQUIPMENT ........................................................................................................................... 215
   4. TRANSMISSION ROUTE ALTERNATIVES................................................................................................................... 219
   5. CHOICE OF POLES .............................................................................................................................................. 220
2. **CHAPTER EIGHT: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN ......................................................... 221**
   1. ESMP OBJECTIVES ............................................................................................................................................ 221
   2. ESMP METHODOLOGY ...................................................................................................................................... 221
   3. ESMP IMPLEMENTATION ................................................................................................................................... 223
      1. *Source of Funding .................................................................................................................................... 225*
   4. DEVELOPMENT OF SPECIFIC MANAGEMENT/PROJECT PLANS (FRAMEWORK AND MINIMUM REQUIREMENT) ..................... 225
      1. *Emergency Preparedness and Response Plan ......................................................................................... 231* *8.4.2* *Occupation Health and Safety Management Plan .................................................................................. 232*
      2. *Waste Management Plan - Framework and Minimum Requirement ..................................................... 233*
      3. *Road Safety and Traffic Management Plan ............................................................................................ 235*
      4. *Storm Water Management Plan ............................................................................................................. 236*
      5. *Chance Find Procedure ............................................................................................................................ 237*

*8.4.7.* *Community Development Action Plan (CDAP) .................................................................................... 238*

* + - 1. *Views from the Project Communities ................................................................................................. 238*
      2. *CDAP Implementation Arrangement .................................................................................................. 239*
  1. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN ................................................................................................ 240
  2. ENVIRONMENTAL AND SOCIAL MONITORING .......................................................................................................... 257
     1. *Compliance Monitoring and Corrective Action ....................................................................................... 257*
     2. *Reporting and Review ............................................................................................................................. 258*
  3. INCIDENT AND ACCIDENT REPORTING ................................................................................................................... 262
  4. ENVIRONMENT AND SOCIAL -RELATED TRAINING ............................................................................................................ 263

1. **CHAPTER NINE: CONCLUSION AND RECOMMENDATIONS ............................................................................. 267**
   1. CONCLUSION ................................................................................................................................................... 267
   2. RECOMMENDATIONS ......................................................................................................................................... 268

REFERENCES ............................................................................................................................................................... 271

ANNEXES .................................................................................................................................................................... 273

ANNEX I TOR FOR THE PREPARATION OF ESIA AND ESMP .......................................................................................... 273

ANNEX II METHODOLOGY FOR THE ASSESSMENT OF BIOPHYSICAL AND SOCIAL ATTRIBUTES ................................................ 301 ANNEX III FIELD PHOTOS.................................................................................................................................... 305

ANNEX IV WATER SAMPLING COLLECTION, TRANSPORTATION, HANDLING AND ANALYSIS ................................................. 308

ANNEX V SOIL SAMPLE ANALYSIS .......................................................................................................................... 310

ANNEX VI SLEWRC MINI-GRID REGULATIONS, 2018 AND 2019 ............................................................................. 313

ANNEX VII-A- LUNGI LAND SALE AGREEMENT ........................................................................................................ 327

ANNEX VII-B- TRANSFER OF FUND FOR LAND ACQUIRED FOR LUNGI SOLAR PV AND BESS SITE........................................ 330

ANNEX VII-C- LAND OFFER ................................................................................................................................ 331

ANNEX VIII LUNGI CONVEYANCE ........................................................................................................................... 332

ANNEX XI SUMMARY OF MEETING DISCUSSIONS ..................................................................................................... 327

ANNEX XII PLANT SPECIES RECORDED DURING THE SURVEYS ..................................................................................... 327

ANNEX XIII LIST OF BIRDS RECORDED ..................................................................................................................... 330

ANNEX XIV LIST OF BUTTERFLIES RECORDED DURING THE SURVEY ................................................................................. 333

ANNEX XV ECOLOGICAL COMPOSITION OF STUDY SITE .............................................................................................. 336

ANNEX XVI MINUTES OF MEETING ON LAND ACQUISITION (LUNGI) ............................................................................. 337

ANNEX XVII INCIDENT REPORT FORMS ....................................................................................................................343

ANNEX XVIII SOCIO-ECONOMIC HOUSEHOLD SURVEY ................................................................................................. 347

**LIST OF FIGURES**

FIGURE 0-1: MAP OF LUNGI SOLAR PV, BEES AND ANCILLARY FACILITIES ................................................................................... XII

FIGURE 3-1: LUNGI SOLAR PV PROJECT SITE .......................................................................................................................... 82

FIGURE 3-2: PROPOSED TRANSMISSION ROUTE AT LUNGI SITE ................................................................................................... 84

FIGURE 3-3: SCHEMATIC OF PV, BESS AND TRANSMISSION LINE ................................................................................................ 84

FIGURE 3-4: LUNGI 10 MW AC SOLAR PV AND BESS SITE LAYOUT PLAN .................................................................................... 86

FIGURE 3-5: PROPOSED ARRANGEMENT OF SOLAR PV INSTALLATION .......................................................................................... 87

FIGURE 3-6: LUNGI PROJECT COMPONENTS- TRANSMISSION LINE, ACCESS ROAD, SUBSTATION, ETC. ............................................... 89

FIGURE 3-7: ACCESS ROAD TO PV & BESS SITE ...................................................................................................................... 91

FIGURE 3-8: O&M BUILDING ............................................................................................................................................. 92

FIGURE 3-9: STORE AND WORKSHOP BUILDING ....................................................................................................................... 93

FIGURE 3-10: LUNGI DUMPSITE .......................................................................................................................................... 96

FIGURE 4-1: RESPITE GRM FLOW CHART.......................................................................................................................... 117

FIGURE 5-1: ENVIRONMENTAL SAMPLED COMPONENTS.......................................................................................................... 118

FIGURE 5-2: TEMPERATURE AND RAINFALL DATA FOR SIERRA LEONE ......................................................................................... 119

FIGURE 5-3: RELATIVE HUMIDITY, TEMPERATURE, AND RAINFALL DATA AT THE PROJECT SITE.......................................................... 120

FIGURE 5-4: GEOLOGY MAP OF THE PROJECT AREA ................................................................................................................ 121

FIGURE 5-5: WATER SAMPLE LOCATIONS, THE TRANSMISSION LINE, AND PROJECT SITE ................................................................. 127

FIGURE 5-6: NOISE LEVEL MAP OF THE PROJECT AREA ............................................................................................................ 146

FIGURE 5-7: TRAFFIC COUNT ON THE MAIN HIGHWAY ............................................................................................................ 149

FIGURE 5-8: DRONE FOOTAGE OF PROJECT SITE .................................................................................................................... 151

FIGURE 5-9: VEGETATION TYPES FOUND ALONG THE TRANSMISSION LINE ROUTE ......................................................................... 152

FIGURE 5-10: SWAMP AREA IN SUCTARR VILLAGE ................................................................................................................. 153

FIGURE 5-11: SPECIES RECORDED FOR EACH OF THE PLANT LIFE/GROWTH FORMS ........................................................................ 154

FIGURE 7-1: ALTERNATIVE TRANSMISSION ROUTE ................................................................................................................. 219

## LIST OF TABLES

TABLE 2-1: RELEVANT PERMITS .......................................................................................................................................... 16

TABLE 2-2: LIST OF INTERNATIONAL CONVENTIONS RATIFIED BY THE GOSL. ................................................................................. 23

TABLE 2-3 SUMMARY OF WORLD BANK ESS RELEVANT TO THE PROJECT ....................................................................... 51

TABLE 2-4 COMPARISON OF THE SIERRA LEONEAN REGULATIONS AGAINST ESF AND PROVIDES MEASURES TO FILL GAPS. ......... 55

TABLE 2-5: RESPITE EDSA-PIU ORGANOGRAM ................................................................................................................... 72

TABLE 3-1: PV PLANT COMPONENT ..................................................................................................................................... 87

TABLE 3-2: TRANSFORMER, INVERTER, AND SUBSTATION FOUNDATIONS ..................................................................................... 93

TABLE 3-3: FENCE AND GATE STRUCTURE TYPE ....................................................................................................................... 93

TABLE 3-4: KEY PROJECT ACTIVITIES BY PHASES .................................................................................................................... 103

TABLE 3-5: PROJECT IMPLEMENTATION SCHEDULE ................................................................................................................ 105

TABLE 4-1: STAKEHOLDERS CONSULTED DURING THIS ESIA PREPARATION ................................................................................ 106

TABLE 4-2: IDENTIFIED PROJECT STAKEHOLDERS ................................................................................................................... 108

TABLE 4-3: SUMMARY OF KEY QUESTIONS AND CONCERNS OF STAKEHOLDERS MET DURING ESIA PREPARATION ............................. 109

TABLE4-4: RESPITE GRM FLOW CHART ............................................................................................................................ 117

TABLE 5-1: SOIL SAMPLE DATA SHEET ................................................................................................................................. 122 TABLE 5-2: WATER QUALITY PARAMETERS IN THE PROJECT AREAS ............................................................................................ 128

TABLE 5-3: NOISE LEVELS IN THE PROJECT AREA .................................................................................................................... 144

TABLE 5-4: AIR QUALITY PARAMETERS IN THE PROJECT AREA ................................................................................................... 147 TABLE 5-5: TRAFFIC COUNT AT THE PROJECT SITE TABLE 5.1: TRAFFIC COUNT AT THE PROJECT SITE ................................................. 149

TABLE 5-6: SITES SURVEYED FOR ASSESSMENT OF VEGETATION AND FAUNA DIVERSITY .................................................................. 150

TABLE 5-7: AMPHIBIANS RECORDED ................................................................................................................................... 156

TABLE 5-8: REPTILES RECORDED ........................................................................................................................................ 156

TABLE 5-9: MAMMALIAN SPECIES RECORDED DURING THE SURVEY ........................................................................................... 157

TABLE 5-10: CATEGORY OF BIRDS RECORDED ...................................................................................................................... 157

TABLE 5-11: SPECIES DISTRIBUTION AMONG BUTTERFLY FAMILIES RECORDED ............................................................................ 158

TABLE 5-12: DISTRIBUTION OF SURVEY POPULATION AND RESPONDENTS' DEMOGRAPHIC CHARACTERISTICS .....................................160

TABLE 6-1: THE PERIOD OF IMPACT RATING......................................................................................................................... 182

TABLE 6-2: THE EXTENT OF IMPACT RATING ........................................................................................................................ 182

TABLE 6-3: THE MAGNITUDE OF IMPACT RATING.................................................................................................................. 183

TABLE 6-4: THE IMPACT PROBABILITY RATING ...................................................................................................................... 183

TABLE 6-5: SUMMARY OF THE ASSESSMENT AND ANALYSIS OF THE PROJECT E& S IMPACTS ........................................................... 212

TABLE 7-1: COMPARISON OF LITHIUM IRON PHOSPHATE (LIFEPO4) AND SEALED LEAD ACID (SLA) BATTERIES ................................ 218

TABLE 8-1: E&S MANAGEMENT: KEY ROLES AND RESPONSIBILITIES ......................................................................................... 223

TABLE 8-2: ENVIRONMENTAL AND SOCIAL PROJECT LEVEL PLANS ............................................................................................. 227

TABLE 8-3: CDAP BUDGET (2024) LUNGI SITE .................................................................................................................... 239

TABLE 8-4: E&S MANAGEMENT PLAN ................................................................................................................................ 241

TABLE 8-5: ESMP MONITORING PROGRAM ........................................................................................................................ 259

TABLE 8-6: CAPACITY BUILDING PLAN................................................................................................................................. 263

**Acronyms/Abbreviations**

|  |  |
| --- | --- |
| AC | Alternating current |
| ACERWC | African Charter on the Rights and Welfare of the Child |
| ADB | African Development Bank |
| ADFD | Abu Dhabi Fund for Development |
| AIDS | Acquired Immune Deficiency Syndrome |
| AQM | Air Quality Monitoring System |
| AU | African Union |
| BESS | Battery Energy Storage System |
| CBD | Convention on Biological Diversity |
| CCA | Chromated Copper Arsenate |
| CDAP | Community Development Action Plan |
| CDP | Conference of Parties |
| CdTe | Cadmium telluride |
| CEDAW | Convention on the Elimination of All Forms of Discrimination against Women |
| CHP | Community Health Post |
| CITES | Convention on International Trade in Endangered Species |
| CO | Carbon monoxide |
| CRPD | Convention on the Rights of Persons with Disabilities |
| CSi | Crystalline silicon |
| CSR | Corporate Social Responsibility |
| dB | Decibel |
| DC | Direct current |
| DDT | Dichlorodiphenyltrichloroethane |
| DEM | Digital Elevation Model |
| DFID | Department of International Development |
| DoD | Depth of Discharge |
| DOE | Department of the Environment |
| ECOWAS | Economic Community of West African States |
| EDSA | Electricity Distribution and Supply Authority |
| EEEP | ECOWAS Energy Efficiency Policies |
| EGTC | Electricity Generation and Transmission Company |
| EHS | Environmental, Health, and Safety |
| EIA | Environmental Impact Assessment |
| ENB | Environment Natural Sciences and Blue Economy |
| EPASL | Environnemental Protection Agency Sierra Leone |
| EPC | Engineering, Procurement and Construction |
| ESF | Environmental and Social Framework |
| ESIA | Environmental and Social Impact Assessment |
| ESMP | Environmental and Social Management Plan |
| ESS | Environmental and Social Standards |
| ESURP | Energy Sector Utility Reform Project |

|  |  |
| --- | --- |
| EU | European Union |
| EWRC | Electricity and Water Regulatory Commission |
| FAO | Food and Agriculture Organization |
| GDP | Gross Domestic Product |
| GEWE | Gender Equality and Women's Empowerment |
| GHG | Greenhouse Gas Emissions |
| GIIP | Good International Industry Practice |
| GM | Grievance Mechanism |
| GoSL | Government of Sierra Leone |
| HFO | Heavy Fuel Oil |
| HIV | Human Immune Virus |
| IBA | Important Bird Area |
| IDA | International Development Association |
| IEA | International Energy Agency |
| IFC | International Financial Cooperation |
| ILO | International Labour Organization |
| IOS | International Organization of Standards |
| IRENA | International Renewable Energy Agency |
| ITF | Inter Tropical Front |
| IUCN | International Union for the Conservation of Nature |
| JSS | Junior Secondary School |
| km | Kilometre |
| kV | Kilovolts |
| L&FS | Life and Fire Safety |
| Li | Lithium ion |
| LiFePO4 | Lithium Iron Phosphate |
| LVAC | Low Voltage AC |
| m | Metre |
| MBSSE | Ministry of Basic and Senior Secondary Education |
| MDAs | Ministries, Departments, and Agencies |
| MECC | Ministry of Environment and Climate Change |
| MHP | Micro Hydro Power |
| MoE | Ministry of Energy |
| MPPT | Maximum Power Point Tracking |
| MVAC | Medium Voltage AC |
| MW | Megawatt |
| MWh | Megawatt peak |
| MWp | Megawatt hour |
| NaCEF | National Commission for Environment and Forestry |
| NaS | Sodium Sulphur |
| NBSAP | National Biodiversity Strategy and Action Plan |
| NEAP | National Environmental Action Plan |

|  |  |
| --- | --- |
| NGO  NIOSH  NOx  NPA  NPAA  NWRMA  NZE  ODK  OHS  OPEX  PAPs  PCBs  PCP  PCU  PEL  PLDC  PM  POM  POPs ppb PPE ppm  PV  RESPITE  ROW  SDGs  SEA/SH  SHS  SLM  SLRA  SLRSA  SMEs  SOC  SOPs  SPSS  SSS  ToR  TWh  UDHR  UNFCCC  UNICEF  VOCs | Non-Governmental Organizations  United States National Institute for Occupational Safety and Health  Nitrogen Oxides  National Power Authority  National Protected Areas Authority  National Water Resources Management Agency  Net Zero Emissions  Open Data Kit  Occupational Health and Safety  Operational and Capital Expenditure  Project Affected Persons  Polychlorinated Biphenyls  Pentachlorophenol  Power Conditioning Unit  Permissible Exposure Limit  Port Loko District Council  Particulate Matter  Project Operational Manual  Persistent Organic Pollutants  Parts per Billion  Personal Protective Equipment  Parts per Million  Solar Photovoltaic  Regional Emergency Solar Power Intervention  Right of Way  Sustainable Development Goals  Sexual Exploitation and Abuse and Sexual Harassment  Solar Home System  Sound Level Meter  Sierra Leone Roads Authority  Sierra Leone Road Safety Authority  Small scale Enterprises  Soil Organic Carbon  Standard Operating Procedures  Statistical Package for Social Sciences  Senior Secondary School  Terms of Reference  Terawatt hour  Universal Declaration of Human Rights  United Nations Framework Convention on Climate Change  United Nations International Children's Emergency Fund  Volatile Organic Compounds |
|  | x |

|  |  |
| --- | --- |
| WARD | Western Area Rural District |
| WARDC | Western Area Rural District Council |
| WASH | Water Sanitation and Hygiene |
| WB | World Bank |
| WBG | World Bank Group |

**EXECUTIVE SUMMARY**

### Background to the Project

The Government of Sierra Leone (GoSL), through the Electricity Distribution and Supply Authority (EDSA) on behalf of the Ministry of Energy (MOE), in response to the impact of the Ukraine war and rising oil prices, has initiated the Regional Emergency Solar Power Intervention (RESPITE) project, financed by the World Bank. RESPITE aims to address fiscal impact and power outages through the development of renewable energy infrastructure. The project will finance the development of a 13 MWp (10 MWac) solar PV plant with 6 MWh of storage will be constructed in Lungi. The sub-component will finance the DSI and O&M for the power plant and 5 MWh storage system as well as the construction of 11kV connection to the existing 11kV substation. The project aims to increase renewable energy capacity, promote regional integration, and mitigate greenhouse gas emissions.

The project will adhere to the World Bank's Environmental and Social Framework (ESF) and relevant Standards (ESS), applying eight of the ten ESSs, apart from ESS7 and ESS9. EDSA (the proponent) is required to conduct an Environmental and Social Impact Assessment (ESIA) and create a corresponding Management Plan (ESMP) to effectively address project related risks and impacts. These plans and commitments of GoSL are clearly outlined within the Environmental and Social Commitment Plan (ESCP). **Project Description and Location**



***Figure 0-1: Map of Lungi Solar PV, BEES and Ancillary Facilities***

### Solar PV, BESS and Ancillary Facilities Site

The proposed project site (and 8.6631710 Latitude and -13.1877040 Longitude), located between Youriya and Koimaya (which is sited with Gbaneh Bana community). It is approximately 5 kilometers away from the Freetown International Airport Lungi, as the crow flies. This site is situated within the administrative region of the Kafu Bullom Chiefdom in the Port Loko District and spans an area of 44.7583 acres of land. The land was owned by the William Sheka Kamara family and held in trust by the paramount Chief of the Kafu Bullom Chiefdom. This site is presently transferred from the Koroma family, with the consent from the Paramount Chief of the Kaffu Bullom Chiefdom to Ministry of Energy (MoE) through Ministry of Lands, Housing and Country Planning through a willing-buyer willing-seller arrangement at a price negotiated and voluntarily agreed to by both parties. All the necessary legal procedures and proper documentations are concluded, including evidence of compensation payment and conveyance letter dated 4th July 2023 (annexed in VII (A&B) and VIII).

The site can be accessed via an unpaved road that intersects with the highway linking Port Loko and Lungi and is situated at a distance of approximately 600 m and 650 m from the Koimaya and Gbana Bana communities. The access road is used by nearby communities, including school going children, people accessing the nearby health clinic and women accessing other villages and market.

### 11kv Transmission Route

The electricity generated from the proposed solar power plant will be transmitted through an 11KV overhead transmission line to the existing 11kV substation in Lungi. The proposed transmission route, spanning around 10km passes through Koimaya and Gbana Banah, which are situated on the Lungi - Port Loko highway. From Gbaneh Bana, the proposed transmission route falls on the right side of the highway to Makassa junction, where it branches off to Makassa and Suctarr. The transmission route passes through a 350m stretch of inland valley swamp between Makassa and Suctarr. This swamp is used for the cultivation of vegetables and rice. There are houses along the road from Gbaneh Banah to the substation, but it is important to note that these houses are away from the roadway RoW, For any loss of asset within the RoW, the RP will define and implement all the necessary compensation measures as per GoSL and ESS5 legal framework, and prior to commencement of any physical work of the project.

### Access Roads

The distance from Freetown to the project site is about 170 km, almost entirely on a Grade A tarmac road, where only the first 30 km involves heavy vehicular traffic. The rest of the road (Highway) is a high-speed route (max. 80kph), but decreases to 50 kph around settlements, including Gbaneh Bana village at the entrance to the solar PV site. There is a dirt road stretching over 1 kilometer from the Gbaneh Bana junction that leads to the proposed PV and BESS site. The road from Gbaneh Bana village to the site has a width of approximately 6 meters, which is consistent with the standard road width of a single carriage way in Sierra Leone, around 3.65 meters (12 feet). However, intersections and roundabouts require wider road widths to accommodate turning movements. To enable trucks to make safe turns from the main highway to the project site, a bite widening of the RoW is necessary at the junction. The current road is easily accessible to trucks transporting cement and other local materials. If the project deems it necessary to expand the road to a dual carriage way (approximately 7.3 meters), it can be done without any disruption to the neighboring houses.

Within the facility, the network of roads shall encompass the perimeter roads as well as all roads that link buildings and installations, excluding field inverters, to connect the buildings with the electrical substation. The main access road shall have a minimum width of 6 meters and be paved with either bitumen or concrete asphalt to facilitate smooth transit during construction, operation, and maintenance phases. This main road serves as the central axis for secondary roads that lead to primary equipment such as inverters and transformers. The secondary road network consists of roads that connect the field inverters to the main roads. These roads have a width of 4.5 meters and shall be surfaced with macadam or gravel.

### Policy, Legal, and Institutional Frameworks

The project will adhere to a comprehensive set of national policies and regulations to ensure its successful and responsible implementation. Amongst, the Sierra Leone Environmental Protection Agency Act, 2022,

aims to ensure the effective and efficient protection and management of the environment, as well as addressing other relevant issues. The Act requires an EIA report for projects such as the construction and the operation of the PV plant, BESS Plant and transmission system. National Electricity Act of 2011: the previous National Power Authority (NPA) was split into two new entities, Electricity Generation and Transmission Company (EGTC) and Electricity Distribution and Supply Authority (EDSA). By this Act. EDSA's primary purpose is defined, as the provision, distribution, and retail sale of electricity across the country, except in places where another eligible body has been granted a license. The Customary Land Right Act (2022) seeks to provide for the protection of a customary Land right, the elimination of discrimination, and the management of land subject to customary law. Local Government Act (2004) and Amended Act of 2017 and 2022: The operations of a local council are guided by this Act, which incorporated the roles of the district council, the highest political authority in the locality and shall have legislative and executive powers to be exercised. It shall also be responsible generally for promoting the development of the locality and the welfare of the people. Sierra Leone Roads Authority (Amendment) Act (2010): the Authority shall set the width of the Rightof-Way (RoW) for roads that form part of the national network. The RoW refers to the designated strip of land adjacent to the road, extending from the road's edge to the approved offset distance, which may vary depending on the road classification. This land parcel is primarily reserved for future development purposes and to facilitate access for utility companies such as EDSA. Employers and Employed Act, consolidated to 1960: regulates relations between employers and the employed and safeguards the health of the employed. Child Rights Act (2007): the minimum age for admission of children into full-time employment is fifteen (15) and the minimum age for a child's engagement in light work is thirteen (13) years. The Sexual Offences Act, 2012 as amended in 2019 seeks to protect women and girls from the harm of unlawful sexual acts and provides the age of consent for sex as 18 years. The Act criminalizes sexual harassment (soliciting by person in authority) and imposes a punishment of not less than 15 years for persons found guilty. Furthermore, it criminalizes harassment, which includes instances of uneven power relations where people in authority may use their positions to procure sex especially from women and girls who may not be able to resist it. The Gender Equality and Women’s Empowerment Act (2022) seeks to promote gender equality, providing equal opportunities for all employees, regardless of gender.

The National Lands Policy (2015): emphasizes land distribution (acquisition and allocation), land tenure systems, land use planning and regulations, land management and administration systems, and land adjudication systems for all Sierra Leoneans and investors. Renewable Energy Policy of Sierra Leone (2016): aims to enhance energy access and sustainability by promoting the use of renewable energy sources, such as solar PV and energy storage. Sierra Leone recognizes that the emissions of greenhouse gases, such as carbon dioxide, from using fossil fuels and petroleum products, have led to increasing concerns worldwide. Climate change policy (2021): guides and coordinates the implementation of relevant provisions enshrined in UNFCCC and Kyoto Protocol, and the Paris Agreement, taking into consideration Sierra Leone’s National Medium-Term Development Plan (2018-2023) and the United Nations Sustainable Development Goals (SDGs).

This ESIA has also discussed international conventions that have been ratified or accepted by the GoSL as well as pertinent permits and licenses essential for the RESPITE implementing agencies to acquire during the entirety of the project implementation.

The institutional framework for this project involves key entities responsible for planning, designing, and implementing project deliverables and ensuring the implementation of environmental and social management. These institutions include the Ministry of Energy (MoE), Ministry of Finance, Ministry of Environment and Climate Change (MECC), Environment Protection Agency - Sierra Leone (EPASL), Sierra Leone Roads Authority (SLRA), and the Port Loko District Council (PLDC).

### Implementation Schedule

The overall construction schedule will include the integration of environmental and social management and monitoring activities. The civil works are estimated to be completed within a timeframe of about 16 months. **Environmental Baseline**

#### ▪ Topography

The proposed project site is in the Gbaneh Bana catchment/Koimaya region, with extensive flatlands with low topographical relief. The area has a hydrological network of small streams and creeks that support local agriculture. Many of these streams and creeks ultimately discharge into the Sierra Leone River, a primary river system that runs through the region and plays a key role in the socioeconomic activities of local communities.

#### ▪ Climate and Hydrology

Sierra Leone experiences a monsoon-type humid tropical climate with a dry season from November to April and a rainy season from May to October. The annual rainfall averages around 3,000 mm, and the average monthly temperature ranges from 23°C to 29°C. The climate is influenced by the north-south movement of the Inter-Tropical Front (ITF), causing alternating southwest winds (rainy season) and northeast dry winds (dry season).

The hydrologic cycle follows the same general pattern in all regions across the country. The only thing that varies by region is the amount of water received through precipitation, or the amount that is lost through evapotranspiration. The communities within these watersheds depend on rain-fed surface and groundwater for their livelihood. The general climatic trend has been humidity dropping in the dry season (<85%) with correspondingly increasing temperature (>28 0C) and low precipitation (close to zero). This trend is reversed in the rainy season and the cycle continues. Climate change is expected to cause more erratic weather patterns, with longer dry spells and intense rainfall. The RESPITE project aims to implement management practices to mitigate additional water stress and pollution in the affected communities and ecosystems.

#### ▪ Geology

The project area is situated within the Bullom Group, which consists of estuarine and freshwater sediments with sands, silts, clay, and lignite. Some areas may have consolidated lateritic duricrust, requiring appropriate Geotechnical studies for large structure construction.

#### ▪ Soil Properties and Quality

Soil samples were collected from three locations. The following parameters where considered: Soil pH, Exchangeable Acidity and Aluminium, Soil Electrical Conductivity, Total Nitrogen and Phosphorus, Available Potassium, Calcium and Magnesium and Total Organic Carbon.

The soils analysed are generally acidic. Samples from Lungi have pH values ranging from 4.9 to 5.0 (mean = 5.0). The mean values for exchangeable acidity and aluminium for Lungi are 1.12 cmol and 1.2cmol, respectively. A low level of Al3+ causes an insufficient supply of basic soil nutrients such as CEC (Ca, Mg and K) which are critical for germination. The Electrical Conductivity values varied from 80 to 90 μS/cm, averaging 83μS/cm. This result indicates that there are no soil salinity issues at Lungi. Total Nitrogen values vary from

0.5 to 0.58 mg/kg. The levels of Nitrogen in the soils are generally low. Phosphorus values are also low. Levels of Phosphorus raged from 6.5 to 6.9 mg/kg (mean = 6.9 mg/kg). Available Potassium varied from 0.29 to 0.33cmol. Lack of Potassium in the soil can lead to plant deficiency, causing stunted growth, yellowing leaves, and poor fruit and flowering. The total organic carbon ranges from 2.5% to 2.8% (mean = 2.6%).

#### ▪ Water Quality

Water quality samples were collected from seven sample sites upstream and downstream of the project site (Makassa 1, Makassa 2, Camp David, Gbaneh Bana, Youriya, Baimaya and Koimaya.Physical properties such as turbidity and temperature were measured. Chemical and physicochemical parameters were assessed, including dissolved oxygen, ammonia, nitrites, total dissolved solids (TDS), and pH. Biological parameters, specifically E. coli, were also analyzed. The results showed that most parameters met the recommended guidelines, except for turbidity in one surface water sample and E. coli in another, which was still within acceptable levels considering the baseline.

With reference to turbidity, the WHO standard for treated water is 5 NTU or less. All the sample sites meet this threshold except for the surface water sample at Camp David. However, this value is considered normal for untreated swap area water considering the bacterial standard for irrigation water.

With reference to ammonia, WHO has no recommended guideline value for ammonia. However, the USEPA sets the allowable concentration for a one-hour acute exposure at 17 mg/L or below, and for chronic exposure (30-day rolling average) at 1.5 mg/L. The baseline values reported are all below these two thresholds.

With reference to nitrite, the WHO recommended guideline is 3 mg/L or less. All the samples have nitrite values less than this threshold, indicating a benign baseline in contiguous surface and groundwater at the project site.

With regards to TDS, the WHO recommended guideline for TDS is 240 mg/L or less. All the readings were below this threshold.

With reference to E.*coli*, the WHO guideline for E. *coli* in treated water is zero. The sample from Camp David is above this threshold; however, it is not high enough to cause concern.

#### ▪ Noise

Noise assessment was conducted at 5 locations in the project area. All noise readings were observed during the day focusing on potential impacts on communities and workers. The noise levels exceeded 55dB at all locations except for the PV and BESS site. Sources of continuous noise in the project area include intermittent traffic from vehicles, heavy equipment, bike riders and aircraft.

#### ▪ Air Quality

A total of five sample sites were selected for measuring the concentrations of various air quality parameters. The parameters measured include particulate matter (PM), ozone (O3), Nitrogen dioxide (NO2), and Sulphur dioxide (SO2). May 2023 readings represent the end of the dry season (or the beginning of the rainy season) while the November readings mark the end of the rainy season (or the start of the dry season).

For PM2.5, all the readings were lower than or within range of the daily average threshold for both periods. For PM10, the average at the Lungi Government Hospital was higher than the daily average threshold. However, concentration at this same site in 2022 was lower than the threshold. Activities at all these sites indicated that PM values fluctuate between high and low concentrations in different times of day. High concentrations represent days and hours of heavy traffic in the area. Transportation mainly by motor bikes is the major source of dust emission in the communities.

With reference to O3, WHO recommends a daily maximum O3 emission of 100 µg/m3 for 99% of 8-hour days in a year. All the O3 values are well below the recommended threshold for maximum contaminant level.

With regards to NO2, 3 locations in the project area are the only one with NO2 concentration higher than the recommended standard for daily average.

The Permissible Exposure Limit (PEL) established by OSHA is 5 ppm SO2 averaged over 8 hours of exposure in light of these concerns. The background concentrations are well below the PEL recommended.

#### ▪ Traffic Monitoring

A local traffic assessment was conducted through a traffic count on the project access road and the main highway. During this ESIA preparation, a local traffic assessment was conducted through a traffic count on the project access road. Counts were made at 2 locations – at the project site and on the main highway at the Gbaneh Bana junction. The data shows that motorcycle ‘Okada’ is the most common mode of transportation along the project access road and surrounding communities. Residents noted that traffic is high between 9am to 7pm daily.

#### ▪ Ecology

The Ecological study was limited to two main study sites, namely: (i) the main site where the solar panels/BESS and other facilities will be installed, which is located proximal to Koimaya and Youriya; and (ii) the transmission line route, which will run through Koimaya village, Lungi Town, the hospital and potentially to be connected to powerhouse servicing Lungi International Airport.

#### Mammals

The number of species of mammals recorded was four, although a more intensive sampling using small mammal traps would have yielded moresmall mammal species such as rats and shrews. Generally, the mammalian diversity was low in both areas and so only a few species were encountered or indicated to occur by local people. Table 5.8 shows mammalian species recorded during the survey.

#### ▪ Avifauna

In total 69 species of 25 avian families were recorded across all sites visited. The swamp ecologies along the transmission line provides suitable habitat for migratory waterbirds; the active annual migratory period for Palaearctic migrants starts in December and ends in February and so the time of the survey does not favour the occurrence of species of the Palaearctic assemblage. From observation, in the Suctarr swamp area, the most important ecologies along the transmission line because they support both biodiversity and local livelihoods through swamp farming (mainly rice) and fishing on the other hand.

#### ▪ Butterfly diversity

During the survey a total of 85 species of butterflies were encountered comprising 605 individuals. The species are distributed among five families - Nymphalidae, Pieridae, Papillionidae, Hesperidae and Lycaenidae. Nymphalidaeaccounted for the highest diversityof all species encountered and Lycaenidae had the least.

### Social Baseline

The socio-economic baseline study provides valuable insights into the project area's existing social and economic conditions, serving as a foundation for assessing the proposed project's potential impacts. Key findings from the study include:

#### ▪ Composition

The project area consists of eight primary communities (Baimbaya, Youriya, Koimaya, Gbaneh Bana, Koboya, Baya, Kerefay, and Santigieya) with standard dwelling units made of cement blocks or burnt bricks. Each dwelling unit typically accommodates one household.

#### ▪ Livelihood and Economy

Farming (64.7%) and trading (18%) are the primary sources of income for community members. Fishing is also an important livelihood source for coastal communities. Agriculture is mainly subsistence-based, with crops like rice, cassava, and vegetables being grown and sold in local markets. The "Lumar" trading system significantly contributes to the local economy and promotes regional trade.

#### ▪ Land Tenure and Land Use

Land in the Gbaneh Bana/Koimaya community follows a customary ownership scheme, where families own the land, but tribal authorities hold it in trust. The proposed project site is claimed to be owned by the William Sheka Koroma family and held in trust by the Paramount Chief. The land is predominantly used for crop cultivation, including cassava, rice, cereals, tubers, and palm trees for palm oil production. The GoSL, Ministry of Lands, Housing and Country Planning has allocated a Plot: 44.7583 Acres of land located in Lungi Port Loko District in the Northern Province of the Republic of Sierra Leone to Ministry of Energy (MoE), by fulfilling the necessary steps (through a willing-buyer willing-seller arrangement with land owning family) and with appropriate documentations including evidence for land sale agreement, payment of compensation and conveyance letter for the transfer of land to MoE, dated 4th July 2023. (See Annex VII (A, B & C) and Annex

VIII).

#### ▪ Literacy and Education

The level of education among adults, mainly heads of household in the project area, is low, with 60.1% reporting no formal education. There is limited availability of schools and inadequate facilities, resulting in limited access to education for the local population. The dropout rate for secondary school children, particularly girls, is relatively high due to factors like teenage pregnancy.

#### ▪ Medical Facility

The project area has limited hospitals and health centres, leading to overcrowding and inadequate medical care. The local Community Health Post (CHP) in Gbaneh Bana, which serves over fourteen communities, including the eight communities in the project area, is the preferred treatment facility but faces challenges regarding facilities and equipment. The local health post has no GBV response mechanism and tool kit. Traditional healers and herbal medicine are sometimes relied upon due to limited access to healthcare.

#### ▪ Drinking Water Facility

Hand pump wells serve as the primary improved water source for drinking in the communities. Although intermittent shortages occur, especially during the dry season, the water from these sources is considered safe for consumption.

#### ▪ Sanitation and Waste Management

The primary disposal methods for household-generated waste are burning and throwing it in the bush. These methods are not environmentally friendly. A proper waste disposal method for the project is outlined in the ESMP.

#### ▪ Archaeological and Cultural Heritage

No archaeological or cultural site of significance is found in the site for the proposed project area. However, the ESMP has captured measures to appropriately deal with chance findings during the project's construction phase.

#### ▪ Vulnerable Groups

Some vulnerable groups in the project area require special attention and support. These groups include women, children, the elderly, people with disabilities, and marginalized communities. These groups often need more access to resources, services, and opportunities. It is crucial to consider their specific needs and ensure their inclusion in the project's planning, implementation, and benefits.

Women in the project area play vital roles in the community and households but often face gender-related disparities and discrimination. Empowering women through targeted initiatives and providing them with equal opportunities can positively impact the area's overall socio-economic development. Furthermore, addressing gender disparities, ensuring access to education and healthcare, promoting social inclusion for people with disabilities, and empowering marginalized communities are vital aspects that should be considered in the project's planning and implementation.

### Stakeholders' Participation and Consultation

Stakeholder consultations were conducted between November 2022 as well as February and May 2023 as part of the ESIA process for the proposed project. Relevant government agencies and project-affected persons, including local community leaders, residents, vulnerable groups, including women, the elderly, people with disabilities, and traders along the Right of Way (RoW), were identified and consulted with. A total of 240 (Male 140 and Female 100) participants took part in the consultation process.

Communication methods, such as formal letters, SMS text messages, and phone calls, were used to inform stakeholders about the consultation meetings. During these engagements, stakeholders were provided information about the project, its objectives, and potential impacts. Their general view of the project, concerns, and questions were sought. Public consultative meetings were held in the project area's communities to ensure maximum participation and engagement. Key issues and action points emerged from the stakeholder engagements.

* The local community residents expressed their support for the project and their commitment to its success.
* The land-owning family involved in the consultation expressed willingness to provide the identified land through a willing-seller-willing buyer arrangement 1.(See Annex VII A, B & C, VIII and XVI for evidence of land transfer).
* The Community Health Post (CHP) staff highlighted the need for additional facilities to handle the high number of patients due to the influx of migrant workers and requested support to address these deficiencies before the project commences.
* Women in the community showed enthusiasm for the project and requested employment opportunities while advocating against discrimination and abuse.
* Local community leaders expressed dedication to promoting the project and increasing awareness and acceptance among residents.
* Youth representatives emphasized the importance of job creation and pledged to maintain peace while addressing any future grievances through the appropriate Grievance Redress Mechanism (GRM).
* The stakeholders also raised points, such as the need for training opportunities for community residents and the importance of respecting the area's laws, customs, and traditions.
* The local bike rider's union expressed concern about road safety during the construction phase due to dust generated by heavy vehicles but acknowledged the project's positive impact on their industry. **Public Disclosure**

Upon approval of the draft final ESIA report, it will be publicly disclosed to all stakeholders, especially those in the local project area. The engagement with stakeholders has allowed for their input, concerns, and suggestions to be considered, contributing to the project's development and ensuring that it benefits the community while addressing their needs and aspirations.

### Grievance Redress Mechanism

The SEP developed for the project details the processes involved in registering and managing grievances at no cost to the complainant. Grievance resolution procedures is also in place If grievances unresolved by the project GRM, the complaint will move to the next tier with the complainant having the option of seeking redress in the courts of Law.

The Energy Sector Utility Reform Project (ESURP) has finalized an operational GRM including grievance registry/log which will be used for RESPITE as well. It will establish digital platforms and accommodate emerging issues around SEA/SH for confidential reporting and referral to service providers as well as survivor cantered procedures for management of SEA/SH complaints. Multiple channels at the local level will be established to ensure safe and accessible procedure during consultations with women (in women specific groups and will be led by a woman).

1 As per the documentation attached in this ESIA, the Government of Sierra Leone, Ministry of Lands, Housing and Country Planning bought the land from land owning family through a willing-seller-willing buyer arrangement and transferred the Plot: 44.7583 Acres of land located in Lungi Port Loko District in the Northern Province of the Republic of Sierra Leone to Ministry of Energy (MoE), with a conveyance letter dated 4th July 2023.

MOE will provide oversight to GRM process in coordination with EDSA, contractors, local councilors and the GBV service provider (NGO). A web application will be housed at MOE and provides access to EDSA and contractors to register complaints received at sub-project level or the field. Complaints can also be made to the local councilor who will then channel the complaint to EDSA, MOE or contractors to be filed in the digital platform for tracking of resolution. Complaints from the general, project stakeholders, PAPs etc. may also be made directly through the digital platform either by calling, sending text, WhatsApp etc. The project will identify an NGO GBV service provider to setting up and ethically manage SEA/SH complaints.

### Project Alternatives

#### The No Project Alternative

* Abandoning the project is not considered logical or feasible due to the unmet demand for electricity in Sierra Leone and the project's contribution to increasing access to electricity.
* Over-reliance on heavy fuel oil (HFO) generators would undermine sustainable growth targets and energy security.

#### Location Alternatives

▪ Factors considered for determining suitable locations include climate, Global Tilt Irradiation (GTI), presence of Lungi International Airport, land parcel characteristics (slope, orientation, size), surrounding terrain, land availability and ownership, and access, safety of community members, site access, power evacuation to the national grid, availability of skilled and unskilled labour, and environmental considerations.

#### Technology and Equipment

##### *Renewable vs Conventional Sources*

* Conventional power generation has high financial, environmental, and social costs compared to renewable energy sources.
* Solar PV and BESS are determined as the most feasible options for the project based on technical performance values.

##### *Choice of Solar Panels*

▪ Mono-facial panels (with silicon solar cells on one side) are recommended since the land at Gbaneh Bana Lungi has a low albedo factor, making bi-facial panels less viable.

##### *Choice of Solar Cells*

▪ Despite their higher initial investment costs, crystalline silicon (c-Si) solar cells are the most common and reliable option.

##### *Solar Panel Installation Systems*

* Fixed tilt systems are suitable due to their simplicity, low maintenance costs, and the site's proximity to the equator.
* Tracking systems are more complex but offer improved performance. Considering the concerns of glare at Lungi, a tracking system is recommended.

##### *Choice of Inverters*

* Three options considered are the central inverter, string inverter, and microinverter.
* String inverters are popular due to their smaller size, better Maximum Power Point Tracking (MPPT) capability, and ease of replacement.

##### *Choice of Batteries*

* Lithium Iron phosphate (LiFePO4) batteries are recommended for the project.
* Sealed Lead Acid batteries have a lower initial cost but require more frequent upkeep compared to lithium batteries.
* Lithium batteries have a higher initial cost but offer a longer lifespan and require less maintenance.

#### Transmission Route Alternatives

The feasibility of the proposed transmission line is evident since it only traverses the Suctarr swamp area without any significant environmental repercussions or relocation concerns.

Option 2, on the other hand, would intersect numerous swamps as it passes through Youriya and Baimbaya, requiring the costly construction of bridges for access.

Option 3 would follow the main Lungi highway, cutting through the urbanized parts of town, but it is not a viable choice as it would result in significant resettlement issues.

#### Choice of Poles

Using wooden poles for the 11kV overhead lines in the PV/BESS project at Lungi may have certain advantages, such as availability and potentially lower cost. However, significant environmental, health, and safety concerns are associated with wooden poles. The potential drawbacks may include **Decay and rot:** Wooden poles are prone to decay and rot over time, especially in humid or wet environments. This can lead to structural instability and potential collapse of the poles.

**Fire hazard:** Wood is combustible, making wooden poles susceptible to fires caused by wildfires, lightning strikes, or electrical equipment accidents. This can result in power outages, property damage, and risks to human lives.

**Insect infestation:** Wooden poles are vulnerable to insect infestations, such as termites and wood-boring beetles. These insects can weaken the structure of the poles, increasing the risk of failure.

**Chemical treatments:** To enhance the lifespan and resistance of wooden poles, they are often treated with chemical preservatives. However, these treatments can contain hazardous substances like pentachlorophenol (PCP) or chromate copper arsenate (CCA). Improper handling or disposal of these chemicals can pose environmental and health risks.

***In contrast***, steel poles have drawbacks, such as the potential for rust and corrosion if improperly treated or damaged during installation. However, concrete poles are a more environmentally friendly and durable option. They naturally resist damage from salt and other weather-related issues, making them suitable for areas with challenging climates.

***Concrete poles*** are a more feasible choice for the PV/BESS project at Lungi compared to wooden or steel poles Considering the environmental and durability aspects.

#### Design Measures

The selection of the proposed Solar PV and Battery Energy Storage System (BESS) design for the Lungi project was based on various factors related to project locations, irradiation, temperature, sun angles, and shading. The design aimed to achieve the right balance between annual energy production, cost, and environmental considerations. Here are the critical rationales for selecting the design:

#### The Basis for Selecting PV System Design

* The installed capacity requirement for energy improvement in Lungi is 13.06MWp. Specific PV modules (585Wp mono facial Crystalline Silicone), inverters (string type inverters at 250kVA), and step-up transformers (6300kVA each) were selected to meet this requirement.
* The proposed design uses standardized modular structures assembled in strings and combined into tables, simplifying the construction process and allowing for efficient assembly.
* String inverters were chosen to maximize solar production in case of inverter failure, with lower repair or replacement costs than transformers.
* The east-west orientation of the panels was selected to cater to peak and mid-day loading conditions, as the mid-day demand in the isolated Lungi network is estimated to be 4.6MW.
* The 10° tilt angle of the PV design maximizes annual irradiation on the collector plane, considering factors like soiling, shading, and seasonal irradiation.
* The inter-row spacing of 1m and block spacing of 2.5m was chosen to balance shading reduction, overall plant area, cable runs, and ohmic losses.
* The configuration of modules in a landscape orientation reduces electrical shading losses compared to a portrait configuration.

#### The Basis for Selecting Power Lines and Poles

* The PV/BESS plant will be directly connected to the existing 11kV switchgear via an 11kV overhead line circuit without negatively impacting the operation of the current energy system.
* Long rod insulator strings were chosen for the power lines due to their better electrical performance and higher mechanical strength, making them suitable for high-voltage transmission and distribution poles.

#### The Basis for Selecting MV Plant

* An MV substation was designed to collect the MVAC outputs from the solar PV field or BESS for connection to the grid infrastructure at Lungi.
* MV minimizes cable runs and associated electrical losses, and the metal-enclosed vacuum interruption switchgear conforms to IEC standards.
* Adequate space allocation prevents the shading of modules and ensures safety, security, and efficient operation.

#### The Basis for Selecting BESS System Design

* The BESS system was designed to store excessive PV-generated power, with a recommended 6MWh battery capacity based on a load flow study.
* The BESS system provides a spinning reserve for the Lungi network and offsets the use of conventional generators during peak hours.
* The design includes battery units with BMS, cooling, fire protection, inverters and PCS for DC to AC conversion, a dedicated step-up transformer, and RMU switchgear for connection to the MV substation.
* Fire protection measures and BMS ensure early detection and effective fire suppression while cooling and ventilation systems control and mitigate the release of hazardous gases or fumes.

### Environmental and Social Management Plan

The ESMP details the anticipated risks, mitigation and management measures throughout the construction and operation of the PV and BESS and related activities, including transmission line, access road, etc.

|  |  |  |  |
| --- | --- | --- | --- |
| **Potential Risk and Impact** | **Mitigation Measures** | **Responsibility**    **Mitigation** | **Cost of** |
| The impacts of selecting an inappropriate design include inefficiency and wasted resources, leading to inefficiencies in project execution. It can result in cost overruns and additional expenses due to the need for redesign or rework. Poor functionality and performance can undermine the project's success and user satisfaction. Safety risks and hazards may arise due to inadequate design considerations. Limited scalability and adaptability can restrict the project's ability to accommodate future needs or expansion. Negative environmental impacts can occur, such as excessive energy consumption or waste generation. Finally, selecting an inappropriate design can cause reputational damage to stakeholders, affecting their credibility and relationships. | Comprehensive feasibility studies (including detailed engineering and environmental impact assessments currently being prepared subject to public disclosure upon approval by WB and the proponent) involve skilled design experts and consider pertinent factors such as site conditions, local regulations, and project specifications. Thorough engineering analysis including design/technology alternatives, consultation with stakeholders, and meticulous evaluation of design alternatives have been made which are crucial to ensure the choice of a suitable and efficient design for PV, BESS, and transmission line systems | EDSA/PIU | To be determined (TBD) |
| The forced labour allegations associated with polysilicon suppliers used for solar panels introduce a notable and concerning impact on the project. These allegations raise ethical, social, and potentially legal concerns involving accusations of labour practices that violate human rights and ethical standards. Such allegations can affect the project's reputation and stakeholder trust. the project may face increased scrutiny from regulatory bodies and the public, potentially leading to legal and financial repercussions. | market analysis to identify possible sellers of solar panels to the project and requirements in bidding documents as follows:  Bidders will be required to provide two declarations: a Forced Labour Performance Declaration (which covers past performance) and a Forced Labor Declaration (which covers future commitments to prevent, monitor and report on any forced labour, cascading the requirements to their subcontractors and suppliers). In addition, enhanced language on forced labour will be included in the procurement contracts. | EDSA/PIU | TBD |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| * Project delays, affecting subsequent phases and extending the timeline. * Inadequate material quality checks, compromising project safety. * Compliance issues leading to fines, delays, or costly retrofits. * Reputation harm impacting future opportunities and partnerships. | | * ensure that potential suppliers possess all relevant licenses and permits and that the purchased materials meet technical, safety and environmental requirements to be specified in Technical Specifications as part of the closure design. * This helps reduce delays in material acquisition and ensures compliance with technical, safety, and environmental requirements. * Rigorous quality checks and inspections guarantee the use of compliant, high-quality materials in construction. * ensure that potential suppliers possess all relevant licenses and permits and that the purchased materials meet technical, safety and environmental requirements specified in Technical Specifications as part of the closure design. | EDSA/PIU | TBD |
| * Potential tension from unrealistic expectations held by the communities about benefits created by the project reduced trust and ownership, causing resistance during implementation. * Higher risk of unforeseen negative consequences on livelihoods, environment, and social aspects. * Possible legal or regulatory compliance issues. * Increased stakeholder opposition, undermining social support. * Missed collaboration opportunities for mutually beneficial partnerships and project success. | | * Implement the SEP, which calls for continuous engagement throughout the project lifecycle. * Contractors shall engage stakeholders upon mobilization. * Early management of disputes. * Proactive community engagement; and * Transparency and realistic information about the project's impact and benefits are essential to manage expectations effectively and prevent conflicts. * Regularly review and update project progress to manage expectations effectively and avoid potential tensions. | EDSA/PIU    Contractor | 45,000 |
| Loss of or reduced access to land and livelihoods | | * Undertake a Resettlement Plan (RP) to assess any physical and/or economic displacement impacts and determine due compensation packages for affected persons. The RP shall be implemented prior to commencement of any physical works of the project. * Compensate farmers at full replacement value for loss of assets and livelihood disturbances as per the GoSL legislation and ESS5. * The Community Development Action Plan (CDAP) will be implemented as it addresses specific community felt needs. * Project GRM will be implemented. Complaints from PAPs will be timely registered, investigated and resolved. | EDSA/PIU | Project cost |
| Generation of  and other atmospheric emissions | dust | * Water will be used to dampen roads, tracks and/ or stockpiled material, especially under windy conditions. * Any exposed surface that is not going to be utilised after construction will be rehabilitated and maintained. * Traffic control measures aimed at reducing the entrainment of material by restricting traffic volumes and reducing vehicle speeds. * Covering and protecting stored materials from wind and dampening stored materials where appropriate. * Cover vehicles that transport dusty materials * Sweeping and dampening down working areas regularly to prevent the build-up of fine waste dust material. * Provide workers with appropriate PPEs to minimise dust inhalation. * Implement a vehicle speed limit monitoring system on site to help prevent/control dust from vehicles and for health and safety purposes. * Regular inspection of site vehicles’ emissions. * Limit vehicles idling motors to no more than 2 minutes. * During construction, pay special attention to reducing emissions from generators. Machinery causing excess pollution (e.g., visible smoke) will be banned from construction sites. Service all equipment regularly to minimise emissions. * The total footprint area to be disturbed/developed will be kept to a minimum by demarcating the construction areas and restricting construction to these areas only. | Contractor | $35,000 |

|  |  |  |  |
| --- | --- | --- | --- |
| Increase in ambient noise levels around site and access routes | * Plan construction activities to avoid or limit noisy work during sensitive periods, such as late evenings, nights, or weekends, when people are more likely to be affected by noise. * The Project will utilize portable, Sound/ Noise Level Meter and Air Quality Meter for ad hoc noise and air quality measurements and monitoring. * Provide workers with appropriate noise gear when they work in noisy areas. * Switch off equipment when not in use. * Train construction workers on the importance of noise control and the proper use of equipment to minimize noise emissions. * Choose construction equipment and machinery that produce lower noise levels or use noise-reducing technologies. Regular maintenance of equipment can also help keep noise levels in check. * Place noisy equipment or activities away from sensitive receptors, such as residential areas, schools, and hospitals. * Organize truck loading and unloading, as well as handling operations to reduce construction noise on the site. * Avoid the use of unnecessary alarms, horns, and sirens. * Install high-efficiency mufflers on appropriate construction machinery. * Implement noise reduction techniques at the BESS facility, such as employing soundproof enclosures or vibration-damping measures. * Proper maintenance and cleaning of batteries are essential for their efficient and quiet operation. * Use the best available work practices on-site to keep occupational noise levels minimal. | Contractor | $15,000 |
| Worker’s health and safety/community health and safety | * Implement the Health and Safety Management Plan. * Identify potential hazards to workers and residents, particularly those that could be fatal and implement necessary preventive and protective measures. * Implement the Road Safety and Traffic Management Plan. * Restrict access to the facility. * Follow the noise and air quality mitigation measures | Contractor | $ 22,000 |

|  |  |  |  |
| --- | --- | --- | --- |
| Soil contamination | * All storage areas (for fuels and lubricants) will be compacted and have bunded containers to prevent soil contamination and appropriate oil separators installed to cover a 24 -hr rainfall event. * Vehicle service areas must be paved or compacted. * Implement Storm Water Management Plan. * Create and maintain a hazardous material registry that lists the locations and quantities of hazardous compounds, as well as how they are stored and disposed of. * If contamination has been reported, determine the source of the contamination and contain the contaminated area. Isolating the source or implementing controls surrounding the impacted site may be used to limit the damage. Remediate the contaminated land with the best possible technology. * Inactive Stockpiles (stockpiles not scheduled to be used within 14 days) will be covered with plastic sheeting or sandbags placed at the toe of stockpiles. * Use specifically trained personnel to identify and selectively remove potentially hazardous materials, such as polychlorinated biphenyls (PCBs). * Use of waste-specific PPE based on the results of an OHS assessment, including respirators, clothing/protective suits, gloves and eye protection. | Contractor | $ 15,000 |

|  |  |  |  |
| --- | --- | --- | --- |
| Deterioration of water quality | * Standard procedures to control and minimize surface and groundwater pollution will be implemented. These include: * Maintain bonding of all facilities that store hazardous materials. * Maintain washing and ablution facilities. * Provide and maintain solid waste collection facilities. • Provide spill kits and monitor spills; and * Monitor vehicle oil leaks. * Erosion will be prevented at disturbed areas through water diversion berms and proper stockpiling of soil. Ensure stockpiles are placed on a free * draining location so as to limit erosion loss. * Implement the Storm Water Management Plan. * Progressive rehabilitation of all areas affected by construction to prevent erosion. * Store construction materials, fuels, and chemicals away from water sources and implement spill prevention and response protocols. * Conduct regular inspections to identify and address potential sources of water pollution.   **At decommissioning**:   * Carefully remove equipment and infrastructure to minimise waste generation and prevent spillage of hazardous substances. * Dispose of decommissioned materials according to the proper waste management plan, considering recycling or repurposing options | Contactor | $25,000 |

|  |  |  |  |
| --- | --- | --- | --- |
| Ecological disturbance (especially the construction of poles in the Suctarr swamp) | In the case of sensitive habitats like swamp areas, care should be taken to avoid the following:   * dumping construction waste and stockpiling excavated material into streams in swampy environments. These materials would choke aquatic life and distort hydrological cycles within that local area and further downstream. * Spillage of oil and other potential contaminants and pollutants into streams and swampy environments is unacceptable and should be prevented at all costs. Pollutants can obliterate many biodiversity resources like fish and the substrate for farming, which will be a disaster for the local livelihoods.     **As the successful EPC contractor is onboard, will provide a work plan (as part of C-ESMP) incorporating the following**:   * Assess the risks or impact of construction or expansion of the project footprint on adjacent swamp areas and sensitive ecosystems. Make recommendations that will inform engineering design based on this assessment. * Adequate buffer will be established between the facility, TML, access road and the swamp area. * Construction and operation of the proposed project will take into consideration the recommended mitigation measures relating to local community livelihoods and the conservation needs of the swamp ecologies. * Minimize the disturbance of the swamp areas, as much as possible, through implementing erosion and sediment control measures, such as silt fences, vegetation, etc. to prevent soil runoff and sedimentation in the swamp areas; limit major civil works, including excavation and materials movement across the swampy areas to the Dry Season or non-breeding season and protect the integrity and sustainability of the swampy areas; employ eco-friendly preservatives or treatments; avoid or reduce the use of chemicals, fuels, and other hazardous substances that could contaminate the swamps; using the least invasive | Contractor | $25,000 |

|  |  |  |  |
| --- | --- | --- | --- |
|  | techniques and equipment; restoring the site to its original condition after completion; etc. |  |  |
| Loss of biodiversity due to project construction activity.  Habitat destruction and soil disturbance as a result of land clearing, excavation and construction. | * Construction activities will be limited within the project area. * Implement effective sediment and erosion control measures to prevent sediment runoff into water bodies. This includes the use of sediment traps, sediment basins, silt fences, and erosion control blankets to capture and contain sediment. Ensure these measures are properly implemented within the project boundary and along the project access road alignment, restrict land clearing to what is absolutely necessary; all sloped areas must be stabilized to ensure proper rehabilitation is effected and erosion is controlled random movement of heavy machinery at construction sites shall be avoided; the contractor will be responsible to ensure that all cleared surfaces and exposed areas to be re-vegetated to its original state at all worksites after completion of work. | Contractor | $25,000 |
| Loss of or reduced access to land, assets and livelihoods | * Undertake a Resettlement Plan (RP) to assess any physical and/or economic displacement impacts and determine due compensation packages for affected persons. The RP shall be implemented prior to commencement of any physical works of the project. * Compensate farmers at full replacement value for loss of assets and livelihood disturbances as per the GoSL legislation and ESS5. * The Community Development Action Plan (CDAP) will be implemented as it addresses specific community felt needs. * Project GRM will be implemented. Complaints from PAPs will be timely registered, investigated and resolved. | EDSA | Project Cost |

|  |  |  |  |
| --- | --- | --- | --- |
| Population Movement/Labour influx | * Implement the LMP. * Providing housing facilities for incoming workers can help ease the strain on the local housing market. * Implementing social programs and community engagement initiatives can foster harmony between new arrivals and local communities. * Strict enforcement of health and safety regulations ensures the wellbeing of workers and prevents public health risks. * The implementation of the CDAP can foster a positive relationship between the project and the local community by ensuring that the project directly benefits the community. | Contractor | $15,000 |
| Potential Conflict from Issues Related to Labour | * Implement the LMP (including the labour GRM) * The recruitment policy used to employ people on the project must be fair, transparent and clearly communicated to the local population. * Local community structures (such as town/village headmen) will be involved to assist with communicating the proponent's intention to give preference to the existing labour force; and * Awareness will be raised regarding relevant social and community issues among all employees who will be in contact with local villages during construction. This awareness could be raised during the induction of employees, or can be addressed during tool-box talks, with the aim of increasing sensitivity to local norms and customs, and awareness amongst contractors and workers of appropriate and acceptable behaviour * The local community procurement policy and strategy & procedures will be defined. * Integrated job profiling as a first step in career progression planning will be introduced. * Gender-specific recruitment programmes and female targeted bursaries will be initiated. * Needs/opportunity assessments in terms of procurement will be commissioned | Contractor    EDSA/PIU | $ 25,000 |

|  |  |  |  |
| --- | --- | --- | --- |
| Exclusion of vulnerable groups | • The project will actively involve vulnerable and disadvantaged groups in decision-making and allocate resources to community development initiatives to enhance social well-being and cohesion through the CDAP. | EDSA/PIU | $5,000 |
| Spread of communicable diseases including HIV/AIDS | * Awareness and education on the prevention of STIs and safe sex practices * Provide health care services for workers. * Provision of condoms | Contracto  r, | $30,000 |
| Improper waste management can lead to environmental pollution, habitat disruption, and soil contamination.    Inadequate disposal methods may result in soil and water contamination, posing environmental and health hazards.    Inadequate planning for waste disposal can lead to soil and water pollution, as well as potential harm to local ecosystems. | * The Waste Management Plan will be implemented for the life span of the Project. The Waste Management Plan highlighted the following: * identified waste streams, temporary management and final disposal procedures. * Waste management procedures to be implemented which reduce the need for disposal of materials by re-use on and / or offsite. * Provision of an on-site collection service. * Waste streams to be kept segregated. * Adequate provision of waste disposal containers at strategic locations around the site. * training of workers in waste management and safe handling of wastes. | Contractor, EDSA/PIU | $52,000 |
| Job losses at the end of the project life cycle | * At the end of construction, the EPC contractor will introduce job transition programs to assist impacted employees in securing alternative job placements or receiving skills training for various roles within the renewable energy sector or other industries. * The workforce will be empowered to develop skills that will equip them to obtain employment in other sectors of the economy. * Local partners will be supported to diversify economy | Contractor,  EDSA/PIU | $15,000 |
| Removal of Cultural Sites | * The chance find procedure will be implemented and sites will be demarcated where applicable. * A Stakeholder Engagement Process and grievance procedure are in place to, inter alia, address impacts and concerns related to heritage sites. | Contractor | $5,000 |

|  |  |  |  |
| --- | --- | --- | --- |
| Landscape and Visual Intrusion  (Changes in the surrounding landscape and the visual appearance of the project site.) | * Efforts will be employed to maintain the construction site in a neat and orderly condition during the construction phase. * Designated areas for material storage, waste sorting and temporary storage, batching and other potentially intrusive activities will be created and screened off to the extent as feasible. * Security lighting at the facility will require one that is movement activated rather than permanently switched on, to prevent unnecessary constant illumination. * At decommissioning, the site will be restored to its original condition or repurposed | Contractor | $10,000 |
| * Unconducive working environment * Falls, being struck by objects, or caught in-between equipment can occur if safety protocols aren't followed. * High-voltage components pose risks of electric shock, arc flash, or electrocution without proper training and safety procedures. * Falls can happen without proper fall protection measures like harnesses, guardrails, or scaffolding. * Repetitive motions, heavy lifting, and awkward postures can lead to musculoskeletal disorders without proper training and equipment. * Improper handling of chemicals can lead to respiratory issues or skin irritations. * High noise levels and uncontrolled vibrations can cause hearing damage and health issues. * Demanding schedules can lead to fatigue, impairing concentration and decision-making abilities. * Inadequate living conditions and lack of access to healthcare can affect worker well-being. * Non-compliance with labour laws can lead to unfair treatment and exploitation. * Specific groups face challenges or disadvantages in the workplace, requiring special consideration and protection. | • A framework for Health and Safety Management Plan is developed and will be implemented.    The principles of prevention and control underpin management of risks to health and safety at the workplace. These are well established principles and widely applicable. The focus of action and consideration will be given to prevention of risk in the first place, particularly in terms of elimination at the source or substitution e.g. of a less hazardous substance, rather than immediately considering risk management/control measures. Psychosocial issues and general health issues will also be considered along with the safety risks and risks to health caused by physical, chemical, and biological agents. | EDSA/PIU/Contractor | $45,000 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 2. | Community Development Action Plan | **Electrify the Lungi communities**, including Gbaneh Bana involving the installation of 11kV and low-voltage lines, along with transformers, as well as providing guidance to communities on how to apply for service connections.    The **existing access road rehabilitated encompassing** activities such as improvements of the road surface quality, safety, and overall functionality.    **Lungi, Gbaneh Bana CHC SEA/SH Response toolkit supply.** Common to nationwide context, the health facilities in the project area lack adequate resources to serve their populations, with insufficient equipment and basic medical supplies. In Newton, Gbaneh Bana CHC (the core project site), equipment, supplies and basic medical facilities are insufficient to meet the demand. However, the project plans to support the CHC with GBV (SEA/SH) Response in the Project communities as part of the CDAP component with the aim of meeting emergency demands by community members and workers of the project. A budget of $20,000.00 is allocated by the project for the specified action plan. There is lack of essential items and resources that aid in the immediate response and support for survivors of gender-based violence. Thus, the project will supply a comprehensive GBV response kit to Newton, Gbaneh Bana CHC to address immediate needs. The kit will be accompanied by awareness campaigns and training, with regular assessments to ensure responsiveness to evolving needs. These interventions will be provided by the project before the contractor mobilizes thereby guaranteeing adequate facilities both for the community and workers of the project (the budget for GBV related part of the CDAP is included in the SEA/SH Prevention and Response Action Plan, under preparation by the project-EDSA). | EDSA/MOE | See Below Table  -  CDAP Budget |
|  | | **Labor force recruitment.** Emphasis will be given on the recruitment of local workforce during the implementation of the proposed RESPITE project. EDSA is dedicated to facilitating the recruitment process as responsive as possible to local realities, as per skill sets and qualifications of community groups. It will be a stipulation in the contractor's agreement.    **Continuous stakeholder engagement**. Implement Stakeholder  Engagement Plan (SEP) developed for the project, including GRM. |  |  |
| **Total Budget** | |  |  | $  551  ,  566  .  18 |

### Budget

The table below shows Summary of Cost for Implementing the Environmental and Social Management Plan (ESMP).

|  |  |  |  |
| --- | --- | --- | --- |
| **Measure/Action** | **Responsibility** | **Cost Estimates ($USD)** | **Sierra Leonean New Leone**  **(NLe)** |
| Mitigation | Contractor | $409,000 | Le 9,262,623.00 |
| Monitoring | PIU | $78,000 | Le 1,766,466,00 |
| Capacity Building | Consultant | $48,000 | Le 1,087,056.00 |
| CDAP | PIU | $142,566.18 | Le 3,228,696.18 |
| **Total** | | **$677,566.18** | **Le 15,344,841.18** |
| N/B Bank of Sierra Leone exchange midrate ($1 = NLe 22.647), March 2024. | | | |

### Conclusion and recommendations

Lungi PV Solar Plant Subcomponent of RESPITE Project is feasible, indeed attractive, from the technical, economic and environmental and social viewpoints. The identified adverse environmental and social, health and safety impacts are all such that they are capable of control within acceptable limits, provided that the recommended mitigation measures are adopted.

No threatened species of mammals, birds or butterflies were recorded. Identifying any of these species during the survey is one of the key aspects of the study. For most of the species indicated in the ESIA, the type of habitats found in the survey areas cannot support them, because these species depend on closed forest environments, which do not occur in the survey areas. Also, the biogeographic range of some of these forest-dependent species does not extend to the sector of the country where the proposed site is located.

The potential impact on biodiversity of the studied sites is low and does not include any fauna species of global conservation interest list, so there is no critical justification for protecting the sites for the conservation of fauna over the development interest surrounding the supply of electricity to the prospective beneficiary communities. The same applies to the flora in the study sites.

Generally, no significant adverse environmental and social impact will warrant the project's cancellation. Residents around the project communities warmly favor the coming of the project. Nevertheless, the following actions shall be undertaken by the project, on top of other measures stipulated in this ESIA.

* All appropriate ***environmental and social management measures*** detailed in this report and associated ESMP shall be implemented throughout the project's entire life. The Contractor will be required to prepare and implement a Contractors Environmental and Social Management Plan (CESMP) based on the ESMP.
* ***Property ownership and title deed for the land allocated for solar PV, BESS Facilities site (***44.7583 Acres of land located in Lungi Port Loko District in the Northern Province) is presently transferred from the Koroma family, with the consent from the Paramount Chief of the Kaffu Bullom Chiefdom

to Ministry of Energy (MoE) through Ministry of Lands, Housing and Country Planning in a willingbuyer willing-seller arrangement at a price voluntarily agreed to by both parties. All the necessary legal procedures and proper documentations are concluded, including evidence of compensation payment and conveyance letter dated 4th July 2023. No institutional/privately owned property is located within the designated and fenced boundary of the site. Thus, no socio-economic measure is required on return. Therefore, as per the requirements of ESS5, no RP is required for the stated plot of land.

* A ***Resettlement Plan (RP)*** and is required for the transmission line construction within the RoW, including the inland valley swamp between Makassa and Suctarr used for the farming. A preliminary assessment of the proposed transmission route indicates varying degrees of potential disturbance to about 40 economic trees and 5 business stalls in different locations along the route, with some areas showing minimal impact requiring RP to fully assess and provide mitigation measures to minimize disruption. There is a need for a comprehensive tree inventory to be completed in the course of RP development at the RESPITE Project implementation sites. The inventory should record all trees on the project site (economic or natural). The ToR developed for RP preparation has embedded tree inventory within the scope of the assignment. The ESMP for contractor should also ensure that project design leads to minimal trees being cut for the project and also there is compensatory planting of the trees that are cut.

* Overall, the assessment for the 10km route does not indicate significant issues that will warrant the route to be alternated. There are no high-value structures deemed to be demolished. The RP will define the actual physical and/ or economic displacement impacts to be emanated by the proposed project activities.

#### ▪ *Implementation of Community Development Actions*

* **Providing access to electricity**: as already discussed in the previous sections of this ESIA, it is the priority request of the communities in Lungi study area. Therefore, EDSA is committed to electrify the Gbaneh Bana communities in the project site. As per Sierra Leone Electricity Act of 2011, Article 36 (2) (a) The Authority (EDSA) shall not extend supply to premises; (b) more than 200 metres from the nearest supply point. Thus, EDSA can only be able to provide the necessary accessories (provision of transformers, poles, conductors, etc.) and makes ready for the last mile connection. With the appropriate arrangement and technical support from EDSA, the communities will take the responsibility to electrify their houses or institutions accordingly. Based on the information gained from experts of EDSA, the estimated cost for the last mile connection, including the meter or instrument for recording the quantity of electricity supplied or consumed, for a single-phase transformer, is about $ 100.00 (equivalent to 2,300.00 New Leones). A budget of $112,294.56 is earmarked for the stated community development plan (subject to modification).
* **Rehabilitation of the existing access road: t**here is a dirt road stretching over 1 kilometer from the Gbaneh Bana junction that leads to the proposed PV and BESS site (covering about 1 km) will be rehabilitated as part of this project Community Development Plan (CDAP). The rehabilitation works will include ***improvements of the road surface quality, safety, and overall functionality.*** During the recent consultations, EDSA has clearly communicated to the communities and relevant stakeholders on the exact scope of works to be performed on the existing access road rehabilitation program. The GoSL in collaboration with relevant authorities, such as the Sierra Leone Roads Authority (SLRA), Sierra Leone Road Safety Authority (SLRSA), and EDSA will be involved in the successful execution of this road rehabilitation. These authorities possess the necessary expertise and jurisdiction to manage road infrastructure and road safety in Sierra Leone. A budget of $10,271.62 is earmarked for

xxxix

the stated community development plan (subject to modification during detailed technical planning of the road).

* **Support to** GBV (SEA/SH) prevention **in Lungi:** common to nationwide context, the health facilities in the project area lack adequate resources to serve their populations, with In Gbaneh Bana CHC, equipment, supplies and basic medical facilities are insufficient to meet the demand. The project plans to support the CHC with GBV (SEA/SH) prevention which will includes campaign and awareness raising, Multi-Sectorial GBV Response (Health, Psychosocial, Safety/Security and Legal) as part of the CDAP component with the aim for meeting emergency demands by community members and workers of the project. The project allocates a budget of $20,000.00 for the supply of SEA/SH toolkits for the Newton Health Center as will be specified in the GBV/SEA/SH action plan. There is also lack of essential items and resources that aid in the immediate response and support for survivors of gender-based violence. Thus, the project will supply a comprehensive GBV response kit to Gbaneh Bana CHC to address immediate needs. The kit will be accompanied by awareness campaigns and training, with regular assessments to ensure responsiveness to evolving needs. These interventions will be provided by the project before the contractor mobilizes thereby guaranteeing adequate facilities both for the community and workers of the project (the budget for GBV related part of the CDAP is included in the SEA/SH Prevention and Response Action Plan, under preparation by the project (EDSA).
* These commitments shall be achieved during the implementation period of the project.

Maintaining regular stakeholder engagement and ensuring the incorporation of environmental protection and social wellbeing clauses into bidding and contract documents and implemented are the other set of recommendations of this ESIA. Therefore, it is concluded that, provided the benefit enhancement and mitigation measures as recommended in this ESIA report are adopted and a RP is to be prepared and implemented, there are no environmental and social grounds for not proceeding with implementation of the project in the form presently envisaged.

xl

### 1. CHAPTER ONE: INTRODUCTION

#### 1.1. Background

The Government of Sierra Leone (GoSL), through the Electricity Distribution and Supply Authority (EDSA), has hired the service of a team of consultants to develop an Environmental and Social Impact Assessment (ESIA) and associated Environmental and Social Management Plan (ESMP) for the planned solar PV facility in Lungi in Port Loko District, Northern Region of Sierra Leone under the Regional Emergency Solar Power Intervention (RESPITE) project. The RESPITE project is an emergency response by the GoSL to the impact of the Ukraine war and the rising oil prices, which are not only felt in government budgets but are also being felt in increased power outages. The war and resulting oil price rise are leading to a massive fiscal impact on the country, which largely depends on thermal-based generation. The war and its resulting oil price rise are leading to important fiscal impacts for the region, given its continued dependence on oil-based generation. This proposed stand-alone regional IPF will finance the procurement and installation of approximately 106 MW (132 MWp) of solar PV and additional battery storage capacity across four countries in West Africa (Liberia, Sierra Leone, Chad, and Togo), and 41 MW of hydro capacity in Liberia. It is expected that the proposed project will (i) reduce the impact of the high oil prices in those countries and hence provide fiscal space for those countries to address the food crisis resulting from geopolitical developments in Ukraine; (ii) increase the supply of affordable and clean energy on the grid to alleviate current power supply crisis; and (iii) help countries to move away from expensive and polluting Heavy Fuel Oil (HFO) and diesel generation, thereby reducing greenhouse gas (GHG) emissions. Therefore, with financing from the World Bank (WB), the Government of Sierra Leone will implement the RESPITE Project. The proposed project is aligned with the government sector strategy and builds on WB’s sustained engagement in the country’s energy sector.

The RESPITE Project will be implemented in accordance with the World Bank’s Environmental and Social Framework (ESF), and the applicable Environmental and Social Standards (ESS). Eight of the ten ESS were considered relevant for the project:

ESS1- Assessment and Management of Environmental and Social Risks and Impacts

ESS2 - Labor and Working Conditions

ESS3 - Resource Efficiency and Pollution Prevention and Management

ESS4 - Community Health and Safety

ESS5 - Land Acquisition, Restrictions on Land Use and Involuntary Resettlement

ESS6 -Biodiversity Conservation and Sustainable Management of Living Natural Resources

ESS8 - Cultural Heritage

ESS10 - Stakeholder Engagement and Information Disclosure

**The Project Development Objective** is to rapidly increase grid-connected renewable energy capacity and strengthen regional integration in the participating countries. It has 4 components, but only the following are applicable to Sierra Leone:

**Component 1: Construction of Solar PV, BESS and Grid Connections (US$184 million equivalent IDA)** will finance all costs associated with the Design, Supply and Installation (DSI) and O&M for the first three years of the solar PV power plants and any associated works for grid connection.

* *Sub-Component 1B: Solar PV and Battery storage at two locations in Sierra Leone (US$63.5 million IDA equivalent)* will finance all costs associated with (i) the expansion of an existing 5MWac/ 6MWp power plant at Newton to 35 MWac with associated substation, adding storage to it and undertaking works for power evacuation, and O&M for three years, and (ii) the addition of about 10 MWac ground-mounted solar PV with battery storage, undertaking works for power evacuation, and O&M for one to three years at Lungi and Newton. Feasibility studies have been completed for both sites. Support for O&M will include training and capacity building at the utility to ensure that the utility staff have the technical know-how to operate and maintain the power plant.
  + Development of 39 MWp (30 MWac) with 15MWh Battery storage and addition of 7MWh battery storage to the existing 6MWp/4.9MWac at Newton (US$44 million): A 6MWp solar power plant has been developed in the Newton area through a grant to GOSL from Abu Dhabi Fund for Development (ADFD). This component will finance the DSI and O&M for additional storage capacity for the existing plant and adding 39MWp (30MWac) of ground-mounted solar PV. The proposed site is located at 8.322621°, -12.993666 with the government already having acquired 120 acres of land. The site will be linked to the proposed Waterloo substation through a 33kV line and further to the 161kV Bumbuna transmission line to Newton.
  + Construction of 13 MWp (10 MWac) solar PV plant in Lungi Airport Area with 6MWh storage (US$19.5 million): A 13 MWp (10 MWac) solar PV site is planned in the Lungi area that houses the Lungi International airport. The government has identified land (8.663171, -13.187704) for this purpose. The proposal is for a 13MWp (10MWac) fix tilt PV power plant to be connected to the existing MV switching station at Lungi through 11kV lines. The sub-component will finance the DSI and O&M for the power plant and 5 MWh storage system as well as the construction of 11kV connection to the existing 11kV substation.

**Component 3: Distribution Expansion and Transmission Optimization (US$15.5 million equivalent IDA)** will finance the expansion of distribution networks and optimization of transmission in Sierra Leone and Togo to help the newly installed capacity to be connected to regional interconnectors and/or reach national populations.

* Sub-Component 3A: Supply and installation of voltage regulation equipment at 161/11kV Substation of Freetown to increase the evacuation capacity of the 161kV transmission line and Supply and installation of 33 kV and 11 kV distribution lines to optimize the integration of the Newton Solar Park (US$6 million) This sub-component will finance the works associated with increasing the wheeling capacity of the existing 161 kV transmission line from 70 MW to 90 MW. The 161 kV line is around 205 km long which results in a high impedance that induces voltage drop along this line, especially during peak demand operations; this significantly impacts both the power transfer and voltage profiles in Freetown. The planned solar PV plant at Newton will evacuate part of its generation to the 161 kV transmission line and also use 33 kV sub-transmission line that is being built under WB financed Electricity Sector Utility Reform Project (P120304). This sub-component will cover the cost of design, procurement, and installation of devices for reactive power compensation (capacitor banks) and/or shunt reactors for voltage regulation support, and the 33kV and 11kV distribution lines needed to optimize the use of the solar plant. Increasing the 161kV line capacity will alleviate grid congestion and help in meeting the rapidly growing demand in Western Areas.
* Component 4: Regional Coordination, Institutional Strengthening, Implementation Support and Technical Assistance (US$50.5million equivalent IDA).

The World Bank is also providing financing for the environmental and social assessments and other planning documentation needed to meet the requirements of the World Bank’s ESF and to the project’s environmental and social performance. The report covers the ESIA and associated ESMP for the construction of 13 MWp (10 MWac) solar PV plant in Lungi Airport Area with 6MWh storage (Project component Sub-Component 1B (ii) along with the construction of transmission line connecting the proposed PV and BESS to the existing substation in Lungi.

To address the Environmental and Social (E&S) risks and impacts of the proposed works, EDSA is required to prepare an ESIA and associated ESMP primarily adhering to the guidelines set forth by the World Bank's ESF and commitments made in the Environmental and Social Commitment Plan (ESCP).

#### 1.2. The Proponent

The World Bank is financing the proposed development, and EDSA implements it on behalf of the Ministry of Energy (MoE) as the project's proponent. EDSA has initiated an ESIA study to meet the World Bank’s ESF requirement and to obtain an Environmental Impact Assessment (EIA) license from the Environmental Protection Agency, Sierra Leone (EPA-SL), for the project's implementation. This is in accordance with the measures and actions identified in the ESCP. The ESIA study describes the existing environmental and social context of the project area and the project-affected communities to identify the project’s potential impacts and propose mitigation measures that EDSA would implement during the various project phases (preconstruction, construction, operation and maintenance, and decommissioning phases). EDSA is the government’s institution in charge of the country’s electricity supply, distribution, and retail sales.

The project must adhere to the World Bank’s General and Industry-specific Environment Health and Safety (EHS) Guidelines, applicable national and local legislation and international conventions ratified or recognized by the Government of Sierra Leone.

#### 1.3. Need for the Project

The project justification is clearly described in the Project Appraisal Document (PAD). The Construction of Solar PV, BESS, and grid connections is imperative for Sierra Leone as it addresses the critical need for a reliable and sustainable energy source. Like many developing nations, Sierra Leone grapples with the challenge of providing a consistent and reliable power supply to its citizens and industries. The existing energy infrastructure, predominantly reliant on conventional fossil fuel-based sources, faces limitations in terms of reliability and sustainability. The sporadic availability of electricity not only hinders economic growth and industrial productivity but also impacts citizens' daily lives, affecting areas such as healthcare, education, and communication.

This initiative is crucial for Sierra Leone, providing a reliable and sustainable energy source. It addresses the country's urgent need for a stable power supply, especially in areas where access to electricity is sporadic. By harnessing solar energy and integrating storage technology, this project promises to significantly improve energy accessibility and reduce reliance on conventional, less sustainable sources.

#### 1.4. Purpose of the ESIA Study

The overall objective of this assignment is to identify and assess the environmental and social risks and impacts of this proposed project, evaluate alternatives, and design appropriate mitigation, management, and monitoring measures. It also involves preparing an ESIA and an ESMP for the Lungi location in accordance with the World Bank's ESF, the project ESCP, EHS General Guidelines, and Energy/Electricity-specific recommendations. Recommendations of this ESIA will be incorporated into the final project designs, investment decisions and project implementation processes to ensure the sustainable management of the environment during the pre-construction, construction, operation/ maintenance, and decommissioning phases.

The ESIA/ESMPs also identifies and addresses the potential risks of labor influx and employee working conditions, HIV/AIDS, sexually transmitted diseases/infections (STD/I), impact on vulnerable groups and gender inequality associated with project interventions. The Labor Management Procedures and Sexual Exploitation and Abuse and Sexual Harassment Action Plan shall be adopted as annexes to the ESIA/ESMP. Additionally, the Terms of Reference (ToR) stipulate the necessity to assess whether a Resettlement Action Plan is required.

#### 1.5. ESIA Methodology

Based on the ToR in ***Annex I***, the methodology adopted for the study consist of the following:

* Field inspections and transect walk.
* Review of available relevant literature
* Baseline studies (including Socioeconomic sample survey in the project area)
* Stakeholder consultations
* Data analysis and reporting

##### 1.5.1 Field Inspections and Transect Walk

Reconnaissance and detailed site investigation of the project locations were conducted in November 2022, February, April and May 2023 to confirm the project's area of influence and the environmental and social concerns and situations that will be impacted by or are anticipated to arise from the implementation of the proposed project. (*Table 4-2* presents a summary of the issues discussed during the consultations. All other findings are discussed under the respective baseline). The layout of the transmission line linking the solar PV site to the substation in Lungi was determined in April 2023 with the guidance of the EDSA Network Planning Unit.

##### 1.5.2 Review of Available Relevant Literature

The following documents were reviewed:

* Project documents
  + Newton and Lungi PV Plant Grid Impact Studies by Intec GOPA Integrated Energy Consultants- October 2022
  + PV and BESS Plants, Final Design Report by Intec GOPA Integrated Energy Consultants- October 2022
* Project Appraisal Document (PAD), Appraisal Stage Environmental and Social Review Summary (AESRS), Stakeholder Engagement Plan (SEP), etc.
* World Bank Environmental and Social Framework (ESF)
* World Bank ESF Guidance Notes for Borrowers and Good Practice Notes
* World Bank EHS guidelines
  + Environmental, Health, and Safety General Guidelines, IFC and The World Bank Group 2007
  + Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution, IFC and The World Bank Group, April 2007
* Relevant Sierra Leonean policy and regulations
* Sierra Leone Integrated Household Survey, Statistics Sierra Leone 2018
* Sierra Leone 2015 Population and Housing Census: Thematic Report on Population Structure and Population Distribution. Freetown, Sierra Leone: Statistics Sierra Leone.
* Meteorological data
* Survey maps
* Journals
* Aerial maps/imageries of the study area etc.

##### 1.5.3 Environmental and Social Baseline Studies

This ESIA evaluates potential environmental and social risks and impacts during all phases of the proposed Solar PV plant, BESS and ancillary facilities, and a transmission line linking the plant to a substation at Lungi in Northern Sierra Leone. The ESIA establishes the current baseline and evaluates potential risks of impacts based on an assessment of their extent (local, regional, national), duration (short, medium, long-term), and Magnitude (the impact's severity based on the extent to which the impact would change under existing conditions or how it would impact another receptor)

Design statements in the ESIA are largely conceptual and will be detailed and finalized in the final version. However, the conceptual design phase allows for an assessment of potential E&S risks and impacts due to the civil works and the identification of measures to prevent or mitigate them. Once a construction contractor is chosen, their initial tasks will include conducting a check survey, which will serve as a foundation for the detailed design of the PV plant, BESS, and transmission line. Following the finalization of these designs, the ESIA may be revised, and the ESMP will be updated as needed to avoid or reduce impacts. The EPC contractor will incorporate the ESMP into a Contractor ESMP (C-ESMP), providing a detailed outline of how they intend to adhere to the ESIA/ESMP throughout the project's implementation.

##### *EPA-SL Screening*

The project adheres to the ESF of the World Bank, along with the relevant ESS. In compliance with Sierra Leone's EIA license prerequisites, EDSA conducted a project screening in January 2023, employing the agency's designated screening template. This evaluation resulted in the project being categorized as a ‘**category B’** project.

Extensive field studies and consultations were undertaken in November 2022, February, April and May 2023to establish the biophysical and socio-economic baseline of the project area. ***Error! Reference source not found.*** shows the scope of these studies. Photographs of activities done during site visits can be found in *Annex III.*

The data obtained for parameters measured were benchmarked against international standards and guidelines, such as the General and Electricity-specific WB EHS guidelines, the World Health Organisation (WHO) standards, and FAO guidelines (for irrigation).

###### 1.5.4 Stakeholder Consultations

Ongoing engagements have taken place since November 2022 with both the Project Implementation Team (PIT) of the MoE and the World Bank. The purpose of these interactions is to deepen our understanding of the project's scope, organizational structure, and implementation plan, as well as to obtain relevant project documentation.

As part of the information-gathering process on environmental and socio-economic issues, extensive consultations have been conducted with key stakeholders and interested groups via one-on-one interviews and stakeholder consultation meetings. These stakeholders and groups comprise relevant government institutions and regulatory bodies, landowners, project beneficiaries and engineers, local political authorities, and interest groups. Stakeholder consultations were conducted in November 2022 as well as in February and May 2023. Time and venue of meetings were agreed on together with the stakeholders. Consultation meetings were held at different locations and at different times. A total of 240 (Male 140 and Female 100) participants took part in the consultation process (see Chapter 4 for details on consulted stakeholders).

**1.5.5 Data Analysis and Reporting**

##### Bio-physical Data

For water quality, samples were analysed in the laboratory using photometers MD160 and MD610 (for chemical parameters), and compartment bag test (CBT) for *E. coli*. Detailed information on sample collection, preservation, transportation, preparation, and analysis can be found in *Annex IV.*

Regarding soil suitability. The ESIA Team compared the data with the standards and guidelines mentioned in ***Chapter 1.5.3***. Composite samples were air-dried for a minimum of five days after taking sub-samples for moisture content determination. The dried samples were then sieved using a >2.0 mm sieve and placed in labelled containers consistent with field labelling. Specific parameters, instrumentation, and methodology for soil sample analysis are outlined in *Annex V*.

##### Socio-economic Data

Socio-economic data were tabulated and where necessary corroborated by anecdotal evidence. The findings from both desk and field studies have been analysed and incorporated into this report (see chapter 5.2).

### 2. CHAPTER TWO: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

The policy, legal and institutional frameworks governing development projects usually provide guidelines to protect the environment, livelihood, well-being of workers and residents, and sustainable development. The policy and legal provisions are found in various national policies and legal documents. International policies on environmental management include the World Bank guidelines on environmental health and safety and the World Bank Environmental and Social Standards (ESS), which form part of the World Bank’s 2018 Environmental and Social Framework (ESF). These include essential guidelines for this project.

#### 2.1. Legislations and Regulations

##### 2.1.1. The Constitution of Sierra Leone 1991

Sierra Leone's 1991 Constitution is the basic set of laws and jurisprudence that govern the country. It ensures fundamental human rights for all individuals, independent of gender, and prohibits discrimination (Section 27). The constitution also safeguards against property deprivation, encompassing land. Significantly, Act No 6 of the 1991 Constitution, Section 21(1), plays a crucial role in safeguarding individual property rights, especially for vulnerable persons. This section outlines exceptions, where rights, including those related to land, may be overridden:

1. Land or natural assets can be acquired for defense, public safety, public order, public morality, public health, town and country planning, development, or to promote the public benefit or welfare of Sierra Leoneans.
2. Lawful possession or acquisition is permitted for adequate compensation, ensuring the interests of others in the property are secured.

The 1991 constitution also re-echoes specific fundamental provisions in the Universal Declaration of Human Rights (UDHR), 1948, which protects vulnerable people, including women and children.

*Relevance to the Project*: The project will ensure that property acquisition for the project's development adheres to constitutional principles, including fair compensation and consideration for vulnerable individuals and environmental preservation.

##### 2.1.2. The Sierra Leone Environmental Protection Agency Act, 2022

The Environmental Protection Agency (EPA) was established in September 2008 through an Act, later amended in July 2010, to ensure the effective and efficient protection and management of the environment, as well as addressing other relevant issues.

The Act requires an EIA report for certain types of project activities like the construction and the operation of the PV plant, BESS Plant and transmission system. The assessment contents must be contained in a report that is submitted to the Executive Director of the Agency. A proponent requesting to carry out an activity that may compromise the benign state of the environment would be mandated to commence its operations by the issuance of an EIA license on approval of a submitted EIA report. The Board may also disapprove of issuing an EIA license if it envisages that the proponent’s activities would significantly affect the project area and surrounding communities.

The Board, as stated in section 63, has the right to issue regulations requiring the project owner (the proponent) to hold insurance or other necessary financial security. This is to guarantee payment of compensation for any damage resulting from the project's operations. Alternatively, the proponent may guarantee payment, preventive measures, or rehabilitation where necessary.

*Relevance to the project*: The proposed project will follow the guidelines of the Act for acquisition of EIA license.

##### 2.1.3. National Electricity Act of 2011

The National Electricity Act of 2011 resulted in the division of the National Power Authority into EGTC and EDSA. Specifically relevant to the Lungi transmission, PV, and BESS Project, Part X addresses land acquisition and environmental practices. The Act grants the Minister of Energy powers to acquire land for EGTC or EDSA, ensuring compensation, in alignment with Section 21(1) paragraph ‘a’.

The Act permits street excavation and structure construction for energy transmission with the consent of the relevant Ministry. Section 58 empowers entities to cut obstructing vegetation, providing a 14-day notice to land occupiers. Sections 59 and 60 grant authority or designated companies the ability to enter and construct on previously acquired land, giving reasonable notice. Section 62 mandates compliance with environmental, health, and safety regulations for all entities involved in power generation.

Article 36. (1) The Authority shall supply electricity to any person requiring supply subject to a contract which shall contain terms and conditions as the Authority may determine and shall specify the maximum power required.

1. The Authority shall not extend supply to premises –(a) more than two hundred meters from the nearest supply point; and (b) that would affect the safe capacity of the Authority's supply system.
2. The Authority shall declare in writing to each such consumer the standard voltage but this declaration shall be subject to paragraph (c) of section 34.

Article 37. The Authority may-enter into a contract with any person for the execution of work authorized under this Act.

*Relevance to the project*: The project land acquisition for the PV and BESS site underscores the significance of this Legislation as it intricately regulates the land acquisition process and its associated environmental, social, and economic practices.

##### 2.1.4. The Sierra Leone Electricity and Water Regulatory Commission (SLEWRC) Act, 2011

This Act establishes the Sierra Leone Electricity and Water Regulatory Commission. The commission is therefore responsible for formulating, implementing, monitoring quality and compliance, providing tariff guidelines, licenses and implementing regulatory frameworks for the safe, secure, affordable, and reliable supply of water and electricity in Sierra Leone.

As per Section 66 of the SLEWRC Act, no 13 of 2011, the Commission developed a mini-grid regulation in 2018 and 2019. (SLEWRC Mini-Grid Regulations, 2018 and 2019 – see Annex VII). The Regulation sets out general requirements to be adhered to by the mini-grid licensee to mitigate any adverse effect and impact of its operations and activities on the environment. The Regulation also sets out general requirements that mitigate any adverse effect and impact of its operations and activities on the health and safety of staff members, consumers and other individuals.

*Relevance to the project*: During the transmission, PV and BESS operation, electricity traffic is very key for consumers to feel the actual positive impact of the project. This legislation establishes the legal framework for electricity tariff regulation and monitoring the quality of electricity services received by consumers during the operation of PV facilities.

###### 2.1.5. The Customary Land Right Act 2022

The Customary Land Right Act 2022 seeks to provide for the protection of a customary Land right, the elimination of discrimination, and the management of land subject to customary law. This Act provides for free prior and informed consent for all investments; access to land for all citizens; equal rights for women, including youths and persons with a disability under customary law, local land management structure; protection of Biodiversity and ecological areas forms part of this new legislation.

*Relevance to the project*: This legislation seeks to address discrimination and improve consultation concerning access to land or acquisition of land and Biodiversity conservation. This Act gives vulnerable persons, including women and youth, their say in land acquisition for development projects.

###### 2.1.6. Local Government Act, 2004 and Amended Act of 2017 and 2022

This project is located within the Western Area District Council (WARD C). The operations of a local council are guided by the 2004 Local Government Act and its amendment of 2017, which incorporated the roles of the district council in the management of ecological systems. In Part V, Section 20 of the Act, states as follows:

‘A local council shall be the highest political authority in the locality and shall have legislative and executive powers to be exercised in accordance with this Act or any other enactment, and shall be responsible generally for promoting the development of the locality and the welfare of the people in the locality, with the resources at its disposal and with such resources and capacity as it can mobilize from the central government and its agencies, national and international organizations and the private sector’.

Specifically, the Act provides for local councils to carry out their functions in the following paragraphs:

2(a) mobilize the human and material resources necessary for the overall development and welfare of the people of that locality.

2(b) be responsible for the development, improvement and management of human resources and the environment in the locality.

With regards to the use of land, the Act in Section 20, paragraphs 28 stipulate that the local council shall cooperate with the chiefdom council to:

28(c) making and enforcing bylaws; and

28(d) holding land in trust for the people of the chiefdoms.

*Relevance to the project*: Local councils are the highest political body at the local level and are generally responsible for promoting development. Since transmission, PV and BESS plant construction and operation are significant developments that will improve the lives and livelihood of the people at chiefdom, local and national levels. Therefore, WARD C will be involved in project development and implementation.

###### 2.1.7. Sierra Leone Roads Authority (Amendment) Act of 2010

The 2010 amendment to Sierra Leone's Roads Authority (SLRA) Act modifies the 1992 SLRA Act, granting the

Authority legal power to determine the Right-of-Way (RoW) width for national roads. The SLRA is responsible for managing the country's roads, focusing on constructing and maintaining the national road network, advising the government on road policy, and resolving transportation issues.

The SLRA oversees RoW matters, defining the designated land strip along roads for future development and utility access. Endowed with ownership by the government, the SLRA is entrusted to manage and regulate RoW use in line with approved guidelines, ensuring long-term road network development. Reserving land for expansion, the government aims to accommodate growth, enhance utility access, and improve safety standards. The SLRA's management of RoW contributes to effective road planning, maintenance, and coordination with other utility providers, optimizing transportation infrastructure in Sierra Leone.

*Relevance to the project*: The transmission line will be constructed along existing EDSA corridors. However, EDSA will seek clearance from the SLRA for using this facility. The RoW width is typically set at 3 metres.

###### 2.1.8. The Sierra Leone Road Safety Authority Act 1996 (amended 2003,2016)

This Act established the Sierra Leone Road Safety Authority (SLRSA). The Amendment Act of 2003 established the Corps of Traffic Wardens to complement the Sierra Leone Police Force with regard to traffic duties by exercising the following duties:

1. educate the public on road safety,
2. regulate and control traffic,
3. render the roads free from unnecessary obstruction and ensure the free flow of traffic.

The SLRSA’s mandate is to design and administer rules and regulations regarding the following:

1. The registration and licensing of vehicles, whether for private or commercial use.
2. The testing of the fitness of vehicles for their intended use and the fitness of persons to be drivers of a vehicle.
3. The licensing drivers and vehicles
4. The inspection and supervision of vehicle repair and maintenance service
5. The routing and monitoring of passengers and goods transportation.

*Relevance to the project*: The EPC contractors will use the existing road during the project construction phase. Therefore, the contractors will ensure that machinery and vehicles are road-worthy, drivers are licensed, and road speed limits are enforced.

###### 2.1.9. Road Traffic Acts, 2007

The Road Traffic Act of 2007 deals with registering and licensing vehicles, carrying hazardous goods, nonroadworthy or overloaded vehicles, licences for commercial drivers, maximum work hours, the alcohol limit (i.e., 80 mg of alcohol in 100 ml of blood) and drugs. Sierra Leone Roads Authority creates regulations pertaining to the safe usage of roads.

*Relevance to the project*: The EPC contractors and the EDSA will comply with the rules and regulations on vehicles and goods transportation at the project's pre-construction, construction and operation phases.

###### 2.1.10. Public Order Act, 1965

Section 13 of the public order Act of 1965 outlines street noise without referring to Environmental noise. This criminalises any noise from noisy instruments, music, or singing before 6 AM in the morning and after 10 PM at night.

*Relevance to the project*: The site is in close proximity to settlements; therefore, EPC contractors will heed to this law.

###### 2.1.11. Factories Act,1974

Effective since May 30, 1974, this Act focuses on health and safety for workers, mandating cleanliness and reporting of injuries, accidents, diseases, and deaths. It establishes a Factories Appeal Board to handle appeals by factory owners, ensuring justice. The Act covers companies under the term 'factory,' emphasizing workplace health and safety. It requires sanitary facilities, posting of relevant restrictions, safety precautions by owners, and supervision of machinery by competent persons. Additionally, it mandates inspections and reporting of accidents to authorities as prescribed.

*Relevance to the Project*: This Act addresses occupational health and safety issues, hiring of experts, work permits, and hiring of labour, which is very important for this project. As such, this Act will be constantly referenced.

**2.1.12. Employers and Employed Act, consolidated to 1960.**

This Act regulates relations between employers and the employed and safeguards the health of the employed. It sets forth provisions relating to the formation and interpretation of contracts of service, the recruitment of native labour for foreign services, restrictions on the engagement of industrial workers, employment of women, adolescents, and children apprenticeship contracts. Also regulates the death, insolvency and change of residence of employer; breaches of contract and disputes between the employer and the employed, provisions as to agents; advances by employers.

*Relevance to the project*: The Employment and the management of employees are very key from the Preconstruction, construction, and operation phases for this project. The EPC contractors and EDSA will always abide by this legislation for the recruitment and management of its employees who will be involve in the Project.

###### 2.1.13. Child Rights Act, 2007

Under the Child Rights Act of 2007, the minimum age for admission of children into full-time employment is fifteen (15) as per section 125 of the Child Rights Act of 2007 and Section 52 of Chapter 212, Employers and Employed Act. The minimum age for a child's engagement in light work is thirteen years as per section 127(1) of the child Right Act of 2007. However, the minimum age for engagement of persons in hazardous work is eighteen (18) as per section 128 of the Child Right Act of 2007 and Sections 47–56 of Chapter 212, Employers and Employed Act. This law expressly protects children, including girls, from exploitative labour, torture and degrading treatment.

*Relevance to the project*: The minimum age for hiring of workers for this project is 18 years. The C-ESMP will need to outline how the contractor will conduct and keep age verification records. PIU will need to conduct periodic spot checks, review records, and ages of workers.

**2.1.14. The Sexual Offences Act, 2012 as amended in 2019.**

This law seeks to protect women and girls from the harm of unlawful sexual acts, and provides the age of consent for sex as 18 years. Section 13 of the Act criminalizes sexual harassment (soliciting by person in authority) and imposes a punishment of not less than 15 years for persons found guilty of it. Section 13(1), criminalizes harassment, which includes instances of uneven power relations where people in authority may use their positions of authority to procure sex especially from women and girls who may not be able to resist it. Sexual harassment is punishable by a term of imprisonment not exceeding 3 years or a fine of not exceeding 10,000,000 (ten million old Leones or 10, 000 ten thousand new Leones.)

*Relevance to the project*: Sexual harassment in the place of work is prevalent in Sierra Leone so the EPC contractors will implement the GBV Prevention and Response Action Plan.

###### 2.1.15. The Domestic Violence Act 2007

This Act criminalizes constant unwelcome communication of a person in or near a building where the harassed person resides, works, or carries on business. It is important that every employee knows about it. The need for a code of conduct for the contractor and for employees is necessary. It also provides that victims of domestic violence are entitled to free health care services and requires the government to establish safe homes for such victims.

*Relevance to the project*: The EPC contractors will take note of provisions of this legislation especially during the project's construction phase. Contractors will consider the location of dwelling units for workers and contractors will prepare and implement labour management plan as part of their C-ESMP.

**2.1.16. The Gender Equality and Women’s Empowerment Act 2022**

This Act seeks to promote gender equality, providing equal opportunities for all employees, regardless of gender. The law essentially provides for the promotion of gender equality in employment and training, the implementation of gender mainstreaming and budgeting, and for financial institutions to prescribe procedures for improving women’s access to finance and other related matters.

*Relevance to the Project*: Contractors must prepare and implement a labour management plan as part of their C-ESMP.

#### 2.2. National Policy Framework

##### 2.2.1. The Energy Efficiency Policy of Sierra Leone 2016

As defined in the energy policy document, the main policy target for electricity is to sustainably produce adequate energy supplies to meet the development aspirations of Sierra Leone and sustainably provide environmentally friendly electricity at affordable prices throughout the country.

The Energy Efficiency Policy document has policy statements on financing; legal and regulatory; awareness raising; capacity building; institutional support and coordination; research and development; gender; participation of development partners and NGOs; Bilateral regional and institutional cooperation. This policy is expected to boost access to energy services and ensure the sustainable growth of the energy mix in the country.

*Relevance to the project*: This policy expresses GoSL's intention and drive towards increasing the energy mix and access and creating an opportunity for women and girls to participate in this sector.

##### 2.2.2. Renewable Energy Policy of Sierra Leone 2016

Sierra Leone recognizes that the emissions of greenhouse gases, such as carbon dioxide, from using fossil fuels and petroleum products, have led to increasing concerns worldwide. The Renewable Policy aims to set out Government principles, objectives and strategies for renewable energy. It further commits Government to many enabling actions, to ensure that renewable energy becomes a significant part of its energy portfolio. This policy document covers hydro power, solar, wind and biomass.

The Renewable energy Policy document has policy statements on financing; legal instruments; technology development awareness raising; capacity building and education; environmental concerns; research and development; gender children and energy; participation of development partners and NGOs; Bilateral regional and institutional cooperation. The document also has policy options on solar, hydro, bioenergy, and wind.

*Relevance to the project*: Solar PV and BESS form part of the Solar energy architecture to produce renewable energy.

##### 2.2.3. The National Lands Policy, 2015

This policy aims to enhance Sierra Leone's land management and administration systems, utilizing planning, regulations, and adjudication for both citizens and investors. The policy addresses outdated Acts, such as the Provinces Land Act (1927), Concessions Act (1931), Non-Citizens (Interest-in-Land) Act (1966), State Lands Act (1960), Unoccupied Lands (Ascertainment of Title) Act (Cap 117), Survey Act (Cap 128), Registration of Instrument Act (Cap 256), and Foreshores Act (Cap 149).

Key policy statements include vesting sovereign title to government/state lands in the GoSL through the National Lands Commission. For private lands, the policy outlines different arrangements based on tenure: freehold tenure in the Western Area, communal lands in the provinces under the new Chiefdom Lands Committee, family lands under family tenure, and customary tenure lands in the provinces under Chiefdom Lands Committee/Village Area Lands Committee or the family with grantor's residuary rights. These principles guide land and compensation issues crucial for the project.

*Relevance to the project*: Land is a critical and precious natural asset with many social and economic benefits.

The policy differentiates land ownership types.

##### 2.2.4. The National Environmental Policy (2013)

The National Environmental Action Plan (NEAP) was an outcome of the 1992 Rio Declaration on Environment and Development after endorsement by the GoSL. The NEAP recommended a set of actions that were to be taken to redress environmental degradation and facilitate the sustainable utilisation of natural resources. One of the NEAP recommendations was to develop a National Environmental Policy. The National Environmental Policy was initially developed in 1994.

The National Environmental Policy of 2013 aims to achieve sustainable development in Sierra Leone by implementing effective environmental management systems. The key objective is to secure a quality environment for all Sierra Leoneans, ensuring health and well-being.

The policy emphasizes intersectoral synergies, considering major sector goals for environmental sustainability. Sectoral policies within the National Environmental Policy cover areas such as land tenure, water resources, forestry, biodiversity, air quality, sanitation, toxic substances, mining, coastal resources, occupational health, energy, settlements, public participation, quality of life, gender issues, and institutional and legal arrangements.

*Relevance to the project*: The construction and operation of transmission lines, PV and BESS will involve the use of land, changing the state of the land, impacts on lives and livelihoods and so on. Therefore, policy statements on land tenure, water resources management, biodiversity and cultural heritage, quality of life, gender issues and the Environment are key to this Project.

##### 2.2.5. National Biodiversity Strategy and Action Plan

The National Biodiversity Strategy and Action Plan (NBSAP) comprises a series of measures and mechanisms intended to conserve and promote the sustainable use of the different components of the country's biodiversity. The action plan covers Sierra Leone's key systems, namely: (i) Forests; (ii) Montane Ecosystems; (iii) Savannah; (iv) Agricultural Biodiversity; (v) Wetlands/swamp areas and Freshwater; (vi) Coastal and Marine.

The thematic areas considered in the development of the NBSAP 2017-2026 are consistent with the Convention on Biodiversity (CBD) themes, strategic goals and targets, which are global and correlate with the state of biodiversity conservation in Sierra Leone. The following are the National Strategic objectives as per the recent 2017 plan:

1. The country's biodiversity is well protected by its national legislation and policy implementation across all sectors.
2. Workable methods and mechanisms to conserve threatened and rare species.
3. Workable and robust actions to significantly conserve species, habitats, sites and ecosystems in and outside protected areas.
4. Improvement of the lives and livelihoods of local communities, their living standards, ecosystem services and opportunities provided through sustainable and inclusive biodiversity conservation actions.
5. improvement in awareness raising, inclusive public involvement, capacity building and result-oriented execution of conservation programs.

*Relevance to the project*: The project will protect the swamp areas around the project site.

##### 2.2.6. The National Climate Change Policy 2021

The Climate Change Policy aligns with international agreements and Sierra Leone's development plans and priorities, focusing on eight key areas: adaptation, mitigation, loss and damage, capacity building, education, training, and awareness, research and technology development, transfer and systematic observation, climate change financing, gender equality, and cross-cutting issues.

Sierra Leone, dedicated to the Paris Agreement, has outlined specific goals in its Nationally Determined Contributions (NDCs), focusing on reducing greenhouse gas emissions and enhancing resilience to climate change. Updated in July 2021, the NDCs target sequential reductions in CO2 emissions: 5% by 2025, 10% by 2030, and 25% by 2050. The strategy involves interventions in priority sectors, REDD+, and technology transfer through private-sector partnerships.

In the energy sector, Sierra Leone aims to reduce emissions through renewable energy technologies, including PV and BESS, and improve energy source efficiency. This commitment demonstrates Sierra Leone's dedication to global sustainability and climate resilience, emphasizing its responsibility to safeguard the planet for future generations.

*Relevance to the Project*: Energy generation through PV and BESS will reduce greenhouse gases, since heavy fuel oil generators will not be used in this Project.

##### 2.2.7. National Local Content Policy (2013)

The National Local Content Policy presents an opportunity for local/indigenous businesses to maximize benefits from the increasing private investments in the country. The policy brings together the provisions in related policies and laws promoting local content, such as the Business Start-up Act (Amended 2007) and the National Public Procurement Act etc.

“The policy promotes the growth of the private sector by creating linkages with foreign direct investments through increased use of Sierra Leonean local content. Specifically, the policy gives measures to promote the use of local sourced goods and services, to promote domestic small and medium enterprises through targeted private and government procurement, to encourage employment and training of Sierra Leoneans at various managerial levels, and to facilitate transfer of knowledge and skills from large foreign and domestic investors to local small and medium enterprises” (Local Content Policy, 2013, p.9).

However, the challenges affecting the private sector, especially the small-scale enterprises (SMEs), such as the lack of affordable financing and adequate skills, will require long-term planning and prioritization by the government to ensure effective implementation of the policy.

*Relevance to the project*: Residents expect to be contracted for jobs and for the supply of local materials like stones, sand, sticks, timbers etc., for the construction of the PV, BESS and transmission lines. Therefore, EPC contractors will take note of this policy that employable residents will be their first choice for any employment. Also, local businesses and contractors will be given first refusal opportunity to supply local materials or other products they can execute.

##### 2.2.8. Land Ownership Structure

In Sierra Leone, the land is categorized as state land, private land, or communal land. The main statutory law governing the acquisition of land in the provinces is the Provinces Land Act of 1927, Cap 122, alongside customary law. Under customary law, at least three different types of land tenure arrangements are recognized – family tenure, communal tenure, and individual tenure. According to Renner-Thomas, 2010, family tenure is the most widespread.

Customary land tenure systems are not uniform across the country and vary from one ethnic group to the other. However, in customary law, the land is vested in tribal authorities, which include Paramount Chiefs and their Chiefdom Councillors, who serve as custodians of the land. It is considered that land in the provinces is held by ancestors, living community members, and unborn family members (Williams, 2006). The management and preservation of the land is in the hands of the current generation, who does so in the interest of the ancestors and future generations. Much of the land has been individualized in the names of lineages, families, and individuals (Unruh and Turay 2006; Dale 2008).

Most chieftaincy land is held by extended families. Families have rights of access, use, and transfer by lease. In some areas, people from outside the chiefdom (known as “strangers”), are not allowed to exclusively own land. They lease land from landowning families, and they (“strangers”) pay a nominal amount of the crop yield to the family. Rights to sell chieftaincy land are generally limited to sales within the family or community. Some chieftaincy land is retained as communal land for community use (Williams, 2006; Unruh and Turay 2006; Dale 2008). Chieftaincy land under customary tenure can be obtained by purchase (citizens only) or lease. Private and chieftaincy land that has been individualized into family holdings can be transferred by inheritance. Land transfers of family holdings of chieftaincy land are subject to the approval of all family members and the paramount chief. Chiefs may lease communal land that has not been individualized as a family or individual holding (Unruh and Turay 2006). Land in Sierra Leone can be compulsorily acquired by the government - the 1991 Constitution of Sierra Leone provides that no property shall be taken except where “necessary in the interests of defence, public safety, public order, public morality, public health, town and country planning,” and for “promotion of public benefit or public welfare.” Under such circumstances, there must be “prompt payment of adequate compensation.

In some parts of Sierra Leone, the patrilineal system is still followed, meaning that land ownership and inheritance are traced through the family's male line. In such cases, unless a woman's father is part of a landowning family, any children she bears cannot inherit land from that family. In this scenario, the mother only has an interest in the land, and her children must seek entitlement to land from their father's community or family. If the father is not entitled to land rights in his own community or family, the children will be landless.

The 2022 Customary Land Rights Act attempts to address gender disparities in land ownership in Sierra Leone. The Act seeks to recognize and protect the land rights of women and other marginalized groups. Various NGOs and grassroots organizations are also working to educate communities and empower women to assert their land rights.

#### 2.3. Relevant Permits

The below Table outlines the pertinent permits and licenses essential for the contractor to acquire during the entirety of the project implementation, in adherence to the prevailing country legislation. **Table 2-1: Relevant Permits**

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Licenses/Permits** | **Responsibility** | **Institution** |
| - | EIA License | EDSA/PIU | Environmental Protection Agency |
| - | Building permit: to ensure the construction is in compliance with local building codes and regulations. | EDSA/PIU | The Ministry of Lands Housing and Country Planning. |
| - | Civil Works Contractor’s License: This license ensures that contractors meet certain qualifications and standards set by the government. | EDSA/PIU | Ministry of Works and Public  Assets. |
| - | Water usage and permit - licensing and permitting for groundwater use. | EDSA/PIU &  Contractor[[1]](#footnote-1) | National Water Resources Management Agency. |
| - | Right of Way (RoW) permit: Use of the RoW for erecting the 33/11kV transmission line infrastructure. | EDSA/PIU | Sierra Leone Road Authority. |

|  |  |  |  |
| --- | --- | --- | --- |
| - | Tax Identification number for applicable tax regime (custom tax; Pay as You Earn tax PAYE; Goods and Services Tax GST; Withholding tax; etc.). | Contractor | National Revenue Authority. |
| - | National Social Security and Insurance Trust (NASSIT) clearance. (Payment of Social Security for national workers). | Contractor | National Social security and insurance trust (NASSIT). |
| - | Work Permit – Foreign workers working in Sierra Leone. | Contractor | Sierra Leone Immigration  Department. |

#### 2.4. International Environmental and Social Instruments/Obligations for Sierra Leone

Sierra Leone is a party to various regional and international Policies, treaties and agreements that create international Energy and the Environment obligations. These policies, treaties and agreements include the following:

##### ECOWAS Energy Efficiency Policies (EEEP)

This ECOWAS Energy Efficiency Policy was adopted on 17 and 18 July 2013. This policy will contribute to creating a favourable environment for private investments in energy efficiency and will spur industrial development and employment through reduction of energy bills. Energy efficiency will contribute to job creation, both in energy using sectors, and in the energy efficiency supply chain. Increasing energy efficiency is an integral part of the modernisation and greening of the West African economies. Sierra Leone is part of ECOWAS thus the policy applies.

##### The Africa Renewable Energy Initiative (AREI)

The Africa Renewable Energy Initiative is a visionary and continent-wide endeavour aimed at accelerating the adoption of renewable energy throughout Africa. Launched during the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris in 2015, this initiative is dedicated to addressing energy poverty, climate change, and sustainable development challenges in Africa. Here are key highlights of the Africa Renewable Energy Initiative:

1. Ambitious Renewable Energy Goals: AREI's primary objective is to add 300 gigawatts (GW) of renewable energy capacity to Africa's energy mix by 2030. This ambitious target aims to significantly boost the contribution of renewable energy to the continent's overall energy generation, while concurrently curbing greenhouse gas emissions.
2. Renewable Energy Access: AREI places special emphasis on extending energy access across Africa, especially to rural and underserved regions. By promoting renewable energy projects, the initiative seeks to bring modern and reliable electricity to millions of people who currently lack access to such services.
3. Climate Change Mitigation: As part of global climate change mitigation efforts, AREI actively contributes to reducing Africa's carbon footprint by transitioning away from fossil fuels and adopting clean and sustainable renewable energy sources. This aligns with the objectives of the Paris Agreement to limit global warming and combat climate change impacts.
4. Investment and Financing: AREI is focused on mobilizing public and private sector investment and financing to support renewable energy projects across Africa. By attracting investments from international donors, financial institutions, and private companies, the initiative seeks to fund and propel renewable energy initiatives on the continent.
5. Pan-African Collaboration: AREI promotes collaboration among African countries, regional organizations, and development partners to pool resources and expertise in advancing renewable energy projects. By fostering cooperation, AREI aims to overcome shared challenges and facilitate the exchange of best practices in renewable energy development.
6. Gender Equality and Social Inclusion: AREI prioritizes gender equality and social inclusion within its projects, ensuring that women and marginalized groups benefit from renewable energy initiatives. The initiative recognizes the significance of social equity and empowerment, striving to provide sustainable energy access to all segments of society.
7. Renewable Energy Technologies: AREI supports a diverse range of renewable energy technologies, including solar, wind, hydro, geothermal, and biomass. By promoting a varied portfolio of renewable sources, the initiative aims to harness Africa's abundant renewable energy potential.
8. Capacity Building and Knowledge Sharing: AREI is committed to building local capacity and expertise in renewable energy development through training and knowledge-sharing initiatives. By empowering African countries with essential skills and know-how, the initiative fosters long-term sustainability and self-reliance in the renewable energy sector.

AREI represents a transformative approach to renewable energy development in Africa, bringing together stakeholders to create a sustainable and prosperous energy future for the continent. The initiative underscores the vital role of renewable energy in driving economic growth, safeguarding the environment, and fostering social progress throughout Africa.

##### Sustainable Development Goal 7

Sustainable Development Goal 7 (SDG 7) focuses on ensuring universal access to affordable, reliable, sustainable, and modern energy. In the context of solar projects, SDG 7 highlights specific areas where solar energy plays a significant role in achieving this goal. Incorporating solar projects in energy plans and policies enables countries to make substantial progress in achieving SDG 7, while also contributing to broader sustainable development objectives and fostering a greener and more inclusive future. Here are the key highlights of SDG 7 for the project:

1. Promoting Renewable Energy: SDG 7 emphasizes the promotion of renewable energy sources, including solar energy. By harnessing the sun's energy to generate electricity in an environmentally friendly and sustainable manner, solar projects contribute significantly to this goal.
2. Clean and Sustainable Energy: Solar energy is clean and emits minimal greenhouse gases, making it an essential component of sustainable energy development. Investing in solar projects allows countries to reduce their carbon footprint and contribute to global efforts in combating climate change.
3. Energy Efficiency and Storage Integration: Solar projects integrate energy efficiency measures and energy storage technologies, optimizing energy use and ensuring power availability during periods of low sunlight. This contributes to a reliable and efficient energy supply.
4. Rural Electrification: The project plays a vital role in rural electrification efforts, bridging the energy gap in rural communities and creating opportunities for economic growth, education, and improved healthcare.
5. Sustainable Development Synergy: Solar projects align with multiple SDGs beyond Goal 7. By providing clean energy, they support Goal 13 (Climate Action), Goal 11 (Sustainable Cities and Communities), and Goal 12 (Responsible Consumption and Production), among others.
6. Job Creation and Economic Development: Solar projects create employment opportunities in manufacturing, installation, maintenance, and related sectors. Additionally, the growth of the solar industry contributes to economic development and builds local capacity.

##### United Nations Framework Convention on Climate Change (UNFCCC)

The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty drafted at the United Nations Conference on Environment and Development (UNCED), otherwise known as the Earth Summit, held in Rio de Janeiro from 3 to 14 June 1992. The objective of the treaty is to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

The UNFCCC was opened for signature on 9 May 1992, after an Intergovernmental Negotiating Committee produced the text of the Framework Convention as a report following its meeting in New York from 30 April to 9 May 1992. It came into force on 21st March 1994.

The Kyoto Protocol is the protocol to the United Nations Framework Convention on Climate Change (UNFCCC or FCCC) aimed at fighting global warming. The UNFCCC is an international environmental treaty whose goal is to ensure the “stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” The Protocol was initially adopted on 11 December 1997 in Kyoto, Japan, and entered into force on 16 February 2005. As of November 2009, 187 States had signed and ratified the protocol.

##### The Montreal Protocol

The Montreal Protocol on Substances that Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer) is an international treaty designed to protect the ozone layer by phasing out the production of a number of substances believed to be responsible for ozone depletion.

As a signatory to this convention in 1995, Sierra Leone gathers and share information on greenhouse gas emissions. No greenhouse gases, sulphur dioxide, or nitrogen oxides are emitted by PV panels or concentrating mirrors. Air emissions are only expected during the construction phase of the Project. An Environmental Monitoring Plan includes air emission for the proposed project operations.

##### The International Labour Organization (ILO), 1919

Is a specialized agency of the United Nations that was established in 1919. The ILO's mission is to promote social justice and promote decent working conditions for all. There are currently 190 ILO conventions covering a wide range of labour issues, including forced labour, child labour, freedom of association, collective bargaining, equal pay, occupational safety and health, and social security. Sierra Leone has been a member of the ILO since 1961 and has ratified 48 conventions including the 10 fundamental conventions, 2 Governance Convention and 33 technical Conventions. The following are the 10 fundamental conventions:

1. Forced Labour convention,1930.
2. Freedom of Association and Protection of the Right to Organize Convention, 1948.
3. Right to organize and collective bargaining convention, 1949.
4. Equal Remuneration Convention, 1951.
5. Abolition of Forced Labour Convention, 1957.
6. Discrimination (Employment and Occupation) Convention, 1958.
7. Minimum Age Convention 1973.
8. occupational Safety and Health Convention, 1981.
9. Worst forms of child Labour convention 1999.
10. Promotional framework for occupational safety and health convention, 2006.

***The EPC contractor will take note of these conventions and adopt it in the C-ESMP.***

##### International Labour Organisation Ordinance No148

This Convention set up in 1995 to establish the principle of national action on the improvement of working conditions. Sierra Leone became signatory to this convention in 1961. Participating parties may accept the obligations of this convention separately in respect of air pollution, noise, and vibration. Measures instituted to occupational hazards associated with these impacts, shall be prescribed by national laws and regulations as outlined in the Factories Act of 1974.

The Project will recognize that the safety and security of its employees and the communities in which it operates are an integral part of its operations. It sets up an environment in which people believe it is possible to work injury free, regardless of what role they perform. As part of its Environmental and Social Management Plan, an Occupational Health & Safety Plan (OHSP) will be prepared, aiming at:

1. Defining and communicating the principles, practices and expectations of Health & Safety objectives of the project.
2. Setting out how the project is designed to manage and reduce risks associated with both routine activities and unplanned events.
3. Defining the criteria against which Health & Safety performance will be judged.
4. Describing areas of Health & Safety responsibilities for the Project team, including contractors.
5. Describing the Standard Operating Procedures (SOPs) that will ensure that Health & Safety activities are organized, managed and reported in a systematic and consistent manner; and
6. Providing education and training for staff at the company’s operations in health and safety issues.

##### The Stockholm Convention on Persistent Organic Pollutants

This is an international environmental treaty that aims to eliminate or restrict the production and use of persistent organic pollutants (POPs). Negotiations for the Convention were completed on 23 May 2001 in Stockholm. The convention came into force on 17 May 2004 with ratification by an initial 128 parties and 151 signatories. Co-signatories agree to outlaw nine of the dozen dirty chemicals, limit the use of DDT and curtail inadvertent production of dioxins and furans.

##### African Convention on Nature and Natural Resources

The African Convention on the Conservation of Nature and Natural Resources (known also as Algiers Convention) is a continent-wide agreement signed in 1968 in Algiers but has now been superseded by the African Convention on Conservation of Nature and Natural Resources (revised) signed in Maputo in 2003. Its objective is to encourage conservation, utilisation and development of soil, water, flora, and fauna for the present and future welfare of mankind, from an economic, nutritional, scientific, educational, cultural, and aesthetic point of view. Member states to the agreement undertake to adopt the measures necessary to ensure the conservation, utilisation and development of soil, water, floral and faunal resources in accordance with scientific principles and with due regard to the best interests of the people.

##### The African Charter on Human and Peoples' Rights (ACHPR) from 1981 to 1986

ACHPR, also known as the Banjul Charter. This charter was adopted by the Organization of African Unity (OAU) in 1981 and entered into force in 1986. It outlines the fundamental human rights that must be respected and protected by African governments, including civil and political rights, economic, social, and cultural rights, and the right to development. Sierra Leone ratified the ACHPR, and its human rights policies and practices are monitored by the African Commission on Human and Peoples’ Rights, which reviews the State’s reports concerning its human rights situation and decides on complaints of alleged violations. Sierra Leone has not accepted the jurisdiction of the African Court on Human and Peoples’ Rights to hear complaints presented by the Commission, African intergovernmental organizations, and States parties to the African Charter.

**Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa, 2003.**

This is an international treaty that was adopted by the African Union in 2003 to promote and protect the rights of women in Africa. This treaty builds on the provisions of the ACHPR, and specifically focuses on the rights of women. The following are some of the key provisions of the Protocol:

1. Elimination of discrimination against women which includes all forms of discrimination against women, including areas of education, employment, and access to justice.
2. Prevention of violence against women which involves the prevention and punishment of all forms of violence against women, including domestic violence, rape, and female genital mutilation.
3. Protection of women in armed conflicts by ensuring their safety, holding perpetrators of sexual violence accountable etc.
4. Promotion of women's rights in health which include access to healthcare services, including reproductive healthcare, and prevention of HIV/AIDS.
5. Promotion of women's rights in politics and decision-making.
6. Protection of the rights of widows from discrimination and violence.

Sierra Leone has ratified the protocol which has played an important role in promoting and protecting women's rights as in the recent enactment of The Gender Equality and Women’s Empowerment Act (GEWE) 2022. This Act enshrines improvements to women’s access to finance, employment opportunities, equal pay, maternity leave, and political representation. GEWE 2022 establishes a 30 percent quota for women’s participation in government for both appointed positions, including cabinet, ministry, and ambassador roles, and elected positions, such as parliamentary and local council seats.

###### The African Charter on the Rights and Welfare of the Child (ACERWC), 1990

ACERWC is a regional human rights treaty that was adopted by the African Union (AU). It sets out the rights and responsibilities of children in Africa and establishes the legal framework for their protection and welfare.

The Charter defines a child as any person below the age of 18 years and recognizes that every child has the right to life, education, protection from harmful cultural practices, and access to healthcare, among other rights. It requires states to take measures to protect children from abuse, neglect, and exploitation, and to provide support and care for children who need special protection. Sierra Leone is a member and ratified ACERWC in 2002.

###### United Nations Convention on the Rights of the Child, 1989

This convention is the most widely ratified human rights treaty in history and has helped transform children’s lives to making sure every child, has every right. Sierra Leone ratified the United Nations convention on the right of a child in 1991. This convention has the following protocols:

1. optional protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict signed and ratified by Sierra Leone on 8th September 2000 and 15th May 2002.
2. optional protocol to the Convention on the Rights of the Child on the sale of children child prostitution and child pornography signed and ratified by Sierra Leone on 8th September 2000 and 7th September 2001.

This convention and protocols have help in the enactment of The Childs Right Act, 2007 by the Sierra Leone parliament though not all legal provisions made it to the Act. Other international and regional instruments on child protection are: ***The Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment; and the African Charter on the Rights and Welfare of the Child***.

###### Convention on the Rights of Persons with Disabilities (CRPD)

This convention and its Optional Protocol were adopted on 13 December 2006. Sierra Leone Signed the Convention and its operational protocol on the 30 Mar 2007. The protocol has not been ratified except the convention which has been ratified on 4th Oct 2010.

###### Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) 1979

The spirit of this convention is rooted in the goals of the UN to reaffirm faith in fundamental human rights, dignity and worth of the human person. This convention reaffirms equal rights of men and women as its spells out the meaning of equality and how it can be achieved. Article 2 of the convention obliges States to take all appropriate measures, including legislation, to modify or abolish existing laws, regulations, customs, and practices, which constitute discrimination against women. Sierra Leone is a signatory to CEDAW.

Sierra Leone is also a signatory to key regional instruments such as the Protocol to the African Charter on Human and People’s Rights on the Rights of Women in Africa (Maputo Protocol) 2003; the African Union Declaration on Gender Equality and Development; and the Economic Community of West Africa (ECOWAS) Protocols on Women and Development. However, by no means have all legal protections in all the conventions protocol and agreements yet been enacted into Sierra Leone law books.

###### International Covenant on Economic, Social and Cultural Right

This instrument is poised to the ideals of freedom from fear and wants which can only be achieved if conditions are created whereby everyone may enjoy his economic, social and cultural rights, as well as his civil and political rights. Sierra Leone is a signatory to this convention and was ratified by Sierra Leone on 23 August 1966.

#### 2.5. International Conventions Ratified or Accepted by the GoSL

The following pertains to international conventions that have been ratified or accepted by the Government of Sierra Leone (GoSL)

# Table 2-2: List of International Conventions ratified by the GOSL.

|  |  |  |
| --- | --- | --- |
| **No** | **Convention/Policy/Protocol** | **Status** |
| 1 | ECOWAS Energy Efficiency Policies (EEEP) | Adopted on 17 and 18 July 2013 |
| 2 | The Convention on Biological Diversity (CBD) | Ratified in 1996 |
| 3 | Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) | Ratified on 28th October 1994, and it entered into force on 26th January 1995. |
| 4 | United Nations Framework Convention on Climate Change (UNFCCC) | Signed and ratified in June 1995 |
| 5 | The Kyoto Protocol | Ratified in June 2005 |
| 6 | The Montreal Protocol on Substances that Deplete the Ozone Layer | Ratified in 2001 |
| 7 | Forced Labour Convention,1930 | In force 13 June 1961 |
| 8 | Freedom of Association and Protection of the Right to Organize  Convention, 1948 | In force 15 June 1961 |
| 9 | Right to Organize and Collective Bargaining Convention, 1949 | In force 13 June 1961 |
| 10 | Equal Remuneration Convention, 1951 | In Force 15 Nov 1968 |
| 11 | Abolition of Forced Labour Convention, 1957 | In force 15 Nov 1968 |
| 12 | Discrimination (Employment and Occupation) Convention, 1958 | In force 14 Oct 1966 |
| 13 | Minimum Age Convention 1973; (Minimum age specified by 15 years) | In force 10 June 2011 |
| 14 | Occupational Safety and Health Convention, 1981 | In force 25 Aug 2021 |
| 15 | Worst forms of Child Labour convention 1999 | In force 10 June 2011 |
| 16 | Promotional framework for occupational safety and health convention,  2006 | In force 25 Aug 2021 |
| 17 | The Stockholm Convention on Persistent Organic Pollutants | Signed and ratified in 2003 |
| 18 | The African Convention on the Conservation of Nature and Natural  Resources | Signed in 2003 |
| 19 | The African Charter on Human and Peoples' Rights (ACHPR) | Ratified 21 September 1986 |
| 20 | Protocol to the African Charter on Human and Peoples' Rights on the  Rights of Women in Africa, 2003 | Ratified 30 October 2015 |
| 21 | United Nations Convention on the Rights of the Child, 1989 | Ratified in 1991 |
| 22 | Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict | Ratified on 15th May 2002 |
| 23 | Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography | Ratified on 7th September 2001 |
| 24 | The Convention Against Torture and other Cruel, Inhuman or Degrading  Treatment or Punishment | Ratified on 25th April 2001 |
| 25 | The African Charter on the Rights and Welfare of the Child. | Ratified in 2002 |
| 26 | Convention on the Rights of Persons with Disabilities (CRPD) | Ratified on 4th October 2010 |
| 27 | Convention on the Elimination of All Forms of Discrimination Against  Women (CEDAW) 1979 | Ratified 11th Nov 1988 |
| 28 | The African Union Declaration on Gender Equality and Development | Ratified on 11th November 1988 |

#### 2.6. International Lending Institutions' Policies, Standards and Guidelines

The following applies to the Project.

##### 2.6.1. World Bank (WB) Guidelines: Environmental, Health, and Safety Guidelines, General EHS Guidelines, 2007

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of good international industry practice. These general EHS guidelines are designed to be used together with the relevant Industry Sector EHS guidelines, which guide users on EHS issues in specific industry sectors.

The following EHS guidelines are applicable to the project.

1. EHS Guidelines - Environmental
   1. Air Emissions and Ambient Air Quality
   2. Wastewater and Ambient Water Quality
   3. Water conservation
   4. Hazardous Materials Management
   5. Waste Management
   6. Noise
   7. Contaminated Land
2. EHS Guidelines - Occupational Health and Safety
   1. General Facility Design and Operation
   2. Communication and Training
   3. Physical Hazards
   4. Chemical Hazards
   5. Personal Protective Equipment (PPE)
   6. Monitoring
3. EHS Guidelines – Community Health and Safety
   1. Water Quality and Availability
   2. Structural Safety of Project Infrastructure
   3. Life and Fire Safety (L&FS)
   4. Traffic Safety
   5. Transport of Hazardous Materials
   6. Disease Prevention
   7. Emergency Preparedness and Response
4. EHS Guidelines - Construction and Decommissioning
   1. Environment
   2. Occupational Health & Safety
   3. Community Health & Safety

##### 2.6.2. World Bank Environmental, Health, And Safety Guidelines for Electric Power Transmission and Distribution

The EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas.

Some of the followings are addressed in the EHS Guidelines: ·

1. Construction site waste generation; ·
2. Terrestrial Habitat Alteration
3. Construction of Right-of-Way
4. Avian and Bat Collisions and Electrocutions

##### 2.6.3. World Bank Environmental and Social Standards (ESS)

The ESSs are technical reference documents that form part of the World Bank’s 2016 Environmental and Social Framework (ESF) that guide the proponent on their application with general and industry-specific examples of Good International Industry Practice (GIIP).

As discussed in the previous sections, RESPITE will apply eight of the ten Environmental and Social Standards (ESS) with the exception of ESS7 and ESS9. The Environment and Social Standard (ESS) 1 of the World Bank Environment and Social Framework requires the Borrower to carry out an environmental and social assessment (ESA) of the project to assess the environmental and social risks and impacts of the project throughout the project life cycle.

In addition to the ESS guidelines, the Project will follow the recommendation of the Good Practice Note for addressing SEA/SH in Investment Project Financing involving Major Civil Works.3

Where Sierra Leone regulations differ from the measures presented in the ESS Guidelines, the project will be expected to apply whichever is more stringent, and for this case, the ESS guidelines. In short, the ESS guidelines will be used in conjunction with applicable Sierra Leonean laws such as the Factories Act, 1974 and the Public Health Ordinance Act, 1960 and Public Health Act, 2004. Table 2-3 presents summaries of the relevant standards and how they will be addressed in the Project.

3 [https://thedocs.worldbank.org/en/doc/6f3d9ddc6010c4221315dd1282958e41-0290032022/original/SEA-SH-Civil-](https://thedocs.worldbank.org/en/doc/6f3d9ddc6010c4221315dd1282958e41-0290032022/original/SEA-SH-Civil-Works-GPN-Third-Edition-Final-October-12-2022.pdf)

[Works-GPN-Third-Edition-Final-October-12-2022.pdf](https://thedocs.worldbank.org/en/doc/6f3d9ddc6010c4221315dd1282958e41-0290032022/original/SEA-SH-Civil-Works-GPN-Third-Edition-Final-October-12-2022.pdf)

# Table 2-3 Summary of World Bank ESS Relevant to the Project

|  |  |  |
| --- | --- | --- |
| **ESS No.** | **Summary of ESS** | **Implications of the ESS to the RESPITE Project** |
| ESS 1 | Assessment and Management of Environmental and Social Risks and Impacts **ESS1** outlines the Borrower’s responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through Investment Project Financing (IPF), in order to achieve environmental and social outcomes consistent with the Environmental and Social Standards (ESSs)  The objective of environmental and social assessment is to assist in making better decisions so that projects are environmentally sound and sustainable, and proportionate to the risks and impacts of the project. It will inform the project's design and be used to identify mitigation measures and actions to improve decision-making. The Bank classifies the proposed project into one of four categories, depending on the project's type, location, sensitivity, and scale and the nature and magnitude of its potential environmental impacts. | RESPITE project Construction works for Solar PV plant, BESS and its transmission lines will involve some excavation, earth movement and impounding and disruption of ecosystems and loss of livelihood.  Project activities will be screened and assessed for environmental and social (E&S) risks and impacts in accordance with the Environmental and Social Framework (ESF). Based on the screening and assessment results, detailed environmental and social impact assessments (ESIA) will be conducted, as required, based on the nature and scale of the activity and its potential environmental and social risks and impacts. ESMP, C-ESMP, SEP, GM and other E&S instruments will be developed and implemented to address any risks identified during the process. |
| ESS 2 | Labour and Working Conditions.  **ESS2** acknowledges the significance of employment creation and income generation in pursuing poverty reduction and inclusive economic growth. However, the ESS prescribes that the project proponent will promote sound worker-management relationships and enhance the development benefits of the project by treating workers in the project fairly and providing safe healthy working conditions.  The objective of ESS 2 is to promote safety and health at work, promote fair treatment, non-discrimination, and equal opportunity of project workers; | RESPITE Project activities involve civil and engineering works, vehicular movement, as well as the operation of tools and machinery. These activities may expose project-affected persons and local communities to notable risks such as noise and dust pollution, traffic congestion, and vehicular accidents. Risk of labour influx and the behaviour of project workers also create the condition for the exacerbation of sexual exploitation and abuse, gender-based violence, transactional sex and sexually transmitted diseases and HIV/AIDs. Communities may also be exposed to transmission of COVID-19 and other emergency situations. As |

|  |  |  |
| --- | --- | --- |
| **ESS No.** | **Summary of ESS** | **Implications of the ESS to the RESPITE Project** |
|  | prevent the use of all forms of forced labour, child labour, SEA/SH and support the principles of freedom of association; support the principles of freedom of association and collective bargaining of project workers consistent with national laws and means to raise workplace concerns. It also provides project workers with accessible means to raise workplace concerns and to receive resolution. | part of ESIA, a GBV assessment will also be conducted and GBV Action Plan will be prepared in addition, Since the RESPITE Project will use major suppliers, service providers, and contract workers. The ESS mandates that employees' health and working conditions be given high priority in the workplace and that they be treated equally and fairly without discrimination. Additionally, employees are free to form groups and voice any issues at work.  Therefore, the Client is required to adopt and implement the Labour Management Procedures (LMP) as part of the ESIA/ESMP, including provisions on working conditions, management of workers’ relationships, occupational health and safety (including personal protective equipment, and emergency preparedness and response), code of conduct (including relating to SEA and SH), forced labour, child labour, grievance arrangements for Project workers, and applicable requirements for contractors, subcontractors, and supervising firms. Develop and maintain a Project GM, which will be available to Project workers, PIU staff, as described in the LMP and consistent with ESS2. |
| ESS 3 | Resource Efficiency and Pollution Prevention and Management  **ESS3** recognizes that such projects often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services, and the environment at the local and regional levels.  The main objective of this standard is: to promote the sustainable use of resources, including energy, water and raw materials; avoid or minimize adverse | Project activities which include the construction of Solar PV, BESS, and transmission lines, will be associated with significant environmental and social risks and impacts such as disruption of ecosystems and scarce resources, liquid and solid waste could be generated from excavated soil, oils from construction machinery, concrete blocks, metal and glass pieces, etc. There could also be air emissions from heavy vehicles and machinery, |

|  |  |  |
| --- | --- | --- |
| **ESS No.** | **Summary of ESS** | **Implications of the ESS to the RESPITE Project** |
|  | impacts on human health and the environment by avoiding or minimizing pollution from project activities; to avoid or minimize project-related emissions of short and long-lived climate pollutants; to avoid or minimize generation of hazardous and non-hazardous waste; to minimize and manage the risks and impacts associated with pesticide use  The policy also applies to the management of all chemicals that pose a threat to the environment and the Bank supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. | and fugitive dust generated by compaction and construction activities and use of hazardous and non-hazardous chemicals. A framework and minimum requirement for Waste Management Plan for the project is developed under Section 8.4.3 of this ESIA, to manage hazardous, nonhazardous and electronic wastes as part of project ESIA/ESMP and to prevent or minimize pollution from inadequate waste management and disposal from the Solar PV and the power plant sites including disposal of old, damaged or disused PV panes, old batteries, electronic waste (ewaste), and other wastes.  It shall be a requirement for contractors to develop and implement a sitespecific waste management plan (WMP). The plan shall address management of all solid and liquid refuse that result from project activities. The WMP will provide guidelines on waste reduction, segregation, collection and disposal practices in accordance with international best practices, to avoid deterioration of the natural environment and negative impacts on the health and safety of workers and the communities in the project areas. The Project is committed to apply the waste hierarchy and will seek to be a zero-waste discharge facility. This plan is the primary tool to guide employees towards waste management (see Section 8.4.3). |
| ESS 4 | Community Health and Safety | There are health, safety, and security risk and impacts on project-affected communities. |

|  |  |  |
| --- | --- | --- |
| **ESS No.** | **Summary of ESS** | **Implications of the ESS to the RESPITE Project** |
|  | **ESS4** recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. Communities that are already subjected to impacts from climate change may also experience acceleration or intensification of impacts due to project activities. This standard addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their circumstances, may be vulnerable | Specific risks and impacts to the community arising from Project activities include the behaviour of project workers, risks of labour influx, response to emergency situations (e.g., a fire response or natural disaster), exposure to the COVID-19 disease, accidents and pollution, sexual exploitation and abuse, sexual harassment, and include mitigation measures in the ESMPs |
| ESS 5 | Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement:  **ESS 5** acknowledges that project-related land acquisition and land-use limitations can negatively affect communities and individuals. Physical displacement (relocation, loss of residential land, or loss of shelter) or economic displacement (loss of land, assets, or access to assets leading to loss of revenue sources or other means of subsistence) may result from project-related land acquisition or limits on land usage. | Construction of Solar PV, BESS and its transmission lines demand land, and this may involve land acquisition, land use change, restrictions on land use, and economic displacement (loss of land, assets, or access to assets leading to loss of income sources or other means of livelihood). A Resettlement Plan (RP) will be prepared to address these potential impacts. The RAP aims to assess and mitigate any adverse effects on the Project Affected Persons (PAPs) resulting from the project's activities. The RAP outlines a series of measures and actions to minimize or compensate for the losses incurred by the PAPs. It ensures that affected individuals and communities receive appropriate assistance, support, and compensation. |
| ESS 6 | Biodiversity Conservation and Sustainable Management of Living Natural Resources:  **ESS6** recognizes the importance of maintaining the core ecological functions of habitats, including forests, wetlands, and the biodiversity they support. The Bank supports the protection and conservation of biodiversity and sustainably | RESPITE Project activities such as clearing of site, and civil works may pose some biodiversity risks and impacts. However, project activities have been screened, and based on screening results, a Biodiversity Management Plan (BMP) is not required for the proposed project. |
| **ESS No.** | **Summary of ESS** | **Implications of the ESS to the RESPITE Project** |
|  | managing living natural resources as these are fundamental to sustainable development. Requirements related to ecosystem services are set out in ESS1. |  |
| ESS 8 | Cultural Heritage:  **ESS8** recognizes that cultural heritage, in its many manifestations, is important as a source of valuable scientific and historical information, as an economic and social asset for development, and as an integral part of people ‘s cultural identity and practice. The objective of this ESS is to protect cultural heritage from the adverse impacts of project activities; address cultural heritage as an integral part of sustainable development; promote meaningful consultations with stakeholders regarding cultural heritage; and promote the equitable sharing of benefits from the use of cultural heritage | The possibility for disruption of cultural heritage is very low for this project. However, should contractors encounter any, these will be mitigated through measures outlined in a chance find procedure included in this **ESIA/ESMP** (***See plan in the ESMP chapter).*** |
| ESS 10 | Stakeholder Engagement and Information Disclosure:  **ESS 10** recognises that effective stakeholder engagement can improve projects' environmental and social sustainability, enhance project acceptance, and significantly contribute to the design and implementation of a successful project. Stakeholder engagement is a process that takes place at all stages of a project's life cycle. Where adequately designed and implemented, it supports the development of strong, constructive responsive relationships that are important for successfully managing a project's environmental and social risks. | RESPITE Project activities such as land acquisition and other project-related activities require much awareness and collaboration with local authorities (effective stakeholder engagement) throughout the project’s life cycle. Stakeholder Engagement Plan (SEP) for the project has been developed and will be adopted and implemented in accordance with ESCP. |

##### 2.6.4. Comparison of Sierra Leonean Regulations and World Bank’s ESF

# Table 2-4 Comparison of the Sierra Leonean regulations against ESF and provides measures to fill gaps.

|  |  |  |  |
| --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** | **Gap and remarks** |
| **ESS 1: Assessment and Management of Environmental and Social Risks and Impacts** | | |  |
| **World Bank**  **Requirement** | The Bank will require the client to conduct an environmental and social assessment of projects proposed for Bank support in accordance with ESS1 | Projects with environmental risks and impacts are required to obtain an EIA license from EPASL to commence activities. | The national environmental law does not have stringent rules on emerging concepts, such as gender and disability inclusiveness and climate change. Nonetheless, there are isolated instruments, such as the Gender Equality and Women’s Empowerment Act (2023) and climate policy, Action Plan, and the NDC. The project will be implemented in accordance with ESS1 and national laws, policies, and regulations. |
| **Borrower’s E&S**  **Framework** | May use the client’s framework if it can meet the objectives of ESSs. | No provision for alternative requirements except that international standards take precedence if agreements are in place. | The project may not use the client’s framework, but the World Bank ESSs will apply, together with Sierra Leone requirements (if they are not conflicting or weaker). |
| **A. E&S Assessment** | * Conduct E&S assessment, including stakeholder engagement * Apply national framework, ESSs,   EHSGs/GIIP   * Apply mitigation hierarchy * Offset significant residual impacts * Differential measures for vulnerable or disadvantaged people - Consider primary suppliers | * ESIA law has much less emphasis on social conditions and impacts, but other laws partly fill gaps, but with less specificity concerning community impacts * No reference to EHSGs or GIIP, but EPASL does recognize international guidelines and standards | World Bank ESSs will apply, together with Sierra Leone requirements (if they are not conflicting). |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ESS &Topic** |  | **ESF requirements** | **National requirements** | **Gap and remarks** |
|  |  |  | * No equivalent provision for   Biodiversity Management Plan - No equivalent provisions for vulnerable and disadvantaged people   * No coverage of primary suppliers |  |
| **B. ESCP** |  | ESCP for compliance in a specified time | No provision in permits/approvals for delayed compliance. The only applicable condition is that no civil works will commence with an EIA license | The ESCP is a legally binding document between the Bank and the client that strictly applies. |
| **C. project**  **monitoring & Reporting** | | Monitor proportionate to the nature of the project, risks and impacts, and compliance requirements  Reports to World Bank | Quarterly monitoring in place. EIA licenses are issued on an annual basis, and renewal is pending compliance with licensing conditions. | Project monitoring and reporting will be in accordance with the ESCP and project ESMP. Quarterly monitoring by EPASL will complement the project monitoring framework. |
| **D. Stakeholder engagement and information disclosure** | | Engage stakeholders through lifecycle | Generally consistent, including project consultation and  disclosure, but no requirement for project-specific stakeholder engagement plan | The project will implement the Stakeholder Engagement Plan, which will be periodically updated as necessary. |
| **ESS2: Labor and Working Conditions** | | | |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** | **Gap and remarks** |
| **A. Scope of**  **application** | ESS2 applies to workers employed by the client and contractor who work on the project and to contracted workers, primary supply workers | There is a national labour law (for employment), a Factories Inspectorate Act, (which makes provisions for occupational health and safety), and Gender Empowerment Law (2023) which sets a minimum female employment at 30 percent of the workforce.    Requirements apply to employer and employees but do not extend to suppliers | The project will be implemented per ESS2, as it applies to various categories of workers. |
| **B. Working conditions and management of**  **labour relations** | Written labour management procedures  Terms and conditions of employment  Non-discrimination and equal opportunity  Worker’s organizations | Generally consistent with Part iii, iv and Vi of the employment Act of  2023 | The project will be implemented per ESS2, as it applies to various categories of workers. |
| **C. Protecting the workforce** | Prohibits child labour except in very specific and regulated community-based circumstances. Forbids Forced labour. | Minimum employment age is 18, with other limits consistent with ILO, but no work that could “cause health or moral damage” if under  18  - Forced labour prohibited | The project will be implemented in accordance with ESS2, as it applies to various categories of workers.  No one under age 18 will be employed on this project. |

|  |  |  |  |
| --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** | **Gap and remarks** |
| **D. Grievance mechanism (GM)** | A separate workers GRM has to be provided for all direct and contracted workers | No specific requirement for a grievance mechanism for workers | ESS2 will be followed |
| **E. Occupational**  **Health and Safety (OHS)** | Measures relating to occupational health and safety will be applied to the project:   * Apply World Bank Group General and sectorspecific EHS Guidelines * Requirements to protect workers, train workers, document incidents, emergency preparation, addressing issues * Provide safe working environment * Workers allowed to report safety issues and refuse to work under certain circumstances - Provide appropriate facilities (Canteens, toilets, etc.) and ensure accommodations meet needs of workers * All employers to collaborate on applying OSH requirements * Monitor OSH performance | The Factories Act is generally consistent but less detailed. Implementation and enforcement not stringent  - No requirements for accommodations | ESS2 will be followed |
| **F. Contracted**  **workers** | - Reasonable efforts to verify contractors have LMP to meet requirements of ESS2 (except those that apply to the community and  primary supply workers) | Safety requirements apply to all employers, including contractors, but no obligation for developers to verify compliance | ESS2 will be followed |

|  |  |  |  |
| --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** | **Gap and remarks** |
|  | * Procedures for managing and monitoring performance * Access to worker’s GRM |  |  |
| **G. Community**  **workers** | Requirements for working conditions and OHS applied to community labour. | Labour law applies to employers and employees, not volunteers | Community Labor will not be used in this project |
| **H. Primary supply**  **Workers** | Conduct due diligence on the primary supplier’s track record and risk of child labour, forced labour, and safety issues. | - No requirements for due  diligence on primary suppliers | The client will conduct due diligence on the primary supplier’s track record and risk of child labour, forced labour, and safety issues. This will be done during procurement and bidding processes. |
| **ESS3: Resource Efficiency and Pollution Prevention and Management** | | | |
| **Resource Efficiency** | | |  |
| **Scope of application** | Borrowers must apply feasible resource efficiency and pollution prevention measures in accordance with mitigation hierarchy. | There are requirements on pollution prevention, but little on nothing on resource efficiency | Project will be implemented in accordance with ESS3. The sourcing of materials will favour the lowest footprint. Materials will be procured from EIA licensed and certified vendors. |
| **A. Energy use** | Adopt measures in EHSGs if project is  significant energy use | No specific limits. | No significant energy usage. |
| **B. Water use** | Assess water use and impacts on communities and adopt mitigation measures as needed | No direct requirement on water assessment, but EIAs, by design, cover water conservation.  Permits required for water abstraction from streams or wells. | The project will be implemented as per the requirements set out under ESS3. In order to prevent any additional strain on community water sources, the project will implement a borehole for water abstraction. Additionally, the project will incorporate rainwater harvesting and |

|  |  |  |  |
| --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** | **Gap and remarks** |
|  |  |  | collect runoff from solar panel cleaning, which will then be recycled and reused. |
| **C. Raw material use** | Use GIIP to reduce significant resource usage | No direct requirement on resource use, but EIAs, by design, prioritizes sustainable use of resources. | Project will minimize footprint. |
| **Pollution prevention and management** | | |  |
| **General requirements** | * Avoid, minimize, and control release of pollutants, apply the more stringent of EHSGs and national law * Historic pollution and non-degradation requirements | No specific standards have been set. EPA applies standards in the Environmental Regulation for the mining sector to other projects. It also recognizes the WB EHSH  Guidelines. | Any potential pollution/contamination will be minimal.  The project will follow the WB EHSH Guidelines. |
| **A. Management of**  **air pollution** | Requires assessment of potential air emissions and implementation of technically and financially feasible and cost-effective options to minimize emissions | Emissions limits. Project will have only minor emissions. | ESS3 will be followed |
| **B. Management of hazardous and non-hazardous wastes** | * Apply mitigation hierarchy to waste management * National and international conventions for hazardous waste management and movement | * Detailed requirements for hazardous and other wastes - Signatory to international conventions * No requirements to verify haulers/contractors | ESS3 will be followed |

|  |  |  |  |
| --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** | **Gap and remarks** |
|  | - Verify hazardous waste management contractors are licensed and disposal sites operate to meet standards |  |  |
| **C. Management of chemicals and hazardous materials** | - Minimize use of hazardous materials - Avoid use of internationally controlled materials | * Regulations on hazardous   materials   * Signatory to international   Conventions | ESS3 will be followed |
| **D. Management of**  **pesticides** | Not applicable to this project: no pesticides will be used | |  |
| **ESS4: Community Health and Safety** | | |  |
| **Community health and safety** | | |  |
| ▪ **Community health and**  **safety** | * Evaluate risks to the community health and safety and apply mitigation hierarchy and GIIP to reduce risks * Consider third-party safety risks in designing infrastructure and equipment, regarding high risk locations * Ensure the safety of services provided to communities * Identify traffic/road risks, assess risks if needed, consider safety in fleet decisions, take   measures to protect public | General requirements to minimize risk,  no specific requirements for services, ecosystem services, emergencies, etc. | The project will follow ESS4. A traffic management plan in the ESMP has been prepared; an emergency response plan in the ESMP has been prepared to manage potential community health and safety risk.  SEA/SH Prevention and Response Action Plan will be prepared to prevent and address such incidents in the workplace and project communities. |

|  |  |  |  |
| --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** | **Gap and remarks** |
|  | * Assess and avoid impacts on provisioning and regulating ecosystem services as appropriate * Avoid or minimize potential for disease transmission and communication, considering vulnerable groups * Address risks to community of hazardous materials management * Prepare of and respond to emergencies, consider in EIAs, prepare response plans |  |  |
| **B. Security**  **personnel** | * Assess and address risks of security arrangements * Apply principles of proportionality, GIIP, and law * Verify contracted workers are not implicated in past abuses and are trained * Investigate incidents, report unlawful acts to authorities | No specific requirements | Good Practice Note on assessing and managing the risks and Impacts of the Use of Security Personnel will be followed. |
| **ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement** | | | |
| **Applicability** | * Assess need during ESIA process * Applies to permanent and temporary   displacement, listing types of infringements   * Limitations on applicability | - Land can be privately or stateowned | With respect to the Laws of Sierra Leone, Government can acquire any land for the general good of the state pending compensation, including compensation for economic trees and crops in accordance with the Ministry of |

|  |  |  |  |
| --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** | **Gap and remarks** |
|  | * Applies to land users and owners * Recognizes customary land ownership and the impacts of access restrictions on livelihoods | * ownership is shown with a signed survey plan and later a deed at final completion * May be used only as authorized - Legal users may lease land for authorized uses | Agriculture’s rate. The Land Act of 2022 which approved the establishment of the National Development Induced Resettlement Secretariate to provide the guidelines and processes for RP. |
| **A. General** | * Affected people: landowners, users with legal claims, and users with no legal claims * Design project to avoid/minimize Displacement * Provide replacement cost and assistance, disclose standards, offer land-for-land were possible, pay compensation before displacing people were possible. * Engaged with affected communities, including women * Grievance mechanism * Census, cut-off dates, notices; detailed plan and monitoring required; require compensation for customary land ownership and the impacts of access restrictions on livelihoods; require audit if significant displacement | * Only those with legal rights are eligible for replacement land or compensation * Replacement land preferred option * No requirement for assistance - Detailed requirements for committee memberships and actions * Compensation based on established rates for trees or other items lost | Construction of Solar PV, BESS and its transmission lines demands land, and this will involve land acquisition, land use change, restrictions on land use, and economic displacement (loss of land, assets, or access to assets leading to loss of income sources or other means of livelihood). A Resettlement Plan (RP) will be prepared and implemented, prior to commencement of any physical works of the project, to address such potential impacts. The RP aims to assess and mitigate any adverse effects on the Project Affected Persons (PAPs) resulting from the project's activities.  No physical displacement of dwellings is expected. What is envisaged is the loss of crops, business stalls, and temporary access limitations to businesses. ESS5 will be followed, including regarding eligibility and compensation at replacement value will be used. |

|  |  |  |  |
| --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** | **Gap and remarks** |
| **B. Displacement** | * Detailed requirements for physical displacement * Detailed requirements for economic   displacement, including livelihood restoration | * Replacement with equivalent land and houses preferred over compensation * Compensation for lost profits required, but not livelihood restoration | ESS5 will be followed |
| **ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources** | | | |
| **A. General** | * Consider direct, indirect, & cumulative impacts in impact assessment under ESS1 * Characterize baseline conditions * Manage risks with mitigation hierarchy and GIIP, including adaptive management * Differentiated habitats, ESS applies to all, provides for offsets.   -ESS applies to modified habitat with  significant biodiversity value   * Avoid natural habitats unless no feasible alternative; if affected achieve no net loss of biodiversity Critical habitat * Requirements if a project will affect legally protected and international recognized areas of high biodiversity value | Requires protection of  biodiversity but less detailed requirements | Although there are no critical habitats in the area, the study has identified certain impacts on biodiversity due to the project. Subsequent measures have been outlined for mitigation. |

|  |  |  |  |
| --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** | **Gap and remarks** |
|  | * Strict conditions on affecting critical habitats require BMP * No introduction of the spreading of invasive species * Requirements for projects involving primary production and harvesting |  |  |
| **B. Primary suppliers** | Requirements when Borrower purchases natural resource commodities | No equivalent requirements | ESS6 will be followed. |
| **ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities** | | |  |
| **Not relevant to the project** | | |  |
| **ESS8: Cultural Heritage** | | |  |
| **Application** | Covers tangible and intangible (limited) cultural heritage, whether legally protected or not and whether previously identified or not. | * Law covers non-material (language, customs, ceremonies and celebrations, knowledge, and skills, traditional crafts, dancing, music, art, etc.) and material cultural heritage * Some legal limits on weddings, funerals, and other activities | No cultural heritage was identified during the study in the project area. A chance find procedure is incorporated in the ESMP should the EPC contactor find things of cultural heritage during the construction and operation stage of the project |

|  |  |  |  |
| --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** | **Gap and remarks** |
| **A. General** | * Assess and avoid impacts on cultural heritage * Follow chance find procedure if a find is encountered. * Involve experts and national authorities if needed | General requirements to protect cultural heritage and not to disturb sites of interest.  No specific requirement for chance find procedure. | ESS 8 will be followed |
| **B. Stakeholder consultation and identification of cultural heritage** | * Identify and consult with affected and interested stakeholders. * Maintain confidentiality if needed * Allow continued access to   affected sites | No requirement for consultations except with Ministry of Culture representatives must provide access. | ESS8 and ESS10 will be followed |
| **C. Legally protected cultural heritage areas** | Comply with regulations and plans, consult with sponsors | Generally consistent | ESS8 Will be followed |
| **D. Provisions for**  **specific types of cultural heritage** | * Desk-based and expert consultation to identify.   archaeological sites and specify.  protections   * Mitigate impacts on built heritage, preserve physical and visual context of structures - Identify and protect treasured natural features | Less detailed requirements but generally consistent | ESS 8 will be followed |

|  |  |  |  |
| --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** | **Gap and remarks** |
|  | - Identify and protect movable cultural heritage |  |  |
| **E. Commercial use**  **of cultural heritage** | Not relevant for this project | n/a | n/a |
| **ESS9: Financial Intermediaries** | | |  |
| **Not relevant to the project** | | |  |
| **ESS10: Stakeholder Engagement and Information Disclosure** | | |  |
| **Requirements** | * Engage stakeholders throughout project life cycle, determine how they wish to be engaged - Provide stakeholders with information, * Maintain documented record of   Engagements | No consolidated law on stakeholder engagement but The Right to Access Information Act, 2013 provides for the disclosure of information held by public authorities and its agents.  -stakeholders are engage mostly during the conduct of environmental and social tools.  -information are provided at the time of the study and during  disclosure | The PIU has developed SEP for this project guided by ESS10. |
| **1. Engagement during**  **project preparation** | - Identify and analyze stakeholders, including disadvantaged or vulnerable | 1. No requirement to analyse stakeholders 2. No formal plan required 3. Early disclosure required | Stakeholders were consulted during project ESF instruments preparation, response documented, and report will be disclosed with respect to ESS10. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ESS &Topic** | **ESF requirements** | **National requirements** |  | **Gap and remarks** |
|  | * Stakeholder Engagement Plan (SEP) required, with detailed requirements for disclosure, timing of consultations, measures for disadvantaged or vulnerable, etc. * Disclosure of information early to allow consultation on design - Consultation to allow ongoing two-way communication throughout the project life cycle |  |  | The information will also be disclosed before starting implementation of the project activities, during the construction works and throughout project implementation in a manner that is accessible and culturally appropriate; taking into account of any specific needs of groups that may be differentially or disproportionately affected by the project or those with specific information needs (such as, disability, literacy, gender, mobility, etc.). |
| **B. Engagement during project implementation and external reporting** | Engagement and disclosure of information to continue throughout implementation, following Plan | No specific requirement for continuing Engagement | | ESS10 will be followed |
| **C. Grievance mechanism** | * Establish and implement prompt, effective, culturally appropriate, and discreet grievance mechanism * No limit on legal remedies | No specific layout for grievance mechanism other than law enforcement or legal remedy. | | The PIU/EDSA has its Grievance Mechanism, which this project will use which is in line with ESS10 |
| **ESS &Topic** | **ESF requirements** | **National requirements** | | **Gap and remarks** |
| **D. Organizational capacity and commitment** | Define roles & responsibilities, assign personnel to implement stakeholder  engagement activities | No specific requirement for assigning roles and responsibilities | | The PIU/EDSA has developed SEP with defined roles and responsibilities of personnel to implement the plan |

*N.B. In instance of differences between the Sierra Leone regulations and World Bank Environmental and Social Standards, the later will prevail.*

#### 2.7. Institutional Framework

In any project, a dedicated set of institutions assumes responsibility for overseeing the planning, design, and execution of project deliverables. Furthermore, these institutions bear the onus of implementing robust environmental and social measures to pre-emptively address potential risks and impacts linked to the project. This section provides a comprehensive overview of the specific institutions entrusted with the stewardship of this particular project.

##### 2.7.1. The Ministry of Energy (MoE)

The Ministry of Energy is the arm of the Government of Sierra Leone tasked with formulating and implementing energy policies, projects, and programs, as well as providing oversight functions for all subsector agencies (including electricity production, transmission, distribution, and supply) and other forms of energy supply and utilisation, coordinating, and managing all aspects of energy in its various forms in the country. The Ministry has oversight responsibility over EDSA; therefore, all technical and financial matters of the Project will have clearance from the Minister and his technical team.

##### 2.7.2. The Electricity Distribution and Supply Authority (EDSA)

Key functions of EDSA include:

1. responsible for the supply, distribution, and retail sale of electricity for the entire country except in areas in which the commission has issued a distribution license to another appropriately qualified entity.
2. Be responsible for dispatch and system control of electricity within its territory.
3. Establish, as far as practicable, uniform standard voltages throughout its area of supply.
4. Secure the supply of electricity at reasonable prices.
5. Carry on any business usually associated with electricity distribution and supply.
6. Promote and encourage the economical and efficient use of electricity, especially for domestic, commercial, agricultural, industrial, and manufacturing purposes; and
7. Perform any other functions incidental or consequential to its functions under this Act.

EDSA has the mandate to handle transmission and distribution issues as this project involves the construction of transmission lines.

**Table**

**2**

**-**

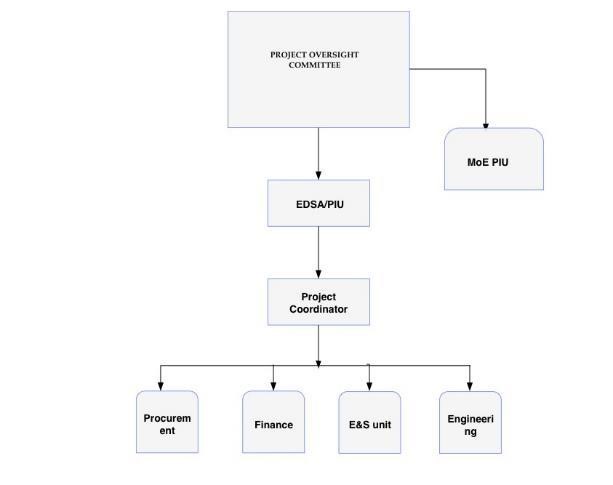
**5**

**:**

**RESPITE EDSA**

**-**

**PIU Organogram**



###### 1. Electricity Generation and Transmission Company

According to the approved power purchase agreement, EGTC generates, transmits, and sells electricity to EDSA. The national transmission system, which connects electricity-producing sources to consumer centres for distribution, is likewise managed by EGTC. Since the major aspect of this project deals with the generation of energy using PV and BESS, EDSA must work together with EGTC on this project.

###### 2. The Electricity and Water Regulatory Commission

Sierra Leone’s Electricity and Water Regulatory Commission was established in 2011. Its main functions are to formulate, implement, monitor quality and compliance, offer tariff guidelines, licenses, and implement regulatory frameworks for Sierra Leone’s safe, secure, cheap, and dependable water and electricity supply.

This commission is important to this project as they are pivotal in electrification tariff determination.

##### 2.7.3. The Ministry of the Environment

The Ministry of the Environment, established in November 2019, is responsible for a range of government policies related to protecting and managing the environment and natural resources. The responsibility for managing and protecting the environment lies with the new Ministry of the Environment, which oversees the Environment Protection Agency, National Protected Areas Authority (NPAA), Nuclear Safety and Radiation in Sierra Leone, and the Standards Bureau. The political head of the Ministry is the Minister and has the superseding mandate to handle all matters as regards the environment.

Before the new Ministry of the Environment was formed, the Department of the Environment (DOE) created the National Environmental Action Plan with World Bank assistance (NEAP). It is divided into two parts. The first volume examines Sierra Leone’s environmental problems and suggests solutions. The environmental proposals are contained in the second volume. There is a National Environmental Policy (NEP) in the works. The NEP’s aims, objectives, and strategies are all geared toward achieving Sierra Leone’s long-term growth through solid environmental management. The Ministry is mandated to perform the following functions:

* Lead on the development and supervision of the legal and policy framework for building national environmental resilience as it relates to climate change, natural resources management, including forestry and wetlands/swamps conservation.
* Provide policy advice to the President and government, take the lead on all aspects of the environment and in particular make recommendations for the protection and management of the environment.
* Formulate and review environmental policies, legislation, and standards to ensure consistency and application of international policies relating to environmental protection to safeguard human health and well-being of people in Sierra Leone
* Develop, coordinate and implement climate change legislation, adaptation and mitigation policies and strategies, programs, and initiatives in the country.
* Develop policies to ban and reduce the abusive use of plastic bags and on the protection and management of environmentally sensitive areas.
* Ensure environmental compliance and enforcement in Sierra Leone through EPA-SL
* Coordinate relations with national and international organizations dealing with environmental issues.
* Collaborate with all relevant Ministries, Departments, and Agencies working on environmental issues.
* Mobilize resources in support of the strengthening environmental resilience.
* Perform any other function assigned to the Ministry by law or decision of the Cabinet of Sierra Leone.

This recently established Ministry has a huge mandate. It supervises the Environment Protection Agency, Nuclear Safety and Radiation Protection Authority, and the Forestry Department. All issues dealing with environmental impact assessment, environmental and social management plans, resettlement planning, and radiation protection have to be cleared by the Minister with the portfolio. Thus, EDSA and the contractors must continue updating the Ministry about the progress the Project is making and the challenges.

##### 2.7.4. Environment Protection Agency – Sierra Leone

The EPA was created to take the place of the National Commission for Environment and Forestry (NaCEF), which was in charge of overseeing forestry and environmental matters. The following are some responsibilities of the Agency under the Act:

* advise the Minister on the formulation of policies on all aspects of the environment and in particular make recommendations for the protection of the environment.
* co-ordinate the activities of bodies concerned with the technical or practical aspects of the environment and serve as a channel of communication between such bodies and the Minister.
* co-ordinate the activities of such bodies as it considers appropriate for controlling the generation, treatment, storage, transportation and disposal of industrial waste.
* issue environmental permits and pollution abatement notices for controlling the volume, types, constituents and effects of waste discharges, emissions, deposits or other sources of pollutants and of substances that are hazardous or potentially dangerous to the quality of the environment or any segment of the environment.
* issue notices in the form of directives, procedures or warnings to such bodies as it may determine for controlling the volume, intensity and quality of noise in the environment.
* prescribe standards and guidelines relating to ambient air, water and soil quality, the pollution of air, water, land and other forms of environmental pollution, including the discharge of wastes and the control of toxic substances.
* ensure compliance with any laid down environmental impact assessment procedures in the planning and execution of development projects, including compliance in respect of existing projects.
* promote effective planning in the management of the environment; etc.

##### 2.7.5. The Sierra Leone Roads Authority

The SLRA is the body in charge of administering the country’s roads. Their mission is to construct and maintain the national road network, provide general road policy advice to the government, and help resolve transportation issues. The SLRA manages Sierra Leone’s RoW.

SLRA shall play a vital role in this project by handling permission issues and precise identification of the RoW. Furthermore, SLRA will engage in this project by collaborating the rehabilitation works of the access road in the project site.

##### 2.7.6. Port Loko District Council

Port Loko lies in the north-west of Sierra Leone. It occupies a total space of 5,719 km2 and comprises thirteen (13) chiefdoms. Following Cabinet Conclusion, CP (2011) 124 Port Loko District which initially had eleven (11) chiefdoms gained additional chiefdoms. The district now has two local councils, the Port Loko District Council and Port Loko City Council. The 13 chiefdoms of the district are Bureh Kasseh Makonteh

(BKM), Buya Romende, Dibia, Kaffu Bullom, Koya, Lokomasama, Maforki, Marampa, Masimera, Sanda Magbolontor, and Tinkatupa Makonteh Safroko (TMS). Lungi is part of Kaffu Bullom chiefdom hence under Port Loko District Council.

The Council has a total of twenty-eight wards and by extension twenty-eight-member ward councillors that provide voices for the thousands of electorates at the local level. The Chairman is the head of the entity supported by the Chief Administrator who advises on the technical decision concerning the administration and general operations of the Council. The Chief Administrator supervises the professional staff of the Council and also serves as the vote controller ensuring prudent management of resources for both council and the devolved grants.

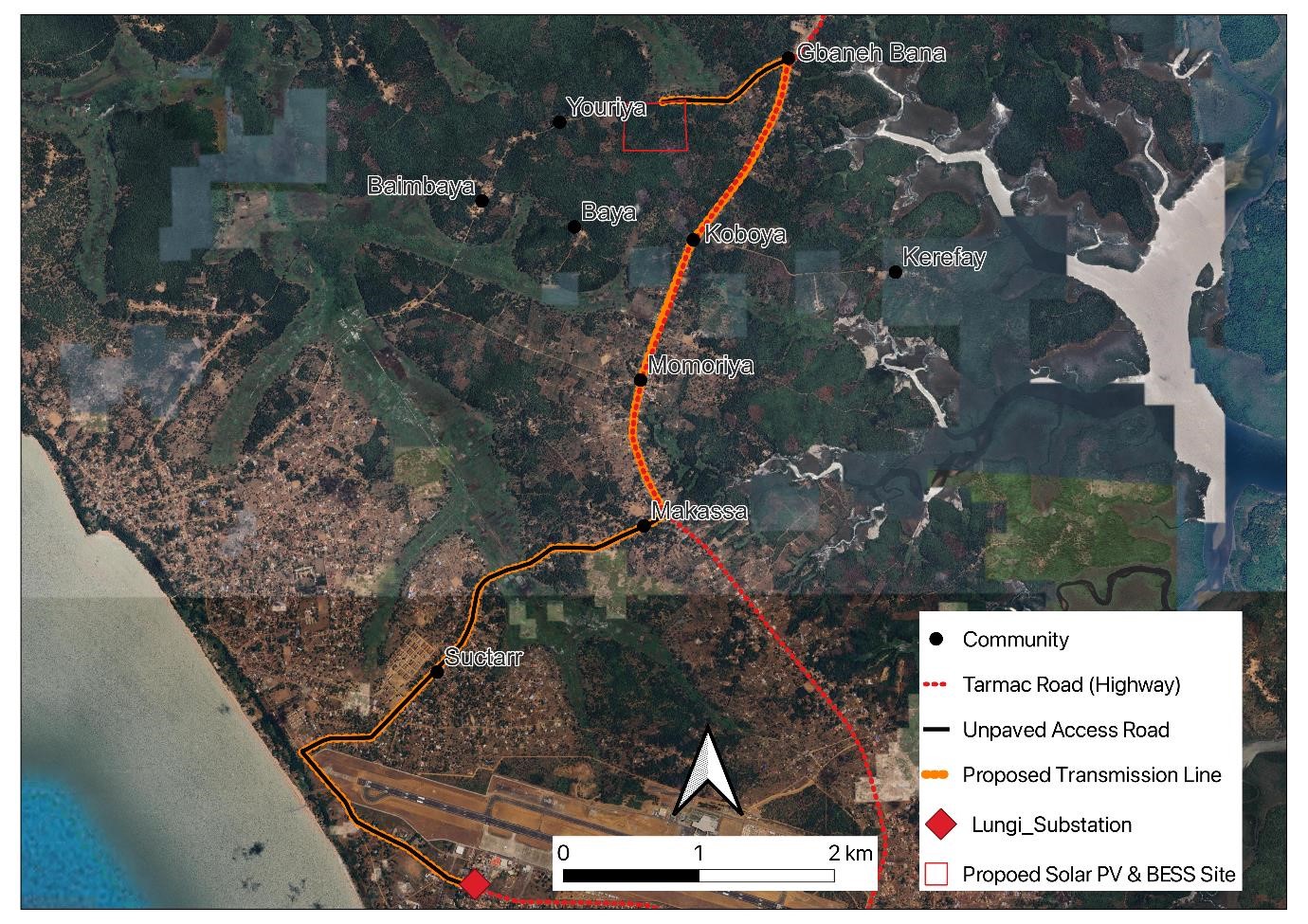
###### *Customary Hierarchy*

In Kaffu Bullom chiefdom, Port Loko District, there exists a customary hierarchy that governs the social and administrative structure of the district. The customary hierarchy in Kaffu Bullom chiefdom is deeply entrenched in age-old traditions and customs that have been transmitted from generation to generation. At the apex of this hierarchy is the Paramount Chief, who wields the highest level of authority and assumes the primary responsibility for governing the chiefdom as a whole. Below the Paramount Chief, there are various sub-chiefs, each overseeing a specific section or locality within the chiefdom. These sub-chiefs are responsible for maintaining peace, resolving disputes, and representing their respective communities. Within each community, there are also elders and village heads who play significant roles in decisionmaking and community affairs. The customary hierarchy in Kaffu Bullom chiefdom reflects a system of traditional leadership and governance that is deeply rooted in the cultural heritage of the community. The project area is located in Foronkoya and Lungi sections.

### 3. CHAPTER THREE: PROJECT DESCRIPTION

#### 3.1. Project Description and Location

The planned project involves the construction of a 10MW Solar PV plant equipped with a 6MWh battery storage system and additional supporting infrastructure in the vicinity of Lungi airport. Once completed, this solar facility will be integrated into the current MV switching station at Lungi, utilizing 11kV transmission lines for connection.



***Figure 3-1: Lungi Solar PV Project Site***

##### 3.1.1. Solar PV, BESS and Ancillary Facilities Site

The proposed project site (-13.1877040 Longitude and 8.6631710 Latitude), located between Youriya and Koimaya (which is cornubated with Gbaneh Bana community). It is approximately 5 kilometers away from the Freetown International Airport Lungi, as the crow flies. This site is situated within the administrative region of the Kafu Bullom Chiefdom in the Port Loko District and spans an area of 45 acres of land, as depicted in Map 3-1 above. The land is claimed to be owned by the William Sheka Kamara family and held in trust by the paramount Chief of the Kafu Bullom Chiefdom. Currently, the land-owning family has sold the property at a price voluntarily agreed to the Ministry of Energy through the Ministry of Lands and Country Planning. Having the appropriate legal procedure and proper documentation, GoSL, Ministry of Lands, Housing and Country Planning has transferred a Plot: 44.7583 Acres of land located in Lungi Port Loko District in the Northern Province of the Republic of Sierra Leone to Ministry of Energy (MoE), by fulfilling the necessary procedures and with proper documentation, including land sale agreement, payment transfer and conveyance letter for the specified land to MoE, conveyance letter dated 4th July 2023. (See Annex VII (A, B & C) and Annex

VIII).

The site can be accessed via an unpaved road that intersects with the highway linking Port Loko and Lungi and is situated at a distance of approximately 600 m and 650 m from the Koimaya and Gbana Bana communities. The access road is used by nearby communities, including school going children, people accessing the nearby health clinic and women accessing other villages and market.

##### 3.1.2. 11kv Transmission Route

The electricity generated from the proposed solar power plant will be transmitted through an 11KV overhead transmission line to the existing 11kV substation in Lungi. The proposed transmission route, spanning around 10km passes through Koimaya and Gbana Banah, which are situated on the Lungi - Port Loko highway. From Gbaneh Bana, the proposed transmission route falls on the right side of the highway to Makassa junction, where it branches off to Makassa and Suctarr. The transmission route passes through a 350m stretch of inland valley swamp between Makassa and Suctarr ***(see Figure 3-2).*** This swamp is used for the cultivation of vegetables and rice. There are houses along the road from Gbaneh Banah to the substation, but it is important to note that these houses are away from the roadway RoW. For any loss of asset within the RoW, the RP will define and implement all the necessary compensation measures as per GoSL and ESS5 legal framework, and prior to commencement of any physical work of the project.

The transmission route continues to stretch to the Lungi Substation, which is the destination for the electrical energy being transmitted. Along the stretch from Makassa Junction through Makassa and Suctarr, there are several mongo trees which need to be pruned to ensure that they do not interfere with the transmission line when constructed. The transmission line is an important infrastructure project as it evacuates the power generated from the Solar PV plant to the Lungi substation which will provide electricity to communities and businesses, thereby improving their quality of life and supporting economic growth in the region. The transmission line will be carefully designed and constructed to ensure it can withstand the elements and operate reliably over its lifetime.

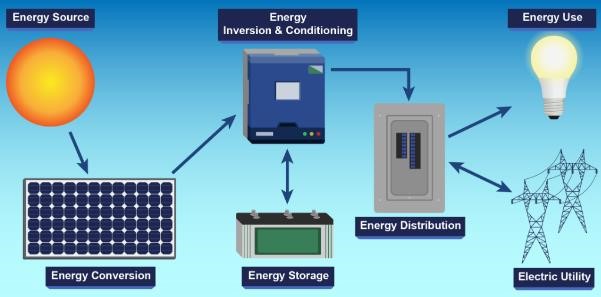
Furthermore, given the importance of the inland valley swamp for agriculture, the construction of the transmission line will be done in such a way as to minimize any negative impact on the swamp and the crops grown in it. Additionally, measures will be put in place to ensure that the transmission line does not pose a risk to public safety, particularly given its proximity to populated areas and major transportation routes.



***Figure 3-2: Proposed transmission route at Lungi site***

#### 3.2. Project Facilities and Components

The project will involve the construction of a solar PV and BESS facility on a 45-acre property about 600 m and 650 m from Koimaya and Gbaneh Bana respectively, on the Port Loko-Lungi Highway. The energy generated will be evacuated through an 11kv transmission line to the Lungi substation. **Error! Reference source not found.** summaries the project intervention.



***Figure 3-3: Schematic of PV, BESS and transmission line***

***Source****:* [*How a PV System Works - FSEC® (ucf.edu)*](https://energyresearch.ucf.edu/consumer/solar-technologies/solar-electricity-basics/how-a-pv-system-works/) *–https://energyresearch.ucf.edu/consumer/solartechnologies/solar-electricity-basics/how-a-pv-system-works/*

During the construction phase, the facility will be cleared of its vegetation and disposed of at a designated waste dumpsite in Lungi. The facility will be cleared and demarcated for specific installations. These installations are listed below:

* Solar PV modules
* Cables
* Transformers
* Power Conditioning Unit (PCU) or inverter
* Switchyard
* Earthing and Lighting Protection
* Main control room (office space and Supervisory Control and Data Acquisition)
* Access roads
* BESS facility
* Perimeter security post and fire assemble point
* Power Transmission Poles
* Maintenance facility
* Storage facility
* Water supply
* Sanitary facility
* Drainage system
* Waste storage facility

##### 3.2.1. The Solar PV Facility

Solar cells are employed to convert solar energy into electricity, and these cells are interconnected to form PV modules, commonly referred to as solar panels. The project will encompass the installation of 22,320 units of these solar PV modules. (See *Error! Reference source not found.* for site layout)



***Figure 3-4: Lungi 10 MW ac Solar PV and BESS site Layout Plan***

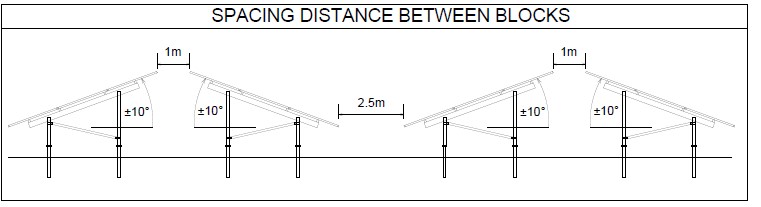
***Source****: Newton and Lungi PV Plant Grid Impact Studies by Intec GOPA Integrated Energy Consultants- October 2022*

86

The design philosophy and concept used for the solar facility made room for the following building blocks:

* Solar panel modules will be connected in series and parallel to form a string.
* Strings will be connected to form a solar PV table.
* String inverters will be connected to each string to convert DC to AC.
* Smart transformers in the solar field collecting the LVAC (Low Voltage AC) and stepping it up to MVAC (Medium Voltage AC) and interconnected in a ring configuration for connection to MV substation.

For the facility design, a standard modular approach was employed where modules are assembled into strings and then strings are combined into "tables". The solar PV arrays are proposed to be tilted at 10° facing directly east and 10° facing directly west, as shown in the elevation drawing in *Error! Reference source not found.*. Access for maintenance is provided between rows, as indicated in the said figure.



***Figure 3-5: Proposed arrangement of solar PV installation***

***Source*: Newton and Lungi PV Plant Grid Impact Studies by Intec GOPA Integrated Energy Consultants- October 2022**

The solar PV design components are shown below in Table 3.1.

# Table 3-1: PV Plant Component

|  |  |
| --- | --- |
| **Design** | **Lungi 10 MWac Plant** |
| Solar field design | 13MWp installed capacity |
| Number of solar panels | 22320 units |
| Quantity of 6300kVA smart transformers | 2X |
| Tables are installed facing | East and West, each alternative row |

***Source***: Newton and Lungi PV Plant Grid Impact Studies by Intec GOPA Integrated Energy Consultants- October 2022

##### 3.2.2. BESS System Design

The facility will incorporate a Battery Energy Storage System to store electricity generated by the PV modules for later use. This BESS not only enhances the plant's performance but also includes a dedicated BESS inverter.

6MWh Lithium Iron Phosphate (LiFePO4)batteries shall be installed at the Lungi substation.

The BESS system design used for Lungi comprised of the following building blocks:

* Battery units (containerised) complete with Battery Management System (BMS), cooling, and fire protection.
* Inverter and Power Conversion System (PCS) for converting DC to AC, accommodating 2 battery strings.
* A dedicated step-up transformer to be used for stepping up the battery inverter output voltage to MV distribution voltage levels. (This transformer is required as the output voltage of the BESS inverters is different form the output of the solar field inverters).
* Ring Main Unit (RMU) switchgear for connecting to MV substation, and the option of forming a ring if more battery strings are to be added.

##### 3.2.3. Control and Supervisory Control and Data Acquisition (SCADA)

The implementation of SCADA in a solar facility enhances operational efficiency, maximizes power generation, improves fault detection and response time, and optimizes maintenance efforts. It provides operators with real-time visibility and control over the solar power generation process, enabling efficient and reliable operation of the facility.

##### 3.2.4. 11kV Transmission Line



***Figure 3-6: Lungi Project Components- Transmission Line, Access Road, Substation, etc.***

Wooden poles will be utilised in building the 11kV transmission line. These wooden poles are carefully treated, ensuring they undergo a preservation process to enhance their durability and resistance to environmental factors. Construction activities involve the following:

1. The necessary excavation permit/clearnance is obtained from concerned authority wherever applicable.
2. Site preparation: Clear the area of any obstacles or vegetation that might interfere with the installation. Pegging of pole position. Pole position shall be carried out accurately on site according to the approved drawings. Co-ordinates of each pole shall be accurately measured and the type of the pole. temporary marking shall be done for the pole pit with white marking powder. Excavated area will be barricaded with the proper safety instruction. Foundation Excavation: A team of workers, using manual labour, will excavate the foundation to reach a depth of 2.0 meters. When rocks are encountered during the excavation process, a Hydraulic Hill Tee will be utilised to facilitate effective cutting through the rocky substrate. This combination of manual excavation and the application of the Hydraulic Hill Tee ensures precision and efficiency in addressing geological challenges during the foundation preparation. These excavation shall not be open for longer duration
3. Pole Erection: A team of workers using manual labour will lower the wooden transmission poles into the prepared holes, ensuring that they are vertically aligned and properly spaced. Fill holes with boulders and soil or concrete for stability, considering soil conditions.
4. Pole dressing: Pole dressing consists of installing the line fittings and insulators. This activity requires pole climbing by a lineman. This is work at height and needs devices for climbing and lineman securing with the use of all safety tools/equipment like safety belts, helmets, etc. It also needs tools for the fitting’s assembly to the pole, such as wrenches, straps, etc. During this activity, some linemen work at height, while others work on the ground.
5. Cables and conductors stringing and sagging.
   1. Cable and conductor stringing involves pulling the cable along each pole structure and passing it through stringing sheaves or travellers.
   2. The sagging process starts from the final span, allowing the conductor to be turned back to the reel without damage. The pulling team uses temporary tools like clamps and hoists for tension control before securing permanent clamps, with linemen working at various heights and on the ground.

**Construction on the Suctarr swamp**

The proposed transmission line crosses a 350m swamp stretch at Suctarr, accommodating around 3 poles. Swamp construction will be machine-free.

Concrete poles will be utilized in building the 11kV transmission line in the swamp areas, and these poles have the adequate strength and resistance to environmental and soil conditions. Construction activities for this installation is similar to that of wooden pole only that in the swamps, special methodology is adopted during foundation work and pole erection due to the soil condition. The construction activity involves the following:

1. The necessary excavation permit/clearnance is obtained from concerned authority wherever applicable
2. Site preparation: Clear the area of any obstacles or vegetation that might interfere with the installation.
3. Pegging of pole position: Pole position shall be carried out accurately on site according to the approved drawings. Co-ordinates of each pole shall be accurately measured and the type of the pole. Temporary marking shall be done for the pole pit with white marking powder. Excavated area will be barricaded with the proper safety instruction.
4. Foundation Excavation: A team of workers, using manual labour, will excavate the foundation to reach a depth of 2.0 meters. During excavation, mud pump will be utilized throughout to remove water from the pit (Hole), to be able to achieve the required depth. After excavation a 150mm lean concrete will be poured on the base to make surface of the base stronger. Immediately after this pole erection is done, to prevent water filling the pit.
5. Pole Erection: A team of workers using manual labour will lower the steel transmission poles into the prepared holes, ensuring that they are vertically aligned and properly spaced. Immediately erection is done, Form work shall be done by wooden sheet and proper support shall be done. cement, sand crushed stone & water shall be mixed in concrete mixture as per approved concrete grade (cement: sand: crushed stone) (shall be followed as per approved drawings & concrete design mix). The concrete will use a recommended SRC cement and extend concrete from NSL at least 1000mm to avoid water contact with the pole. Concrete shall be poured on compacted ground as per required quantity. All concrete shall be consolidated by vibration and spading, so that the concrete is properly placed. Air shall be removed from concrete mix by use of a suitable vibrator. The top of the concrete surface shall be done smooth and good finished by manual surfacing. Concrete is allowed to set within 48-72hours. Special cement is used for this foundation.
6. Pole dressing: Pole dressing consists of installing the line fittings and insulators. This activity requires pole climbing by a lineman. This is work at height and needs devices for climbing and lineman securing with the use of all safety tools/equipment like safety belts, helmets, etc. It also needs tools for the fitting’s assembly to the pole, such as wrenches, straps, etc. During this activity, some linemen work at height, while others work on the ground.
7. Cables and conductors stringing and sagging: Cable and conductor stringing involves pulling the cable along each pole structure and passing it through stringing sheaves or travellers. The sagging process starts from the final span, allowing the conductor to be turned back to the reel without damage. The pulling team uses temporary tools like clamps and hoists for tension control before securing permanent clamps, with linemen working at various heights and on the ground.

##### 3.2.5. Access Roads

Equipment (solar panels, batteries and other components) will be imported through a Bank approved procurement process and transported to the project site from Queen Elizabeth II Quay. To minimize transportation risks, the equipment will be transported in convoys to a warehouse or storage facility to be constructed at the site. The distance from Freetown to the project site is about 170 km, almost entirely on a Grade A tarmac road, where only the first 30 km involves heavy vehicular traffic. The rest of the road (Highway) is a high-speed route (max. 80kph), but decreases to 50 kph around settlements, including Gbaneh Bana village at the entrance to the solar PV site. There is a dirt road stretching over 1 kilometer from the Gbaneh Bana junction that leads to the proposed PV and BESS site.

Typically, trucks carrying 20 to 40 containers will be used to transport the equipment to site. The road from Gbaneh Bana village to the site has a width of approximately 6 meters, which is consistent with the standard road width of a single carriage way in Sierra Leone, around 3.65 meters (12 feet). However, intersections and roundabouts require wider road widths to accommodate turning movements. To enable trucks to make safe turns from the main highway to the project site, a bit widening of the RoW is necessary at the junction. The current road is easily accessible to trucks transporting cement and other local materials. If the project deems it necessary to expand the road to a dual carriage way (approximately 7.3 meters), it can be done without any disruption to the neighbouring houses. Trucks carrying cements and other local materials can easily access the existing road. The available width of RoW of the existing access road has sufficient land for expansion.

***Figure 3-7: Access Road to PV & BESS site***

as well as all roads that link buildings and installations, excluding field inverters, to connect the buildings with the electrical substation. The main access road shall be upgraded from 4.5 meters to 6 meters as a minimum to facilitate smooth transit during construction, operation, and maintenance phases. This main road serves as the central axis for secondary roads that lead to primary equipment such as inverters and transformers. The secondary road network consists of roads that connect the field inverters to the main roads.

**3.2.6. Balance of Plant (BoP) Facilities**

#### A. Buildings

The buildings will be either steel containers supported by a foundation or concrete structures. BESS shall be a steel container supported on an isolated foundation and columns, while the Operation and Maintenance (O&M), guard house, Workshop and store buildings shall be concrete-framed structure buildings. (See Figure 3-8: *O&M Building*  and 3.9 for O&M, workshop and store building plans).

***Figure***

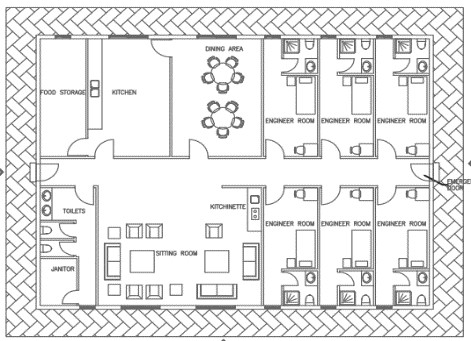
***3***

***-***

***8***

***:***

***O&M Building***



***Source****: Newton and Lungi PV Plant Grid Impact Studies by Intec GOPA Integrated Energy Consultants-*

*October 2022*

***Figure***

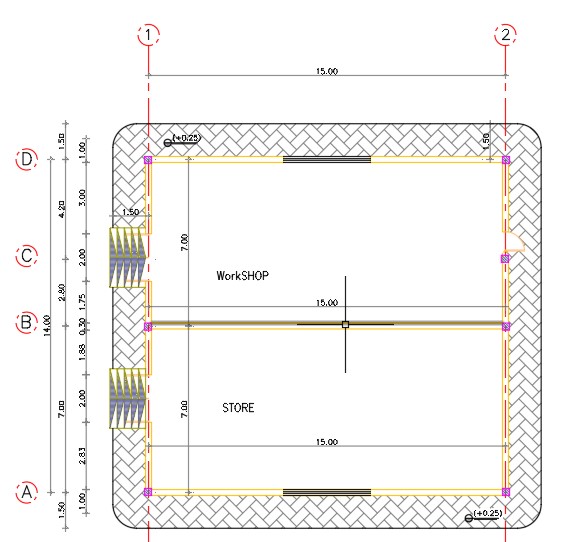
***3***

***-***

***9***

***:***

***Store and workshop building***



***Source****: Newton and Lungi PV Plant Grid Impact Studies by Intec GOPA Integrated Energy Consultants-*

*October 2022*

# Table 3-2: Transformer, Inverter, and Substation Foundations

|  |  |
| --- | --- |
| **Building** | **Type** |
| Transformer | Concrete foundation with oil pit |
| Inverter | Concrete foundation |
| Substation & Cable Trenches | Concrete foundation and concrete cable trenches (slabs, wall & |

covers etc)

***Source****: Newton and Lungi PV Plant Grid Impact Studies by Intec GOPA Integrated Energy Consultants- October 2022*

#### B. Fence & Gates

# Table 3-3: Fence and gate structure type

|  |  |
| --- | --- |
| **Structure** | **Type** |
| Wire mesh fence | Steel wire mesh supported on plain concrete footing. |
| Gates | Steel double leave gate connected to the main access road and steel personal gate. |

***Source****: Newton and Lungi PV Plant Grid Impact Studies by Intec GOPA Integrated Energy Consultants- October*

*2022*

##### 3.2.7. Sanitary Facility

By providing adequate and well-maintained sanitary facilities, employers demonstrate their commitment to the health and well-being of their workers. It helps create a more comfortable and hygienic working environment, contributing to higher productivity and overall job satisfaction. During construction, portable toilets will be employed at the construction site. Portable toilets are normally employed on construction sites because of their simple installation, mobility, and convenience. These units are selfcontained and equipped with features such as toilets, handwashing stations, and hand sanitisers. The contractors will deploy enough toilets to cater for the workers present. The contractors will make arrangements with either Port Loko City Council or the Military who are presently involved in collecting sewage waste to collect the waste from the portable toilets and ensure its proper disposal.

During the operational phase of the project, permanent sanitary facilities will be constructed to cater to the needs of the personnel involved. To manage the sewage waste generated by these facilities, a system of septic tanks will be implemented, allowing for proper containment and disposal of the waste. Some key considerations for sanitary facilities are:

* Design the layout of sanitary facilities to provide privacy and comfort. Separate male and female facilities, and consider providing separate changing areas, if applicable. Use appropriate partitions, doors, and signage to maintain privacy and create a respectful environment.
* Ensure that sanitary facilities are easily accessible for all workers, including those with disabilities. Install ramps or provide alternative accessible facilities to accommodate individuals with mobility challenges.
* Establish a schedule for regular cleaning and maintenance of the sanitary facilities. Ensure that waste is promptly removed, toilets are cleaned, and handwashing stations are stocked with soap, water, and paper towels.
* Provide an adequate supply of soap, water, hand sanitizers, and drying options (paper towels or hand dryers) at handwashing stations. Ensure that supplies are regularly replenished to maintain proper hygiene practices.
* Implement appropriate waste management practices, including the regular emptying and cleaning of waste disposal units. Ensure that waste bins are clearly labeled and segregated for proper waste disposal and recycling.
* Proper ventilation is essential to maintain air quality and prevent odor in sanitary facilities. Install adequate ventilation systems or consider natural ventilation options to ensure a fresh and comfortable environment.
* Conduct training and provide information to workers on the proper use of sanitary facilities, hygiene practices, and waste management procedures. Promote awareness of the importance of maintaining cleanliness and hygiene in the workplace.

##### 3.2.8. Wastewater Treatment and Disposal System

Wastewater is collected from various sources within the solar plant, including equipment cleaning, cooling systems, and sanitation facilities. Efforts will be made to segregate different types of wastewaters, such as sanitary wastewater (from toilets and washrooms) and non-sanitary wastewater (from equipment cleaning and cooling). Septic tanks followed by a soak pit will be used to dispose of wastewater or sewage.

##### 3.2.9. Waste Disposal

The project will generate hazardous and non-hazardous wastes.

1. Some of the hazardous wastes generated from the project may include:
   * Chemicals: Chemicals used in the manufacturing, maintaining, and operating solar PV and BESS systems and other hazardous chemicals.
   * Electronic Waste: Electronic waste from damaged or obsolete PV panels, batteries, and other electronic components.
   * Contaminated Materials: Contaminated materials, such as soil and water, may come into contact with hazardous substances during the project life cycle.
   * End of life batteries: The project will utilize Lithium Iron Phosphate (LiFePO4) and Nikel Cadmium (NiCad) batteries, which are gaining attention for their 'green' disposal. The materials in LiFePO4 batteries are less harmful, and innovative recycling methods that are less energy-intensive are being developed.
2. Some of the non-hazardous wastes generated from the project may include:
   * Construction Debris: Waste materials such as bricks, concrete, wood, and metal that result from construction activities.
   * Packaging Materials: Cardboard, plastic wraps, and other packaging materials used for transporting and storing equipment and components.
   * General Office Waste: Paper, plastic, and other recyclable or compostable materials generated in administrative areas.
   * Scrap Metal: Metal scraps resulting from maintenance, repairs, or decommissioning activities.

A designated site for the disposal of construction and domestic wastes (Non-Hazardous waste) has been identified, situated approximately 8km away from the project site (See

).

Sierra Leone currently lacks specialized hazardous waste disposal sites or facilities dedicated to managing hazardous waste in a comprehensive and environmentally friendly manner. This poses a significant challenge for the country in handling waste that contains toxic substances, such as hazardous waste generated from solar panels and other electronic equipment.

One recent positive development is the establishment of a faecal sludge management plant to address some of the issues related to sewage. However, hazardous waste management, especially for electronic waste, remains an ongoing concern.

Ministry of Energy/ EDSA, in collaboration with EPA-SL will sign MoU[[2]](#footnote-2) to engage a private sector known as KRISS Enterprise (licensed by EPA-SL). It aims to assist the project in proper handling and disposal of hazardous wastes generated from used and expired Solar Batteries from designated RESPITE project sites,

Lungi and Newton, for a period of fifteen years (after the battery life cycle of operation), in compliance with Sierra Leone environmental regulations, mitigating potential risks to the environment and public health aspects.

It is also recommended that the following should be addressed in the Project Operational Manual (POM).

* While the LiFePO4 batteries can last about 10-15 years with proper care and maintenance, the batteries will still require recycling and disposal at the end of their useful life. The Client should consider the battery manufacturer’s buy-back program or contract specialized facilities that can safely process these batteries and recover valuable materials like lithium, iron, phosphate reducing the need for new raw materials and lessening environmental strain.
* The batteries are subject to fire risks, resulting from thermal runaway, short circuits, over charging, etc. The POM should address proper installation procedures, regular maintenance, safe charging practices, proper ventilation, adequate and well-maintained fire suppression equipment,

***Figure***

***3***

***-***

***10***

***:***

***Lungi Dumpsite***



etc.

##### 3.2.10. Accommodation

Workers will not be camped on the Lungi solar power plant site. For migrant workers, they will be accommodated on rented private property in the township of Lungi; the E&S risks of this housing arrangement is covered in the ESMP and LMP.

**3.3. Project Phases and Activities**

Generally, Project activities are categorised under the following phases:

#### Phase I: Pre-construction (Preparatory Phase Activities)

The pre-construction stage refers to the planning and preparation phase before any physical construction work begins on a project. This stage typically includes activities such as the determination of the project site and its size, land acquisition, resettlement of people in the project area, compensation and housing for displaced people, project design and engineering, obtaining necessary permits and approvals, developing a project budget and schedule, selecting contractors and suppliers, and securing financing etc.

The pre-construction stage is critical to the project's success, as it lays the foundation for the construction phase and can help ensure that the project is completed on time, within budget, and to the desired quality standards.

Typically, the pre-construction phase involves the following:

* Identification of land
* Consultations with local communities
* Acquisition of land for project development
* PV plant and BESS site, line-route surveys, geotechnical investigations, solar radiation yield studies, electric grid studies etc.
* Preparation of the Contractor ESMP (CESMP)
* Resettlement and Compensation/ Livelihood Restoration Programme (if applicable);
* Front End Engineering Design.
* Check survey of EPC contractor.
* PV plant and BESS, Transmission line detail design.
* Statutory permitting activities from the EPA.
* Mobilization of EPC contractor.
* Material testing.
* Equipment shipment.
* Hire labour
* **T**ransportation of equipment and materials.

#### Phase II: Construction Phase

The construction phase will span to approximately 16 months. The project construction works will include the following:

##### 1. Site Preparation

* Clearing and levelling the site: Vegetation, trees, and any obstructions are removed, and the ground is levelled to create a suitable area for construction. A comprehensive inventory of trees will be conducted as part of the RP preparation for compensatory measures.
* Access roads: grading of access roads to facilitate transportation of materials and equipment to the site.

##### 2. Foundation and Infrastructure

* Solar PV plant: Excavation and construction of foundations for solar panel arrays, inverters, mounting structures, and other equipment. Installation of electrical infrastructure, including transformers and switchgear.
* BESS: Construction of foundations and structures for battery racks and associated equipment. Installation of electrical infrastructure, including power converters and control systems.
* Transmission line: Erection of towers or poles along the designated route, including foundation construction. Installation of conductors, insulators, and other hardware.

##### 3. Electrical System Installation

* Solar PV plant: Mounting and installing solar panels on the support structures. Wiring and interconnection of panels, inverters, and balance-of-system components.
* BESS: Integration of battery modules into racks, the connection of electrical wiring, and installation of monitoring and control systems.
* Transmission line: Stringing of conductors between towers or poles, attachment of insulators and hardware, and installation of protection and communication equipment.

##### 4. Civil Works

* Construction of buildings: Control rooms, equipment shelters, maintenance facilities, and other necessary buildings or structures.
* Fencing and security: Installation of perimeter fencing, gates, and security systems to protect the site.

##### 5. Commissioning and Testing

• System testing: Conduct tests to ensure the proper functioning of the solar PV plant, BESS, and transmission line. This includes electrical testing, performance verification, and grid connection tests.

**6. Environmental and social Considerations/impact mitigation monitoring** • Monitoring to ensure compliance with the ESMP and associated plans.

• Post construction audit

#### Phase III: Operations and Maintenance Phase

During this phase of the project, a workforce of 35 individuals is anticipated to be employed. Out of these 35 workers, 10 will be stationed overnight at the site on a daily basis. This group will include technicians responsible for managing the installation and maintenance of the PV and BESS, as well as security personnel tasked with ensuring the safety and security of the site during non-working hours. By having a dedicated team present overnight, the project can benefit from continuous surveillance, monitoring, and prompt response to any potential issues or emergencies that may arise.

The project activities will include:

##### I. Solar PV Plant

* Performance monitoring: This involves monitoring the solar panels' output to ensure they produce the expected amount of energy.
* Cleaning: this involves cleaning the solar panels to remove any debris or dirt that may reduce their efficiency.
* Inverter maintenance: This involves maintaining the inverters that convert the DC energy produced by the solar panels into AC energy that the grid or facility can use.
* Electrical system maintenance: This involves maintaining the electrical system, including cables, switches, and transformers, that connect the solar panels to the grid or facility.

##### II. BESS

* Battery maintenance: This involves monitoring the batteries, testing and replacing batteries as needed, and ensuring proper ventilation and cooling of the battery system.
* Inverter maintenance involves maintaining the inverters that convert DC energy stored in the batteries into AC energy that the grid or facility can use.
* Electrical system maintenance: This involves maintaining the electrical system, including cables, switches, and transformers, that connect the battery system to the grid or facility.

##### III. Transmission Line

* Inspection and maintenance: This involve inspecting the transmission lines and towers for damage or wear and repairing or replacing damaged components as needed.
* Vegetation management: This involves managing vegetation around the transmission lines to prevent interference with the lines and reduce the risk of wildfires.
* Testing and commissioning: This involves testing the transmission line and associated equipment to ensure they are operating properly and are ready for use.

This phase will also involve waste generation and disposal, vehicle emissions, the use of access routes, interactions between migrant workers and the local community, accidents, the prevalence of communicable diseases (including STI/STDs, COVID-19, and other such illnesses in the project area), traffic management and Emergency.

The following will be undertaken during this phase:

* Compliance monitoring.
* Periodic environmental and social audit.
* Periodic systems audit.

#### Phase IV: Decommissioning/Closure

This is the terminal stage of the Project. The average life span of solar modules is between 25 – 30 years. At this stage, the modules can either be revamped or replaced. Generally, if a decision is made to decommission the lines, the following steps will be taken:

1. Disconnecting and dismantling of solar panels and inverters: Remove the solar panel and inverter from the supporting structures and electrical system. The transport and disposal of the disassembled solar panels and inverters should be done in accordance with the Specific guidelines on lithium solar battery storage, transportation and disposal (SLEWRC specific guidelines regarding the different types of equipment that are component in a mini grid, 2018 and 2019) in ***Annex VI.***
2. Removing the mounting structures: Remove the mounting structures for the solar panels and the foundations used to secure them. Proper disposal of the materials used in the mounting structure should be followed in ***Annex VI***.
3. Removing the BESS: Disconnect and remove the BESS and the associated control and monitoring systems. The BESS components should be transported and disposed of according to regulatory requirements.
4. Site remediation: Restore the site to its original state or to acceptable environmental performance. This can entail cleaning up polluted groundwater and soil, replanting trees, and stabilizing slopes and embankments.
5. Waste management: Organize the items such as solar panels, inverters, BESS components, and other garbage produced by the decommissioning processes. Sort and classify the garbage, then package and dispose of it in accordance with legal regulations.
6. Regulatory compliance: During the decommissioning process, make sure all legal and regulatory criteria are met. Obtain permits and approvals, monitor the environment, and submit reports to the appropriate regulatory bodies.
7. Communication and stakeholder engagement: Maintain open lines of communication with all interested parties, including staff, regulators, and nearby residents, to keep them updated on the decommissioning process and
8. Post- Decommissioning Audit: An essential tool for ensuring that the decommissioning process is carried out responsibly and sustainably and that the site is left in a secure and environmentally sound condition is the post-decommissioning audit. It aids in ensuring the confidence of all stakeholders, including regulators, the community, and potential site users, that the decommissioning process has been successfully completed.
9. A review of decommissioning-related documentation, such as permits, ESIA and associated ESMP, and monitoring reports, may also be included of the audit. The audit may also include a review of the safety protocols that were followed during the decommissioning procedure as well as an assessment of the strategies for getting rid of any generated trash or hazardous materials.

##### 3.4. Resource Requirement

Given that the project is still in the planning stages, the resource requirements for the construction and operation phases have been determined mainly using the grid impact study report by GOPA energy consultants’ expert judgment and discussions with the project proponent. The following resources would be required (See ***Table 3-4:*** *Key Project Activities by Phases*  for summary of the materials required)

#### Land

The amount of land needed for solar PV, BESS, and other components is contingent on the technology used, conversion efficiency, and incident solar radiation. Feasibility studies have been conducted on the proposed site, which indicate that the 45-acre land available is adequate for the 10MW solar PV project. The land in question was owned by a particular family, who have decided to make a sale of the property at a price voluntarily agreed, to the Ministry of Energy through the Ministry of Lands and Country Planning. Having the appropriate legal procedure and proper documentation, Ministry of Lands, Housing and Country Planning has transferred a Plot: 44.7583 Acres of land located in Lungi Port Loko District in the Northern Province of the Republic of Sierra Leone to Ministry of Energy (MoE), in fulfilling the necessary steps and with proper documentation, evidence for land sale agreement, payment transfer and conveyance letter for the specified land to MoE. (See Annex VII (A, B & C) and Annex VIII). No land acquisition will be required for the transmission route to the Lungi substation. The transmission route will pass along the right of way. There are a few economic trees and business stalls on the RoW that will be studied in detail and compensated through a Resettlement Plan (RP) to be developed and implemented prior to commencement of physical works of the specified TML activities.

#### Manpower Requirement

The project is expected to hire over 400 semi-skilled and unskilled male and female workers during construction. These would be sourced locally. Approximately 5 skilled persons would be employed locally during the operation and maintenance phase. These figures will be confirmed once the project details have been finalised.

#### Water Requirement

Water is required for various pre-construction and construction activities such as soil stabilization, concrete mixing, equipment cooling, dust suppression and domestic uses. During the operation and maintenance phase, water can also be used to clean solar panels to remove dirt, dust, and debris that can accumulate on the surface and reduce the efficiency of the solar cells. A bore hole will be sunk on-site during the construction phase and later repurposed for domestic and washing of solar panels. As there is sufficient rainfall during the wet season, washing the solar modules is only necessary during the dry season, which lasts for 6 months.

A hydrological study has been proposed to investigate and determine whether the current water quantity is sufficient to meet the operational needs of the facility. See ***Table 3.4*** for the project water requirements.

#### Energy Requirement

Temporary generators using diesel fuel will be set up during the construction stage. The project shall use 12kVAkW generators and 15kVA generators. In some situations, generators may be required during the maintenance of a solar plant and BESS. During routine maintenance of the solar panels and BESS, generators may not be necessary, as the BESS can provide backup power in case of outages or when the solar panels are temporarily offline.

However, there may be certain maintenance tasks that require shutting down both the solar panels and the BESS, such as replacing or repairing major components. In such cases, generators may be necessary to provide backup power to critical loads or equipment, such as monitoring systems or essential lighting. Additionally, since the solar facility and BESS are located in a remote area without access to the power grid, generators may be necessary to power maintenance equipment and tools.

It's important for the proponent to carefully evaluate their maintenance needs and develop a plan that includes appropriate backup power sources, such as generators, as needed. This can help ensure that maintenance work can be completed safely and efficiently without risking interruptions to critical systems or equipment.

Generators may also be required for the dismantling and removal of equipment and infrastructure during the decommissioning stage.

#### Raw Material Requirement

Primary raw materials required during the pre-construction and construction phases include sticks, timber, sand, cement, and aggregates. These raw materials will be sourced from EPA certified local suppliers.

# Table 3-4: Key Project Activities by Phases

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Project Phase** | **Key Activities** | **Staffing** | **Support Facilities and services** | **Resource**  **Requirements**  **(Water, Energy,**  **Raw materials)** | **Schedule**  **(No of**  **Months)** |
| Preconstruction /Mobilization | * Site selection * Design and planning * Obtaining permits/approvals * Procurement & logistics * Staff recruitment * Community consultation and information disclosure * Prepare C-ESMP and associated management plans | 30 | * Office/works yard/storage. * Temporary sanitary facilities * Security services * Health & safety services (first aid, safety equipment, training, signing of OHS and GBV code of conduct etc.) * Waste management facilities * Transportation services * Communication services * Establishing workers GRM * GBV referral and MOU with service providers | * Water (3,000 Ltr per day) • Energy (12/15kVA)   generator and  fuel)   * Raw materials   (sand, granites)   * Land | 4 |
| Construction | * Implementation of contractor ESMP, LMP, SEA/SH Action plan * Site preparation (land clearing, preparing foundations, access roads, temporary facilities etc.) * Construction of solar facility/BESS/transmission lines, buildings etc. * Commissioning * Final testing | 562 | * Office/works yard/storage. * Temporary sanitary facilities * Security services * Health & safety services (first aid, safety equipment etc.) * Waste management facilities * Transportation services * Communication services | * Water (6,000 Ltr per day) • Energy (12/15kVA)   generator and  fuel)   * Raw materials   (sand, granites) | 16 |
| Operation & Maintenance | * Safety inspections * Monitoring and control * Maintenance (preventive & corrective) * Cleaning | 34 | * Security service * Control centre * Communication services * Maintenance and repair services * Access roads | * Water (80,000 ltr per annum) * Energy (5/7kVA generator and   fuel) | 300-360 |

103

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Project Phase** | **Key Activities** | **Staffing** | **Support Facilities and services** | **Resource**  **Requirements**  **(Water, Energy,**  **Raw materials)** | **Schedule**  **(No of**  **Months)** |
|  | * Performance testing * Upgrade and modifications |  | * Sanitary facilities * Waste management services * Health & safety services * Management and monitoring |  |  |
| Decommissioning | * Equipment/structure removal * Environmental clean-up * Site restoration * Documentation and reporting * Post decommissioning Audit | 20 | * Environmental management and monitoring * Communication services * Security services * Health & Safety services * Waste management services | * Water   (15,000Ltr)   * Energy (5/7kVA generator and   fuel)  • | 4 |

104

# 3.5. Project Implementation Schedule

The activities related to environmental and social management and monitoring will be integrated into the overall construction schedule. The approximate estimated duration of civil works to be completed is 16 months.

A detailed implementation schedule will be developed, providing a chronological order of significant activities and their respective timeframes for engineering, construction, installation, and commissioning of the 10MW solar PV power plant, BESS, and associated components. (***Table 3-5****: Project Implementation Schedule* ).

***Table 3-5: Project Implementation Schedule***

|  |  |  |
| --- | --- | --- |
| **No** | **Activity** | **Tentative Completion time** |
| 1 | ESIA Study | Nov 2022 – March 2024 |
| 2 | RP Preparation and Implementation | March – April 2024 |
| 3 | Award of EPC contract | March 2024 |
| 4 | Site mobilization | April 2024 |
| 5 | Detailed Engineering & Procurement | May 2024 |
| 5 | Contractor ESMP | June 2024 |
| 7 | Shipment of equipment | June 2024 |
| 8 | Commencement of works | September 2024 |
| 9 | Commissioning, trial run, and testing | February 2026 |
| 10 | Commercial operation | February 2026 |

### 4. CHAPTER FOUR: STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

#### a. Stakeholder Engagement Process During this ESIA Preparation

##### i. Meeting Invitation Procedure

Stakeholders identified for this project were informed about meetings through formal letters, SMS text messages, or calls. Brief information on the project, the project objectives, benefits, and assumed adverse impacts were provided upon initial contact and invitation to the meeting. The ESIA consultant's contact information (email address and phone number) was provided for further clarification.

Stakeholder engagements have taken place with both the project proponent and WB to comprehend the project's extent, structure, and execution, as well as to acquire pertinent project documentation. Extensive consultations have been conducted with key stakeholders and interested groups via one-onone interviews and stakeholder consultation meetings. These stakeholders and groups comprise relevant government institutions and regulatory bodies, landowners, project beneficiaries and engineers, local political authorities, and interest groups.

##### ii. Places and Date of Meetings

Stakeholder consultations were held in November 2022 and in February and May 2023. Date for meetings and venue were agreed on together with the stakeholders. These stakeholders supported providing and coordinating the meeting venues in their respective communities. Consultation meetings were held at different locations and at different times. A total of 240 (Male 140 and Female 100) participants took part in the consultation process (see Table 4-1 below). Discussions in the various stakeholder meetings followed a structured agenda which included:

* Introduction of the RESPITE project to stakeholders and enlighten them of the ESIA process.
* Discuss potential environmental and social impacts of the project and obtained feedback on proposed management and mitigation measures.
* Explain the grievance redress mechanism for the project; and
* Provide stakeholders with an opportunity to ask questions, raise concerns or issues.

# Table 4-1: Stakeholders Consulted During this ESIA Preparation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Date** | **Place** | **Stakeholder** | **Number of Participants** | | |
|  |  |  | **Total**  **number**  **of**  **Males** | **Total**  **number**  **of**  **Females** | **Total** |
| 9th Nov 2022 | Gbaneh Bana | Community Leaders from all communities in the project area | 12 | 0 | 12 |
| 12th Nov 2022 | Gbaneh | Community leaders and residents in the project area | 81 | 34 | 115 |
| **Date** | **Place** | **Stakeholder** | **Number of Participants** | | |
| 12th Nov 2022 | Gbaneh Banah | Local community women from Gbaneh Bana, Youriya, Santigieya, Baya, Koboya, Kerefary,  Koimaya | 0 | 42 | 42 |
| 22nd Nov 2022 | Port Loko District Council | Council staff | 1 | 2 | 3 |
| 22nd Nov 2022 | Lungi Police Division | LUC | 1 | 0 | 1 |
| 2nd Feb 2023 | Lungi | Local community leaders, WB staff, EDSA, ONS | 18 | 2 | 20 |
| 1st May 2023 | Lungi | In-charge nurse and staff, Gbaneh Bana community health post | 1 | 2 | 3 |
| 1st May 2023 | Youriya | FGD with Village residents (chief, elderly) | 2 | 3 | 5 |
|  | Baimbaya | FGD with village residents (Chief, deputy, elder, youth) | 3 | 1 | 4 |
| 3rd May 2023 | Lungi | FSU support staff, Lungi Police division | 0 | 1 | 1 |
| 3rd May 2023 | Lungi Government Hospital,  Suctarr | Staff Nurse | 0 | 3 | 3 |
| 12th May 2023 | Gbaneh Bana | Cross section of local residents including land owners, farmers, traders, etc. | 11 | 2 | 13 |
| 12th May 2023 | Makasa | Cross section of RoW traders | 3 | 3 | 6 |
| 12th May 2023 | Suctarr | Cross section of Row traders, local commercial bike riders. | 7 | 5 | 12 |
|  | ***Total*** | | ***140*** | ***100*** | ***240*** |

##### iii. Objectives of the Consultation Process

The principal goals of the stakeholder consultations are to channel pertinent project information, such as the proposed project design and its associated environmental, social, and mitigation measures, as well as to identify alternatives and establish mechanisms for input, feedback, and complaint resolution. The consultations were specially designed to achieve the following goals (ESS10):

* To establish a systematic approach to stakeholder engagement that will identify stakeholders, build, and maintain a constructive relationship with them, in particular, project-affected parties.
* To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be considered in project design and environmental and social performance.
* To promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle on issues that could potentially affect them.
* To ensure that appropriate project information on environmental and social risks and impacts are disclosed to stakeholders in a timely, understandable, accessible, and fair manner and format.
* To provide project-affected parties with accessible and inclusive means to raise issues and grievances and allow the proponent to respond to and manage such grievances.

**N.B.** Please refer the SEP developed for RESPITE-for Sierra Leone on the identified stakeholder groups and their interest and influence on the project, stakeholder engagement considerations, specific communication requirements, stakeholder engagement techniques including methods of consulting disadvantaged / vulnerable individuals or groups, stakeholder engagement resources and responsibilities, and other detail information.

##### iv. Stakeholder Profiling

# Table 4-2: Identified Project Stakeholders

|  |  |  |  |
| --- | --- | --- | --- |
| **Project Proponents** | **Affected Parties** | **Other Interested Parties** | **Vulnerable groups** |
| * Ministry of   Energy, through  Electricity  Distribution and  Supply Authority (EDSA).   * Ministry of   Finance (MoF). | * Project affected individuals and communities; Crop/plantation owners along the proposed transmission line route. * Market associations and youth groups. * Motorcycles as well as pedestrians using the access road, such as school-going children and their parents. * Gbaneh Banah Community Health Post * Local community schools in Gbaneh Banah * Electricity users * EDSA, EGTC and EWRC workers * Small businesses that require electricity * Community leaders, religious leaders * Workers at construction sites * Ministry of Lands Housing and Country Planning * Ministry of Information and communication * Ministry of Local Government and Rural Development * Ministry of Labour and Social Security * Ministry of Social Welfare and Gender * Ministry of Environment and Climate Change * Environment Protection Agency * District and Local Councils * Sierra Leone Roads Authority * Operations and maintenance team of substations, and transmission lines | * Local communities * Community Chiefs/ headmen/mammy Queens * Civil society organisations -the Network Movement for Justice and Development (NMJD) and the   Centre for Accountability and Rule of Law (CARL)   * Ministry of Health and Sanitation * Ministry of Water Resources * National Protected Areas Authority * Ministry of Basic and Senior Secondary Schools * Ministry of Technical and Higher Education * Community Organizations * The public * Other national and international Independent Power Producers   (IPPs)   * The police and military (security forces) * Market associations * Youth groups * Residents of the beneficiary towns * Businesses locally and with international links * Media (local and national) | * Elderly people * Women * Children * Persons with disabilities   (including  visual and  hearing impaired, physical disabilities and cognitive  disabilities)   * Commercial sex workers * Illiterate people * The homeless * Landless persons |

The general summary of the stakeholder consultations is presented in ***Table 4-3*** below***.***

|  |  |  |
| --- | --- | --- |
| **Points Raised by Stakeholders** | **Response by Project Team/Consultant** | **Action Point** |
| Chiefdom Speaker, Kaffu Bullom (representing **William Sheka Koroma family, the landowner)**: ESIA consultants and the project proponent should endeavour to educate the community people on the project's impacts. The ESIA team should expedite the ESIA study so that the project can move to the next level. | EIA consultant: One of the main objectives of the ESIA is to educate the community people on the impact of the project, both negative and positive impacts. The EIA will recommend actions to mitigate the negative impacts, positive impacts will be maximized.  The study will be thorough and detailed but will be guided by a timeframe to accelerate it so that the project can move into the next phase. | It is key that the approved final ESIA report will be disclosed to stakeholders, relevant government agencies and communities, and published on (websites and newspapers, where applicable in line with Sierra Leone E&S policies, guidelines, and regulations Continued community engagement and education program led by the to inform and educate the community about the project's impacts, benefits, and potential risks. |
| Elderly male community member: What measures will be implemented to address the negative impacts of the proposed project and minimize disruptions to livelihoods for local residents in the project area? | EIA consultant: One of the main aims of the ESIA is to identify E&S impacts of the proposed project, recommend mitigation measures, and focus on identifying and addressing environmental and social impacts, particularly those related to livelihoods and environmental safety. For instance, it will further suggest the need for a standalone RAP to be conducted to ensure due compensation to affected persons. It will also recommend an alternative livelihood source for affected persons whose livelihood has been disrupted by the project. | Continued stakeholder engagement will be prioritised as per the SEP |
| Headman, Gbaneh Bana: What are the benefits that the people of Gbaneh Bana and landowners will get from the proposed project? | EIA consultant: The proposed project will bring multiple benefits to the local people and economy. These benefits include employment opportunities, increased trading activities, and more. The positive impacts are expected to span from the construction stage to the completion stage of the project. | Continued stakeholder engagement will be priotised as per the SEP.  PIU will ensure RAP is undertaken and implemented |

# Table 4-3: Summary of key Questions and Concerns of Stakeholders Met During ESIA Preparation

|  |  |  |
| --- | --- | --- |
| **Points Raised by Stakeholders** | **Response by Project Team/Consultant** | **Action Point** |
| Teacher, Gbaneh Bana: How sustainable will the proposed project be?  Will the electricity tariff be cheap and affordable for the poor masses of this town and the chiefdom at large? | EDSA Engineer: The electricity will be on a cost basis. I cannot determine the electricity tariff, but it will be affordable. | Continued stakeholder engagement will be prioritised as per the SEP |
| Youth Leader, Gbaneh Bana: Raised concerns about the potential politicization of the proposed project and discrimination against the local people. Appeals for the employment of unskilled labour, particularly women, and the protection of women against sexual and gender-based violence (GBV) and harassment by incoming project workers. | EIA consultant: The proposed project is to improve electricity generation and distribution in Lungi, and it will benefit everyone regardless of political affiliation. The ESIA aims to recommend best practices to ensure the project serves and benefits everyone and will also provide guidance for an inclusive employment strategy that benefits the local people. The existing Grievance Mechanism (GM) of EDSA will address all grievances throughout the project life cycle. | Establish a comprehensive training program and employment opportunities for unskilled labor, with a particular emphasis on women, to ensure their inclusion and empowerment in the proposed project. Doing so, the project can provide the necessary skills and employment to the local community, ensuring their fair participation and economic benefits  Additionally, the SEA/SH plan will be implemented |
| Environmental Officer, PLDC: The ESIA is a key phase of the project. While the project aims to deliver development, it is important to protect the environment and its inhabitants. A thorough engagement should be done with the locals in the respective communities regarding all issues and grievances, particularly land issues, should be addressed properly before the project commences. | ESIA consultant: Concern is significant and very well noted. The ESIA stives to just that. And we will thoroughly engage all stakeholders in the project. | A RAP (a separate instrument) will follow requirements of ESS5. /In accordance with ESS10, the Borrower will continue to conduct stakeholder engagement in accordance with the SEP, and will  build upon the channels of communication and engagement already established with stakeholders |
| District Officer, PLDC: The district council should be a significant stakeholder in the proposed project, but often, such projects happen under their jurisdiction without involving them. Council is the superior local authority in the area and, hence, should play an oversight role in such projects. The council have the necessary human resources to play such a role and is also integral in resolving grievances since they have a | EIA consultant: This is noted and will be brought to the attention of the project team. Your concerns and recommendations are significant and relevant. | Establish a formal mechanism for the active involvement of the district council as a key stakeholder in the proposed project, ensuring their participation and oversight throughout the project's lifecycle.    The mechanism should include regular consultation and engagement with the district council, ensuring their input in project planning, decision-making, and implementation processes. The council should be provided with project updates, |

|  |  |  |
| --- | --- | --- |
| **Points Raised by Stakeholders** | **Response by Project Team/Consultant** | **Action Point** |
| good understanding of the locals' customs, traditions, and the laws. |  | relevant information, and opportunities to provide feedback and recommendations.    Additionally, the mechanism should define the council's oversight role, empowering them to monitor the project's progress, ensure compliance with regulations and standards, and address any grievances raised by the local community. The council can act as a bridge between the project stakeholders and the community, helping to resolve conflicts and facilitate effective communication. |
| LUC, Lungi Police Division: The SLP is committed to ensuring the safety of property and personnel concerning the proposed project. The project team should be in constant community engagement with local community residents, especially youth. The SLP will provide adequate security and maintain professionalism in responding to the incidence that may arise in the future. | EIA consultant: this comment is vital. There is a SEP that addresses the consultation needs of the project. The SEP outlines effective stakeholder engagement and stresses on constant engagement throughout the project circle. | The project, as deemed necessary, will assess and implement measures to manage the security risks of the project, including the risks of engaging security personnel to safeguard project workers, sites, assets, and activities. Such measures, reflected in the ESMP are guided by the principles of proportionality and GIIP, and by applicable law, in relation to hiring, rules of conduct, training, equipping, and monitoring of such personnel.  This will also include measures for proactive community policing, intelligence gathering, and timely response to any security incidents that may arise. It will also emphasize the importance of professionalism, accountability, and respect for human rights in all interactions between police personnel and the community. |
| In charge Nurse, Gbaneh Bana CHP: The Community Health Post is challenged with inadequate beds to admit patients, lack of medical supplies, test kits and vaccines, above all no kit to provide care for GBV victims. The community health post also lacks electricity. The project should provide free electricity to the facility and assist with other necessities to capacitate the health post and make it effective in dealing with medical cases. | EAI consultant: This is noted and brought to the attention of the project team. It will be addressed in the Community Development Action Plan (CDAP). | The project will help address the challenges faced by the Community Health Post (CHP) by providing necessary resources, including additional beds, medical supplies, test kits, vaccines, GBV care kits, and free electricity, to enhance the capacity and effectiveness of the health post in addressing medical cases. |

|  |  |  |
| --- | --- | --- |
| **Points Raised by Stakeholders** | **Response by Project Team/Consultant** | **Action Point** |
| Trader, young adult female, along T-Line route, Suctaar. We welcome the project. We want the project so badly. We will comply with it. For those of us who may be affected along the transmission line will comply to ensure the project goes on. But in the case, we are required to move from our business points, where do we go? | ESIA Consultant: A RAP will be conducted which will adequately address your concerns and status as PAP. | Effective consultations during RAP |
| Commercial bike rider, young male, Suctaar: This is a massive project. We are excited about it. We are more so excited about the ESIA study as you (the consultant) have stated. It is unprecedented. We have learned so much about the project. On that note, as motorist, the roads leading to the project site is our major route in our line of business. And from experience, such project using the same roads will pose risk and treat to our safety. | ESIA consultant: That is a major concern and a major probable adverse impact of the project, hence, it denotes the relevance of the ESIA. A traffic plan is developed to address those concerns. The project will follow the measures in the traffic plan. | Contractor traffic management plan will address the concerns of commercial bike riders regarding the increased risks and threats to their safety due to the project's use of access road. |
| Principal, Marcus Garvi secondary school, Gbanneh Bana: This is very good news for the school. We believe electricity will impact on the efficiency of the school and learning outcome in the area. With electricity in the area, pupils can study effectively at home. However, as you stated, the access road leading to the project site is the same road used by our pupils from the communities in that end. This development has opened concerns about their safety to school since they are kids and usually walk on foot to school. But as a school, we will continue to educate our kids on traffic signs and road usage. It will also be effective if the project ensures its workers, especially drivers are professional in their job. | ESIA Consultant: that is a serious concern that will be emphasized to the project team. But as a measure, a traffic management plan will be developed for the project team to enhance road safety and prevent road fatalities. | Contractor traffic management plan will include measures that ensure the safety of students walking to school on the same access road as the project site. Additionally, emphasize the importance of road safety education for students and encourages the project to prioritize professionalism among its workers, especially drivers. |

These are a summary of the general concerns and actions points from the consultations:

* Local community residents in the proposed project area are excited about the project and committed to supporting it.
* Land-owning family commits to giving the portion of land identified to host the proposed project subject to compensation from the government of Sierra Leone. The site is secured and reserved. Negotiations are underway between the land-owing family and the GoSL on the acquisition of the said land.
* The only community health post in the area serving over fourteen communities has inadequate facilities to cope with a large number of patients. Their inadequacies include the lack of beds, medicines, GBV kits, and electricity at the facility. The in-charge nurse at the CHP appealed for support to solve these inadequacies, including support to complement community outreach programs before the project commences because there will be mounting pressure on the health post to attend to overwhelming cases during the construction phase of the project.
* Women are excited about the proposed project in their area. They are determined to be part of the project and in decision-making. They appealed for consideration to empowerment and employment opportunities to be given to them. They spoke out against discrimination in terms of employment and other forms of abuse on them. They committed to take steps to reporting abuse against them in all forms so that perpetrators are brought to book.
* Local community leaders committed to popularizing the project to residents in their respective communities for better understanding of same. All aimed at raising awareness, increase acceptance, and promote peace and stability.
* Youth representatives urged for job creation and employment opportunity for young people in the project. Also pledged to maintain peace and assures of appropriately channelling grievances in the future.
* That community residents will be trained and employed.
* That the laws, customs, and traditions of the area will be respected by the project team and workers.
* The local bike rider’s union in the area raised concerns of road safety during the construction phase of the project due to the fact that the dust that will be generated from usage of road by the heavy trucks and vehicles from the project site will put their health and safety at risk which may lead to accidents. They are excited that the project, through the influx of migrant workers will boost their industry.

#### b. GBV Discussions

Gender-based violence (GBV) is a pervasive issue that affects women and girls globally, and preventing and addressing it requires the involvement of all stakeholders. In an effort to get women folks involved in the proposed project area, a Focus Group Discussion (FGD) was held with women from various communities in Lungi. The FGD aimed to assess their knowledge of the subject matter and proffer ideas for preventing and addressing Sexual Exploitation and Abuse (SEA)/Sexual Harassment (SH) and create a culturally appropriate model to promote a SEA/SH-free population.

The FGD was facilitated by a female gender expert who sought the consent of participants and emphasized the importance of respect, commitment, and confidentiality. The expert then opened up the floor for participants to share their opinions on potential risks and existing mechanisms for prevention and response.

##### Themes/ Issues Discussed

The discussions centred around the following themes:

* Awareness of the project and knowledge of key gender terms.
* Safety and security of women and girls in the communities.
* Availability and accessibility of services.
* Complaint mechanisms.

##### Key Findings

One of the key findings was the limited knowledge of the community members on GBV and SEA/SH risk factors. This shows the need for awareness-raising initiatives that will educate the community members on GBV and SEA/SH and promote behaviours that may lead to reduced risk of GBV.

Participants also expressed their concerns about the safety and security of women and girls in the community, particularly in public spaces such as marketplaces, schools, and public transportation. They highlighted the need for more security measures to be put in place, such as the installation of security cameras and the provision of security personnel in public spaces.

Another important finding from the FGD was that the younger women were more willing to talk about issues relating to SEA/SH than the older women, who were more particular about livelihood support. This highlights the need to involve women of all ages in discussions and initiatives aimed at addressing GBV in the community.

The availability and accessibility of services were also discussed, with participants identifying gaps in services such as healthcare, legal aid, and counselling. They recommended the establishment of more centres that provide these services and the need for these centres to be more accessible to women and girls in the community.

##### Suggestions/ Recommendation

Regarding ways of reducing GBV in the community, the participants recommended the following:

* The creation of community outreach programs and the distribution of preventative resources such as flyers and posters.
* The establishment of community complaint resolution mechanisms using traditional female leaders as heads of the groups.
* The participants stressed the need for education for women and girls on how to prevent and respond to SEA/SH-related issues and where to report such cases.
* There is also the need to for men in the local communities to be educated on GBV and SEA/SH issues and its prevention mechanisms. This will include workers in the project during the construction phase of the project.

In conclusion, the FGD provided valuable insights into the existing GBV risks within the project area and how the project would potentially exacerbate those risks, as well as recommendations for prevention and response strategies. It is important to take into account the recommendations provided by the participants to create effective programs that address GBV and promote an SEA/SH-free community. By involving all stakeholders, including women of all ages, in the discussions and initiatives, the community can work towards a future free from GBV.

###### c. Public Disclosure

Upon approval of the draft ESIA report by the EDSA and World Bank, the document will be disclosed and made available to the public, including all stakeholders.

The ESIA/ESMP document is disclosed to stakeholders through a transparent and participatory approach. The ESIA consultants will collaborate with EDSA/PIU to organize public consultation and disclosure workshops, ensuring that stakeholder concerns and comments are incorporated into the report.

###### d. Grievance Redress Mechanism (GRM)

A comprehensive project wide GRM will be instituted to enable a broad range of stakeholders channel their concerns, questions, and complaints to the various implementation agencies, through multiple grievance uptake channels. The SEP developed for the project details the processes involved in registering grievances at no cost to the complainant. Grievance resolution procedure is also in place If unresolved, the complaint is moved to the next tier with the complainant having the option of seeking redress in the courts of Law.

The Energy Sector Utility Reform Project (ESURP) has finalized an operational GRM including grievance registry/log which will be used for RESPITE as well. It will establish digital platforms and accommodate emerging issues around SEA/SH for confidential reporting and referral to service providers as well as survivor cantered procedures for management of SEA/SH complaints. Multiple channels at the local level will be established to ensure safe and accessible procedure during consultations with women (in women specific groups and will be led by a woman).

The GRM will be a project wide grievance management instrument and will be available for use by all project stakeholders including those directly and indirectly impacted, positively or negatively. This will offer an opportunity to project affected persons to submit questions, concerns/complaints, comments, suggestions and obtain resolution or Feedback.

MOE will provide oversight to GRM process in coordination with EDSA, contractors, local councilors and the GBV service provider (NGO). A web application will be housed at MOE and provides access to EDSA and contractors to register complaints received at sub-project level or the field. Complaints can also be made to the local councilor who will then channel the complaint to EDSA, MOE or contractors to be filed in the digital platform for tracking of resolution. Complaints from the general, project stakeholders, PAPs etc. may also be made directly through the digital platform either by calling, sending text, WhatsApp etc. The project will identify an NGO GBV service provider to setting up and ethically manage SEA/SH complaints.

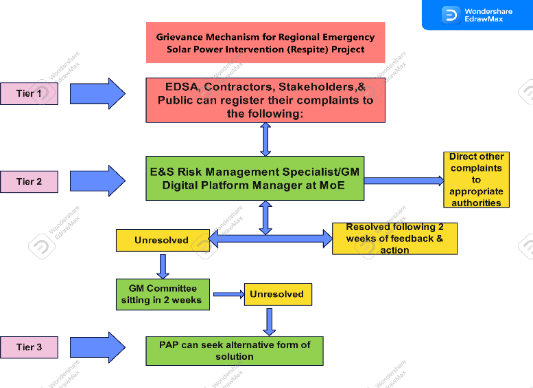
The GRM proposed for this project seeks to achieve the following objectives:

* Encourage registration, acknowledgment, and recording of all concerns or issues.
* Identify the frequencies of issues raised: for instance, unpaid compensation, inadequate compensation, disregard for local ritual ceremonies, land acquisition, GBV issues, and many more.
* Ensure that complaints are appropriately registered, tracked, and documented, with due regard for confidentiality.
* Address the composition of a committee that would handle all grievances (the GRM Committee would include representatives from project stakeholders, PAPs, EDSA, Contractor, local councilors GBV service provider (NGO), etc.).
* Establish procedures for the GRM to enhance easy access, transparency, and accountability and tackle escalation of grievances beyond expectations,
* Manage the concerns raised to achieve a win-win situation within a reasonable timeframe that would adhere to national and international best practices; and
* Record all resolutions agreed upon by all parties involved and ensure that aggrieved persons are satisfied with every outcome of the remedial solution to foster harmony in the project. **Error! Reference source not found.** represents the project GRM structure.

The GRM implementation process will involve the following steps:

* The E&S Specialist at MOE will operate the platform to ensure timely sorting and escalation of grievances to resolving officer.
* Assign a focal person (s) from ESDA, Contractors and Coucilors for component and community level grievance uptake and reporting.
* Train assigned focal person (s) to receive and log complaints in the GRM Database ▪ Constitute GRM Committee to resolve grievances.
* Screen, classify and refer complaints to appropriate unit for redress.
* Monitor, track and evaluate the process and results.
* Provide feedback to complainant within two weeks, and an opportunity for appeal if not satisfied with resolution approach.

**N.B.** As shown in the below GRM flow chart of the project, each tier of the complaint should be addressed within two weeks of feedback and action. If unresolved, the complaint is moved to the next tier with the complainant having the option of seeking resolution in the courts of Law.



***Table***

***4***

***-***

***4***

***:***

***RESPITE GRM Flow Chart***

***Figure***

***4***

***-***

***1***

***:***

***RESPITE GRM Flow Chart***

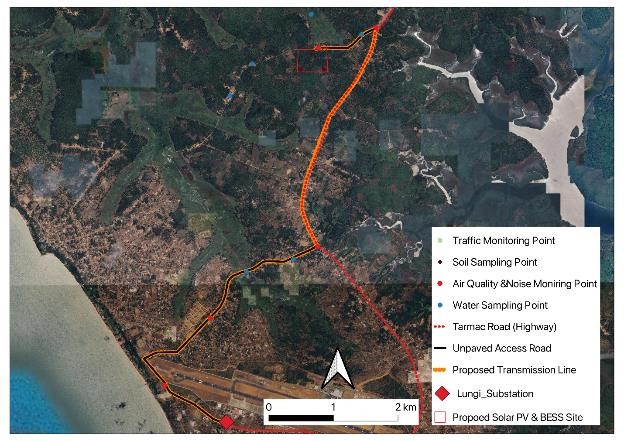
#### e. The World Bank Group Grievance Redress Service

According to World Bank Grievance Redress, communities and individuals who believe they are adversely affected by a Bank-supported project may submit complaints to existing project-level grievance redress mechanisms or the Bank’s Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed to address project-related concerns and impacts. Project affected communities and individuals may submit their complaint to the Bank’s Independent Inspection Panel, which determines whether harm occurred, or could occur, because of the Bank’s noncompliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the Bank’s attention and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the Bank’s corporate GRS, see [http://www.worldbank.org/GRS,](http://www.worldbank.org/GRS) and Bank’s Inspection Panel, see [www.inspectionpanel.org.](http://www.inspectionpanel.org/) The Bank’s GRS will be shared with the project affected community as part of project information disclosure. Considering the very low literacy level of the project affected communities to access the Bank’s GRS through website, the GRM provide alternative means including but not limited to posting the phone number of the Bank’s GRS and Inspection Panel at the Country Office on community notice board.

### 5. CHAPTER FIVE: ENVIRONMENTAL AND SOCIAL BASELINE

Environmental and social baseline data is essential to understand the physical biological and socioeconomic characteristics of the project environment. Such details lay the foundation for analysing the possible impacts of the project's actions on the current environment. Therefore, the environmental and social baseline data collection focuses on the information required to assess the project area’s environmental impact. Figure 5-1: Environmental sampled components shows data collection for the various environmental parameters.

#### 5.1. Environmental Components



***Figure 5-1: Environmental sampled components***

##### 5.1.1. Topography

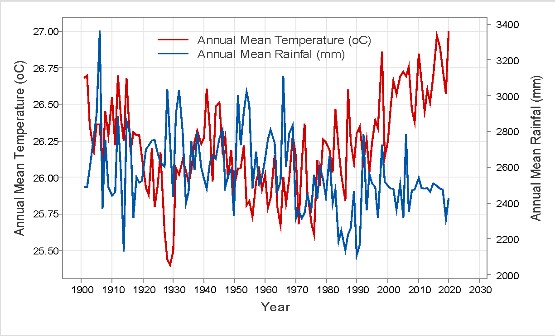
The Gbaneh Bana catchment/ Koimaya, which encompasses the proposed site, is a geographic region located within the coastal plains of Sierra Leone. The landscape of this region is primarily characterized by extensive flatlands, with relatively low topographical relief. The proposed project site specifically exhibits these characteristics, with a large expanse of flat terrain that is ideal for agricultural activities.

One significant feature of the Gbaneh Bana/Koimaya catchment is its hydrological network, which is comprised of numerous small streams and creeks that traverse the region. These watercourses play a vital role in the local ecosystem, providing a critical source of water for agricultural activities, as well as supporting diverse aquatic flora and fauna. Furthermore, many of these streams and creeks ultimately discharge into the Sierra Leone River, a primary river system that runs through the region and plays a key role in the socioeconomic activities of local communities.

##### 5.1.2. Climate and Hydrology

The climate of Sierra Leone is a monsoon-type humid tropical climate with two distinct seasons. The dry season is from November to April, and the rainy season is from May to October. The annual rainfall averages about 3,000 mm, ranging from a minimum standard of 2,000 mm in the North to a maximum of 4,000 mm in the West. The average monthly temperature ranges from 23oC to 29oC. Still, it can rise to an average maximum of 36oC in the lowlands towards the end of the dry season, while in the highlands, the average monthly temperature could be as low as 150C at the beginning of the dry season.

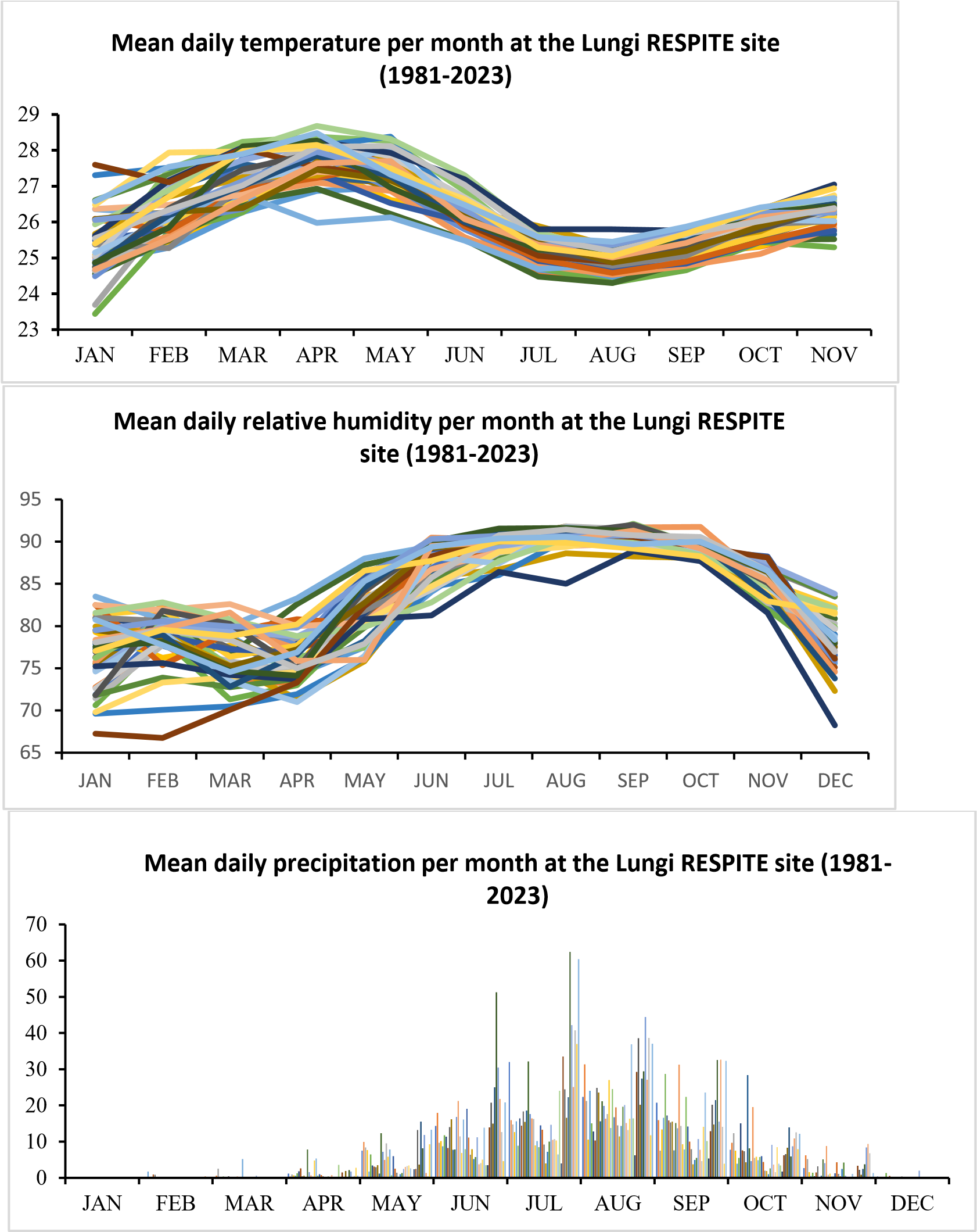
The seasonality of the weather conditions described above is primarily due to the north-south movement of a zone of discontinuity often referred to as the Inter-Tropical Front (ITF). As the belt oscillates slowly across West Africa, the country is alternately affected by southwest winds bringing moist air that often results in rains and the northeast dry winds (Figure 5-2*: Temperature and rainfall data for Sierra Leone* ). shows temperature and rainfall data for Sierra Leone from 1900 to 2020. The mean annual rainfall from the 1970s to date is lower than those before. Temperatures have risen since then, albeit with a significant drop from the late 1920s to the 1930s.



***Figure 5-2: Temperature and rainfall data for Sierra Leone***

The hydrologic cycle follows the same general pattern in all regions across the country. The only thing that varies by region is the amount of water received through precipitation, or the amount that is lost through evapotranspiration. Figure xxx shows climate 40 years of average daily data over months doe relative humidity (%) temperature (0C), and precipitation (mm) in the project area. The rivers and streams within watersheds drain most of the water into the Atlantic Ocean. The general climatic trend has been humidity dropping in the dry season (<85%) with correspondingly increasing temperature (>28 0C) and low precipitation (close to zero). This trend is reversed in the rainy season and the cycle continues.

The communities within these watersheds depend on rain-fed surface and groundwater for their livelihood. Thus, water stress is experienced in the dry season while water borne diseases come to bear in the rainy season, due to transport of pollutants by excess flow. With the threat of climate change, these seasonal patterns are projected to become more and more erratic. There is likely to be longer dry spells interspersed with intense rainfall that led to disasters like flooding and landslides. This is already evident in certain parts of the country. Therefore, the RESPITE project will adopt management practices that would not render the affected communities and ecosystems prone to additional water stress or pollution. (See **Error! Reference source not found.**).

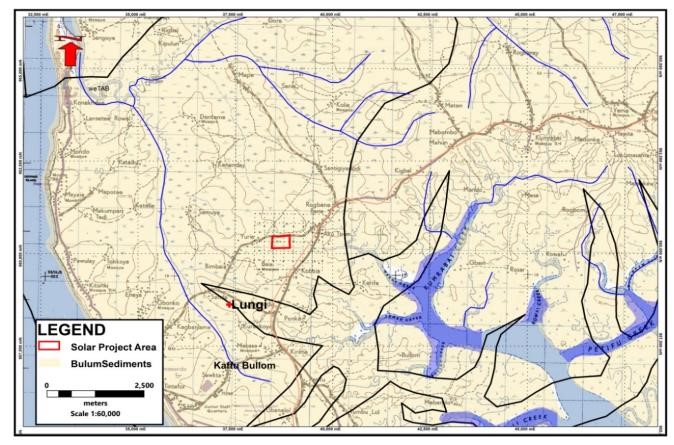
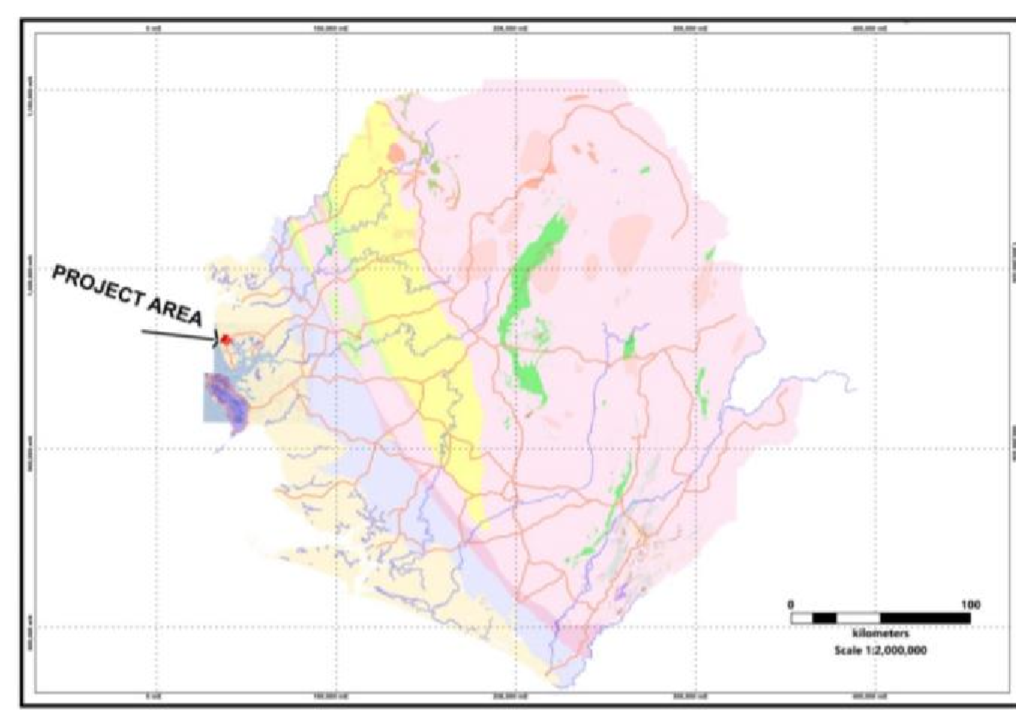


***Figure 5-3: Relative humidity, temperature, and rainfall data at the project site***

***Source:*** [***https://power.larc.nasa.gov/data-access-viewer***](https://power.larc.nasa.gov/data-access-viewer)

##### 5.1.3 Geology

The project area, known as the Bullom Group, consists of Bullom Sediment, characterized by estuarine and fresh-water sediments with sands, silts, clay, and sand lignite (***Figure 5.4***). Spanning approximately 35 miles along the coast from Guinea to Liberia, the geological formation includes a hard lateritic duricrust layer in some locations, requiring specialized engineering for large-scale structures. The region has low elevations, an extensive flat landscape, and poses a low risk of landslides, with Sierra Leone outside earthquake-prone zones. Geotechnical studies at the proposed PV and BESS site confirm soil stability, ruling out concerns about subsidence, earthquakes, mudslides, or similar risks.



***Figure 5-4: Geology map of the project area***

**5.1.3.** Error! Reference source not found.**Soil Properties and Quality**

# Table 5-1: Soil sample data sheet

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Parameter** | **SITE A** | | **SITE B** | | **SITE C** | | **MEANS** | **FAO**  **guidelines** | **Technical**  **Recommendations for Agricultural**  **Potential** |
| **Date** | **3rd May 2023** | | **3rd May 2023** | | **3rd May 2023** | |
| **Coordinate** | **958097.411 N** | **699347.137 E** | **958088.891 N** | **698990.187**  **E** | **958325.482 N** | **699159.484**  **E** |
| **SOIL PHYSICAL PROPERTIES** | Soil Colour | Dark Reddish Brown | | Reddish Brown | | Dark Reddish Brown | | - |  |  |
| Gravel  Concentration  (%) | 0 | | 0 | | 0 | | 0 | Normal | Normal |
| Moisture (%) | 4.5 | | 5 | | 4.8 | | 4.8 | Sandy soil (3 – 10%) | Moisture content must be monitored for plant wilting effects that could affect crop yield. |
| Sand (%) | 70 | | 72 | | 70 | | 71 | Sandy  Clay | Shows acidic soil with low nutrient availability. Critical for crop growth. |
| Silt (%) | 15 | | 14 | | 14 | | 14 | Clay | Clay restricts water, nutrient, and air movement, leaving plants vulnerable to root diseases and nutrient deficiencies.  Critical for |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Parameter** | **SITE A** | | **SITE B** | | **SITE C** | | **MEANS** | **FAO**  **guidelines** | **Technical**  **Recommendations for Agricultural**  **Potential** |
| **Date** | **3rd May 2023** | | **3rd May 2023** | | **3rd May 2023** | |
| **Coordinate** | **958097.411 N** | **699347.137 E** | **958088.891 N** | **698990.187**  **E** | **958325.482 N** | **699159.484**  **E** |
|  |  |  | |  | |  | |  |  | germination of sensitive crops. |
| Clay (%) | 15 | | 14 | | 16 | | 15 | Sandy Loam | Both water and fertilizer tend to leach out of the soil - escaping to waterways before the plant can utilize them.  Considerable and appreciable for plant growth. |
| Texture | Sandy Loam | | Sandy Loam | | Sandy Loam | | Sandy Loam |  |  |
| **SOIL CHEMICAL PROPERTIES** | pH (1:1 – Soil: Water) | 5.1 | | 4.9 | | 5 | | 5 | Strongly acidic | Critical for the growth of sensitive crops. |
| Exchangeable  Acidity | 3.2 | | 3.5 | | 3.4 | | 3.4 | Extremely acid | This reduces root growth, reduces nutrient availability, and affects crop protectant activity, thus harmful to most crops. |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Parameter** | **SITE A** | | **SITE B** | | **SITE C** | | **MEANS** | **FAO**  **guidelines** | **Technical**  **Recommendations for Agricultural**  **Potential** |
| **Date** | **3rd May 2023** | | **3rd May 2023** | | **3rd May 2023** | |
| **Coordinate** | **958097.411 N** | **699347.137 E** | **958088.891 N** | **698990.187**  **E** | **958325.482 N** | **699159.484**  **E** |
|  | Exchangeable Aluminium | 1.2 | | 1.2 | | 1.2 | | 1.2 | Low | A low level of Al3+ causes an insufficient supply of essential soil nutrients such as CEC (Ca, Mg and K): as critical for germination. |
| EC (μS/cm) | 80 | | 90 | | 80 | | 83 | Very low | When EC is very low, it shows soil has a nutrient deficiency. |
| Total Nitrogen (%) | 0.5 | | 0.54 | | 0.58 | | 0.54 | Medium | Excess Nitrogen builds up, which can lead to over-nitrification.  Thus, increasing microbial activities; renders the soil acidic and critical for agricultural purposes. |
| Total  Phosphorus  (mg/kg) | 6.5 | | 7.2 | | 6.9 | | 6.9 | Medium | Beyond medium scale  (Inadequate), phosphorus nutrition will delay plant maturity and reduces yields. |
| Available  Potassium  (cmol) | 0.33 | | 0.35 | | 0.29 | | 0.32 | Medium | Lack of Potassium in the soil can lead to plant deficiency, causing stunted growth, yellowing |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Parameter** | **SITE A** | | **SITE B** | | **SITE C** | | **MEANS** | **FAO**  **guidelines** | **Technical**  **Recommendations for Agricultural**  **Potential** |
| **Date** | **3rd May 2023** | | **3rd May 2023** | | **3rd May 2023** | |
| **Coordinate** | **958097.411 N** | **699347.137 E** | **958088.891 N** | **698990.187**  **E** | **958325.482 N** | **699159.484**  **E** |
|  |  |  | |  | |  | |  |  | leaves, and poor fruit and flowering. |
| Calcium | 0.22 | | 0.24 | | 0.21 | | 0.22 | Very low | This causes soil infertility; therefore, soil cannot supply its three essential plant nutrients (Ca, Mg and K). Thus, it can cause injury to most crops. |
| Magnesium | 0.21 | | 0.2 | | 0.18 | | 0.2 | Very low | This causes soil infertility; therefore, soil cannot supply its three essential plant nutrients (Ca, Mg and K): Critical for germination as a key CEC element. |
| Total Carbon (%) | 2.8 | | 2.5 | | 2.5 | | 2.6 | Low | Lower levels of organic Carbon as nutrients cause an easy erosion effect on soil since it will lack its water-holding capacity. This can lead to poor health of the soil due to low microbial. |

#### Soil pH

Soil pH is a critical parameter when planning for sustainable agriculture. It influences the availability of other plant nutrients in soils. The soils analysed are generally acidic. Samples from Lungi have pH values ranging from 4.9 to 5.0 (mean = 5.0). This value undermines the growth of sensitive crops that requires low pH.

#### Exchangeable Acidity and Aluminium

The mean values for exchangeable acidity and aluminium for Lungi are 1.12 cmol and 1.2cmol, respectively. The values obtained show the low pH of the soil. This reduces root growth, reduces nutrient availability, and affects crop protectant activity, thus harmful to most crops.

A low level of Al3+ causes an insufficient supply of basic soil nutrients such as CEC (Ca, Mg and K) which are critical for germination.

#### Soil Electrical Conductivity

The Electrical Conductivity values varied from 80 to 90 μS/cm, averaging 83μS/cm for the proposed project site. This result indicates that there are no soil salinity issues at Lungi. When EC is very low, it shows soil has a nutrient deficiency.

#### Total Nitrogen and Phosphorus

Total Nitrogen values vary from 0.5 to 0.58 mg/kg for the proposed project site. The levels of Nitrogen in the soils are generally low. Excess Nitrogen builds up, which can lead to over-nitrification. Thus, increasing microbial activities; renders the soil acidic and, therefore, critical for agricultural purposes. Phosphorus values are also low. Levels of Phosphorus raged from 6.5 to 6.9 mg/kg (mean = 6.9 mg/kg) for the project site. Beyond medium scale (Inadequate) phosphorus nutrition will delay plant maturity and reduce yields.

#### Available Potassium, Calcium and Magnesium

The exchangeable cations are low. Available Potassium varied from 0.29 to 0.33cmol for the proposed project site. Lack of Potassium in the soil can lead to plant deficiency, causing stunted growth, yellowing leaves, and poor fruit and flowering.

The levels of Calcium and Magnesium are also low as it causes soil infertility and injury to most crops.

#### Total Organic Carbon

The total organic carbon ranges from 2.5% to 2.8% (mean = 2.6%) for the proposed project site. Lower levels of organic carbon as nutrients cause an easy erosion effect on soil since the soil will lack its waterholding capacity. Thus, it can lead to poor health of the soil as a result of low microbial.

##### 5.1.4. Water Quality

Water quality samples were collected from seven sample sites upstream and downstream of the project site (Makassa 1, Makassa 2, Camp David, Gbaneh Bana, Youriya, Baimaya and Koimaya). The samples were

126

sent to the laboratory of the National Water Resources Management Agency for analysis. Figure 5-5*: Water sample locations, the transmission line, and project site* shows the sample locations, the transmission line, and the project site. Because the Atlantic Ocean is expected to have the lowest elevation, both surface and groundwater are expected to flow southwards.



***Figure 5-5: Water sample locations, the transmission line, and project site***

Potable water must be tasteless, odourless and colourless. Therefore, the water quality parameters that indicate impairment of these organoleptic characteristics were grouped into three primary water quality parameters: physical (and physicochemical), chemical, and biological properties. The physical properties are mainly associated with colour and hotness/coldness of the water. Therefore, this impact assessment delineated the temperature and turbidity of the water samples. The most important chemical parameters are Dissolved Oxygen (DO) (because it directly impacts the survival of aquatic plants and animals), and Ammonia (NH3) and Nitrite (NO2-) (Because these redox species of nitrogen are considered the most toxic and represent nutrient load in the water). The physicochemical parameters are pH (the degree of acidity or alkalinity of the water), and Total Dissolved Solids (TDS) (which represents all dissolved metals and nonmetals of concern in the water e.g., chlorides, nitrates, carbonates, sulphate, sodium, magnesium, potassium, etc). The biological parameter is E. *coli* (which represents harmful microorganisms in the water) (See Table 5-2*: Water Quality parameters in the project areas*  for results).

127

# Table 5-2: Water Quality parameters in the project areas

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Station Name** | **Makassa 2** | **Gbaneh Bana** | **Makassa 1** | **Camp David** | **Youriya** | **Baimaya** | **Koimaya** | **WHO**  **guideline (Drinking) /(a**  **WB EHS**  **guidelines)** | **Guideline (Irrigation)** |
| Water source type | Well | Well | Swamps | Swamps | Well | Well | Well |
| Sampling Date | 11/11/2022 | 11/11/2022 | 11/11/2022 | 11/11/2022 | 5/1/2023 | 5/1/2023 | 5/1/2023 |
| Temp. (oC) | 25.9 | 25.6 | 25.8 | 26 | 17.4 | 19 | 18.6 | No value |  |
| pH (mg/L) | 6 | 6.99 | 6.78 | 6.12 | 5.32 | 5.26 | 5.36 | 6.5 - 8.5 | 6.5 - 8.5  (FAO) |
| EC (µS/Cm) | 50 | 58 | 56 | 47 | 5 | 8 | 14 | <450 µS |  |
| TDS (mg/L) | 25 | 29 | 28 | 23.5 | 2.5 | 4 | 7 | <248 | <450 (FAO) |
| DO (mg/L) | 9.2 | 6.7 | 6.9 | 5.34 | 6.9 | 6.3 | 9.3 | >5 |  |
| Turb. (NTU) | 0 | 0 | 0 | 12 | 0 | 0 | 0 | <5 |  |
| Ammonia (mg/L) | 0.32 | 0.18 | 0.11 | 0.1 | 0.04 | 0.01 | 0.08 | No value | <5 (FAO) |
| Nitrite (mg/L) | 0.005 | 0.01 | 0.005 | 0.005 | 0.003 | 0.004 | 0.004 | <3 |  |
| Nitrate (mg/l) | 1 | 0.2 | 0.16 | 0.46 | 0.1 | 0.1 | 0.1 | <10 |  |
| Sulphate (mg/l) | 2.5 | 8.8 | 2.5 | 2.5 | 0.5 | 0.5 | 0.5 | <20 |  |
| Orthophosphates LR  (mg/l) |  |  | 0.034 | 0.04 | 0.83 | 0.74 | 0.49 |  |  |
| Potassium (mg/l) | 1.4 | 0.7 | 0.9 | 0.7 | 0.7 | 0.35 | 0.6 | <6 |  |
| Iron (mg/l) | 0.01 | 0.04 | 0.12 | 0.42 | 0.02 | 0.01 | 0.01 | <0.3 |  |
| Fluoride (mg/l | 0.2 | 0.35 | 0.3 | 0.1 | 0.1 | 0.12 | 0.14 | <1.5 |  |
| Copper mg/l | 2.33 | 0.025 | 0.29 | 0.14 | 0.11 | 0.09 | 0.10 | <1.0 |  |
| Chromium mg/l | 0.06 | 0.02 | 0.07 | 0.02 | 0.05 | 0.22 | 0.05 | <0.05 |  |
| Chloride mg/l | 0.025 | 5.9 | 7.6 | 0.34 | 4.7 | 5.4 | 6.6 | <250 |  |
| Zinc | 0.4 | 1 | 0.9 | 0.2 | 0.1 | 0.2 | 0.15 | <5.0 |  |
| E. coli (counts/100 mL) | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | <1000  (WHO)\* |

\*WHO recommends <1000 faecal coliforms (FC) per 100 ml (geometric mean) for unrestricted irrigation; a the WB EHS guidelines for drinking water are based on the WHO recommended guidelines

128

**Physical properties**

#### Turbidity

Turbidity in surface water may be influenced by high flows during the rainy season due to sediment erosion and turbulence in the waterbed. For groundwater, the major influences on turbidity are human activities and low water volumes in the dry season. In streams, high sediment load can result in harm to habitat areas for fish and other aquatic life. The suspended particles can also serve as a hiding place for harmful bacteria as well as attachment of toxic chemicals. For this reason, turbidity readings can be used as an indicator of potential pollution in a water body. High turbidity in drinking water is aesthetically unappealing and may also represent a health concern. Turbidity can provide food and shelter for pathogens. If not removed, high turbidity may render disinfection ineffective and encourage regrowth of pathogens in the water, leading to waterborne disease outbreaks. The World Health Organization (WHO) standard for treated water is 5 NTU or less. All the sample sites meet this threshold except for the surface water sample at Camp David. However, this value is considered normal for untreated swamps considering the bacterial standard for irrigation water.

The WHO does not specify a single universal temperature threshold for surface water and groundwater in its guidelines. Instead, WHO provides guidelines and recommendations for water quality of parameters that are temperature dependent, which include microbial contamination, chemical substances, and physical factors.

#### Temperature

The temperature of water plays a pivotal role in biological activity and growth, water chemistry, measurements of water quantity, and the types of organisms inhabiting aquatic environments. It governs the selection of organisms capable of thriving in water bodies. Fish, insects, zooplankton, phytoplankton, and other aquatic organisms each have their preferred temperature ranges. When temperatures deviate significantly from these preferences, the population of these species decreases until they are no longer present. Furthermore, temperature has an impact on the rate of chemical reactions, generally increasing as temperature increases. Water, particularly groundwater, with elevated temperatures, can dissolve a greater quantity of minerals from the surrounding rock, resulting in higher electrical conductivity.

The temperature threshold for surface water and groundwater can vary significantly depending on the specific location, environmental conditions, and the type of water body. There is no universal temperature threshold for all surface waters and groundwater. However, there are some general information on temperature in different areas around the world:

* **Surface Water:** In tropical areas such as Sierra Leone, the surface water temperatures often remain warm throughout the year. The temperature of tropical seas and oceans typically ranges from about 25 to 29 degrees Celsius or higher. Lakes and rivers in tropical regions can also have temperatures within this range, depending on their size, depth, and exposure to sunlight.
* **Groundwater:** Groundwater temperatures in tropical regions are influenced by factors like the local geology and depth of the water table. In many cases, groundwater temperatures in tropical areas can range from around 24 to 27 degrees Celsius or warmer, particularly in shallow aquifers. Groundwater may be cooler at deeper aquifers or during the cold season, but it still tends to reflect the relatively warm ambient air temperatures of the region.

The range of temperature values in this survey are 17.4°C (mostly groundwater in the cooler season) to 26°C (stream samples), which are considered normal water temperatures for this part of the world and the time of year.

**Chemical and physicochemical properties**

#### Ammonia

Natural sources of ammonia include the decomposition or breakdown of organic waste matter, gas exchange with the atmosphere, forest fires, animal and human waste, and nitrogen fixation processes.

Ammonia can enter the aquatic environment via direct means such as municipal effluent discharges and the excretion of nitrogenous wastes from animals, and indirect means such as nitrogen fixation, air deposition, and runoff from agricultural lands. It can also enter the water as a chlorine disinfection by-product.

It causes direct toxic effects on aquatic life. When it is present in water at high enough levels, it is difficult for aquatic organisms to sufficiently excrete the toxicant, leading to toxic build-up in internal tissues and blood, and potentially death. Environmental factors, such as pH and temperature, can affect ammonia toxicity to aquatic animals. The WHO has no recommended guideline value for ammonia. However, the USEPA sets the allowable concentration for a one-hour acute exposure at 17 mg/L or below, and for chronic exposure (30-day rolling average) at 1.5 mg/L. The baseline values reported are all below these two thresholds.

##### Nitrites

Nitrites are a salt nitrous acid, which can be naturally or artificially occurring in groundwater. Nitrites come from fertilizers through run-off, sewage, and mineral deposits. The WHO recommended guideline is 3 mg/L or less. All the samples have nitrite values less than this threshold, indicating a benign baseline in contiguous surface and groundwater at the project site.

##### Total Dissolved Solids

The dissolved solids concentration in water refers to the sum of all the substances, organic and inorganic, dissolved in water. This TDS includes calcium, magnesium, sodium, potassium, bicarbonate, sulphate, chloride, nitrate, and silica as the typical makeup of most of the dissolved solids in water. High concentrations of dissolved solids are more common in groundwater owing to the dissolution of minerals from rocks in the aquifer. Water with high total dissolved solids usually is hard because calcium and magnesium—the two elements that define hardness in water—are two of the major components of dissolved solids in groundwater. Also, chloride is a major component in groundwater due to inflow of sewage. The WHO recommended guideline for TDS is 240 mg/L or less. All the readings were below this threshold.

##### pH

The pH is an indication of the acidity or alkalinity of the water. It ranges from 0.0 to 14.0. When the pH is 7.0 the water is neutral. The water is acidic when the pH is below 7.0, and alkaline when the pH is above 7.0. The WHO recommends that normal pH values be between 6.5 and 8.5. The pH values in all the samples ranged from 5.2 to 7.0; four of the well water samples and the swamp areas have pH less than the WHO recommended lower threshold of 6.5. These values are, however, consistent with the slightly acidic waters of Sierra Leone. This implies that a future pH value less than the recommended range may not necessarily be attributed to the proposed activity; a further investigation on counterfactual causation will be required. Moreover, the nature of the proposed activity does not pose a significant public health concern regarding pH of surface water and groundwater in the project area.

**Biological Properties**

###### E. *coli*

E. *coli* (Ee KOE-lye) is a group of bacteria that live in the intestine of warm-blooded animals including humans and cattle. Hence, human and animal waste are the major sources of E. *coli* in water sources. E. *coli* includes a harmful strain that produces a powerful toxin that can cause severe illness. Surface runoff transports human waste from open defecation and pit latrines into streams, wetlands/ swamps or groundwater. The polluted runoff mixes with sources of drinking water and renders them contaminated. Consumption of or contact with water contaminated with faeces of warm-blooded animals can cause a variety of illnesses. Minor gastrointestinal discomfort is probably the most common symptom; however, pathogens that may cause only minor sickness in some people may cause serious conditions or death in others, especially in the very young, old, or those with weakened immunological systems. The WHO guideline for E. *coli* in treated water is zero. The sample from Camp David is above this threshold. However, the maximum E. *coli* count was 5 per 100 mL sample, which is not high enough to cause public health concern. Moreover, this value is lower than the FAO standard of <1000 for irrigated water. Notwithstanding, the consultant recommends that the proponent designs and implements an appropriate wastewater treatment system at all project sites as part of their ESMP with the goal of minimising severe E. *coli* impacts in the project area.

#### 5.1.5. Noise

Noise disturbance can have negative impacts on both communities and workers. Prolonged exposure to excessive noise levels can result in physical and psychological health effects, such as hearing loss, tinnitus, stress, and sleep disturbances.

In the case of communities, noise disturbance from nearby industrial or construction activities can impact their quality of life and social well-being. The noise can cause annoyance, discomfort, and even conflict between neighbours. Excessive noise can interfere with communication, recreation, and other daily activities. ***Table 5-3****: Noise levels in the project area*  shows noise values at 5 locations in the project area. All noise readings were made during the day.

# Table 5-3: Noise levels in the project area

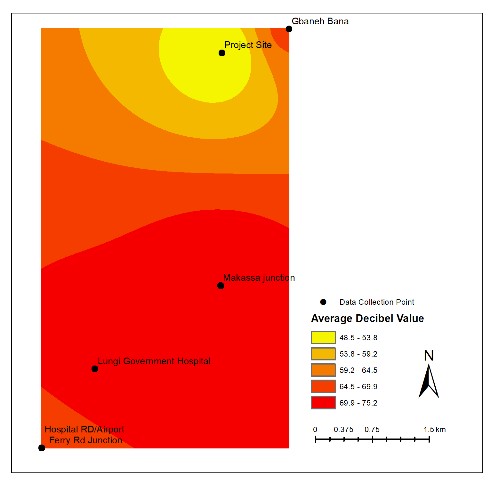
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sample location** | **Description of sample location** | **Easting** | **Northin g** | **Averaged**  **(dB)**  **Values**  **November**  **2022** | **Averaged**  **(dB) Values**  **May 2023** | **IFC/EHS guidelines** |
| Project Site | Along a road normally used by motorbikes and people | 699268 | 958429 | 48.50 | 45.2 | 55 |
| Gbaneh Bana | Along Lungi-port Loko highway | 700156 | 958743 | 66.38 | 56.7 | 55 |
| Makassa junction | On the Lungi-port Loko highway | 699251 | 955349 | 75.20 | 62 | 55 |
| Lungi  Governme  nt Hospital | Main road used by vehicles, motorbikes and people | 697588 | 954246 | 73.00 | 74.4 | 55 |
| **Sample location** | **Description of sample location** | **Easting** | **Northin g** | **Averaged**  **(dB)**  **Values**  **November**  **2022** | **Averaged**  **(dB) Values**  **May 2023** | **IFC/EHS guidelines** |
| Hospital RD/Airpor  t  Ferry Rd  Junction | Main road used by vehicles, motorbikes and people | 696884 | 953201 | 66.35 | 64.7 | 55 |

*Source: Baseline survey (November 2022/May 2023)*

Noise levels and their impacts vary depending on the time of day, type of community, age range of recipients, and existing regulations. Chronic exposure to noise during early childhood has been shown to impair reading acquisition and reduce motivational capabilities and the longer the exposure, the greater the damage. Noise can induce stress depending on variations with time. During daytime, few people become aggravated at LAeq levels below 55 dB, and few are moderately annoyed at LAeq levels below 50 dB. During the evening and night, however, sound levels are recommended to be 5– 10 dB lower than during the day (***Figure 5-6****: Noise level map of the project area* ).

According to the International Organization of Standards (ISO), standard 1999 asserts that long-term exposure to a 24-hour equivalent continuous sound level (LAeq,24h) of up to 70 dB(A) will not result in hearing impairment. To avoid hearing loss from impulse noise exposure, the ISO 1999 recommends that peak sound pressures should never exceed 140 dB for adults, and 120 dB for children.

Sources of continuous noise in the project area include intermittent traffic from vehicles, heavy equipment, bike riders and aircraft. All locations except the project site in Table 5.3 are above the recommended IFC guideline for daytime ambient noise for residential places.



***Figure 5-6: Noise level map of the project area***

##### 5.1.6. Air Quality

A total of five sample sites were selected for measuring the concentrations of various air quality parameters. Concentrations were measured every minute within a 30-minute sample period. These were computed into averages per site. The background air quality values in this impact assessment are defined as the concentrations measured before the commencement of the project activities. The parameters measured include particulate matter (PM), ozone (O3), Nitrogen dioxide (NO2), and Sulphur dioxide (SO2). Table 5-4: *Air quality parameters in the project area*shows concentrations of air quality parameters. May 2023 readings represent the end of the dry season (or the beginning of the rainy season) while the November readings mark the end of the rainy season (or the start of the dry season).

# Table 5-4: Air quality parameters in the project area

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample location** | **Easting** | **Northing** |  | **N** | **ovember 2022** | |  |  |  | **May 2023** |  |  |
| SO2  (µg/m3) | NO2  (µg/m3) | O3  (µg/m3) | PM2.5  (µg/m3) | PM10  (µg/m3) | SO2  (µg/m3) | NO2  (µg/m3) | O3  (µg/m3) | PM2.5  (µg/m3) | PM10  (µg/m3) |
| Project Site | 699268 | 958429 | 270.00 | 60.94 | 0.86 | 4.40 | 13.00 | 114.84 | 23.08 | 23.00 | 6.04 | 23.00 |
| Gbaneh Bana | 700156 | 958743 | 210.00 | 26.39 | 11.84 | 5.00 | 11.60 | 88.81 | 24.83 | 25.73 | 4.58 | 17.54 |
| Makassa junction | 699251 | 955349 | 220.00 | 25.11 | 12.98 | 4.20 | 10.20 | 94.34 | 30.07 | 24.81 | 6.65 | 21.12 |
| Lungi Government Hospital | 697588 | 954246 | 230.00 | 30.94 | 13.94 | 5.40 | 16.40 | 91.86 | 28.10 | 26.70 | 12.31 | 62.92 |
| Hospital RD/Airport Ferry Rd Junction | 696884 | 953201 | 230.00 | 33.48 | 11.31 | 7.00 | 15.00 | 101.41 | 35.19 | 24.20 | 5.92 | 26.19 |
| **WHO Guidelines/ (a WB EHS guidelines)** | | | **500** | **200** | **100** | **25** | **50** | **500** | **200** | **100** | **25** | **50** |

a the World Bank EHS Guidelines for ambient air quality are based on the WHO recommended guidelines *Source: Baseline survey (November 2022/May 2023*

147

**Particulate Matter (PM)**

According to the World Health Organization, PM is usually treated as a proxy indicator of air pollution because it affects more people than any other pollutant. It may represent most of the concerning air contaminants, including sulphate, nitrates, ammonia, sodium chloride, black carbon, and mineral dust. The WHO defines PM as a complex mixture of solid and liquid particles of organic and inorganic substances suspended in the air.

A PM with a diameter of 10 microns or less (≤ PM10) can penetrate and lodge deep inside the lungs; a smaller diameter PM (≤ PM2.5)can penetrate the lung barrier and enter the blood system. Chronic exposure to PM may lead to the risk of developing cardiovascular and respiratory diseases and lung cancer. The WHO recommended standards for a 24-hour ambient PM10 are 150 µg/m3 (Interim target 1), 100 µg/m3 (Interim target 2), 75 µg/m3 (Interim target 3) and an average daily air quality guideline (AQG) of 50 µg/m3. The recommended standards for PM2.5 are 75 µg/m3 (Interim target 1), 50 µg/m3 (Interim target 2), 37.5 µg/m3 (Interim target 3), and an average daily AQG of 25 µg/m3. The WHO’s interim targets are used to guide reduction efforts towards the ultimate and timely achievement of the AQG levels.

For PM2.5, all the readings were lower than or within range of the daily average threshold for both periods. For PM10, the average at the Lungi Government Hospital was higher than the daily average threshold. However, concentration at this same site in 2022 was lower than the threshold. Activities at all these sites indicated that PM values fluctuate between high and low concentrations in different times of day. High concentrations represent days and hours of heavy traffic in the area. Transportation mainly by motor bikes is the major source of dust emission in the communities.

**Ozone (O3)**

Ozone is one of the main components of photochemical smog, and as such, it is regarded as an air contaminant at ground level. Pollutants like nitrogen oxides (NOx) from automobiles and industries, as well as volatile organic compounds (VOCs) generated by vehicles, undergo photochemical reactions in the presence of strong sunlight to form O3. The WHO states that exposure to O3 can worsen asthma, induce breathing issues, impair lung function, and lead to lung illnesses. The WHO recommends a daily maximum O3 emission of 100 µg/m3 for 99% of 8-hour days in a year. All the O3 values are well below the recommended threshold for maximum contaminant level.

***Nitrogen dioxide (NO2)***

3 locations in the project area are the only one with NO2 concentration higher than the recommended standard for daily average. Worthy of note, however, is that this average does not represent a daily average. There is also evidence of fluctuations between days.

##### Sulphur dioxide (SO2)

The Permissible Exposure Limit (PEL) established by OSHA is 5 ppm SO2 averaged over 8 hours of exposure in light of these concerns. The background concentrations are well below the PEL recommended by NIOSH.

###### 5.1.7. Traffic Monitoring

A local traffic assessment was conducted through a traffic count on the project access road. Counts were made at 2 locations – at the project site and on the main highway at the Gbaneh Bana junction. The evaluation was carried out by conducting three days of field monitoring from the 1st to the 3rd of May, with each day's monitoring period running from 7 am to 7 pm (***See Table 5-5****: Traffic count at the project site Table 5.1*).

# Table 5-5: Traffic count at the project site Table 5.1: Traffic count at the project site

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Date** | **Okada** | **Vehicle** | **Bicycle** | **Child** | **Adult** | **Aged** |
| 1/5/2023 | 289 | 5 | 8 | 37 | 207 | 22 |
| 2/5/2023 | 208 | 62 | 5 | 239 | 303 | 80 |
| 3/5/2023 | 230 | 18 | 7 | 200 | 285 | 57 |
| **Total** | **727** | **85** | **20** | **476** | **795** | **159** |

The data shows that motorcycle ‘Okada’ is the most common mode of transportation along the project access road and surrounding communities. Residents noted that traffic is high between 9am to 7pm daily***. Figure 5-7:*** *Traffic count on the main highway*  depict the major traffic on the main highway.

***Figure***

***5***

***-***

***7***

***Traffic count on the main highway***

***:***

0

200

400

600

800

1000

1200

1400

1600

1800

2000

Okada

Car

Truck

count

1

/

5/2023

2

/

5/2023

3

/

5/2023

Total

###### 5.1.8. Ecology and Biodiversity

The current vegetation distribution shows a vast area of degraded land, mainly comprising bush fallows (farm bush), covering approximately 50% of the land area.

The general ecology and physiognomy of the plant community in the western to north-western Sierra Leone, encompassing the areas selected for the solar project at Lungi, is influenced by a combination of factors, namely: (i) both occur within the transition zone between forest and savanna biomes; (ii) the climatic conditions and weather patterns along the Atlantic coast; and (iii) anthropogenic pressures, such as agriculture and human settlements. Thus, this rapid ecological assessment has taken into consideration the effect of current and historic factors that have influenced the status of the ecology of the project area and the diversity and distribution of flora and fauna present. For this study, the diversity distribution and conservation status of the vegetation, mammals, birds and butterflies have been used as appropriate measures and indicators of the ecological impact of the project at the proposed project site at Lungi.

The study was limited to two main study sites, namely: (i) the main site where the solar panels/BESS and other facilities will be installed, which is located proximal to Koimaya and Youriya; and (ii) the transmission line route, which will run through Koimaya village, Lungi Town, the hospital and potentially to be connected to powerhouse servicing Lungi International Airport. The key survey points are given in Table 5-6*: Sites surveyed for assessment of vegetation and fauna diversity*  and ***Annex XV*** presents these sites on a map.

# Table 5-6: Sites surveyed for assessment of vegetation and fauna diversity

|  |  |  |  |
| --- | --- | --- | --- |
| **Survey Point & Nearest Settlement** | **Eastings** | **Northings** | **Summary vegetation description** |
| Main project site | 699179 | 958174 | Dense wild oil palm within the site. Wild oil palm trees mixed with *Anisophyllea laurina* dominant farmbush. *Mellitia pallens* dominates the mature farmbush |
| Point A | 688299 | 958087 | Burnt farmbush, probably done by prepared by a local farmer for the new farming season. |
| Point B | 699177 | 958277 | A patch of grassland, which may have been derived from overuse from farming |
| Point C | 699428 | 958368 | A portion of the farmbush that has grown into a mixed species secondary regrowth including oil palm |
| Point D | 698976 | 958098 | An apparently disused oil palm plantation. There are clear evidence of palm wine tapping which reduces productivity of the oil palm. |
| Pont E | 699372 | 958986 | An upland ecology dominated by wild oil palm *Elaeis guineesis* farmbush regrowth, patches of invasive weed *Chromolaena odorata* and napier grass *Pennisetum purpureum*. |
| Point F | 699124 | 959138 | A swamp ecology of *Raphia farinifera* palm dominated, with edges invasive weed grases *Chromolaena odorata* surrounded with wild oil palm. |
| Point G  Koimaya Village | 699833 | 958573 | A farm bush ecology comprising a mixed tree stands of wild oil palm *Elaeis guineesis*, *Gmelina arborea* and fench stick *Anisophyllea laurina*. |
| Point H  Yourriya Village | 699480 | 958451 | Human settlement surrounded by vegetation dominated by wild oil palm palm *Elaeis guineesis* and Mango *Mangifera indica.* |
| Point I  Swamp Area  Suctarr | 698808 | 957270 | An open and extensive swamp ecology with vegetation comprising rice cultivation napier grass *Pennisetum* purpureum invasive weed *Chromolaena odorata* and stands of wild oil palm *Elaeis guineesis* |
| Point J | 697576 | 954205 | Human settlement with some level of social infrastructure such as a hospital. A significant number of houses observed. |
| Point K | 698484 | 959896 | A swamp ecology of *Raphia farinifera* palm dominated, with edges invasive weed grases *Chromolaena odorata* surrounded with wild oil palm. |

Source: Baseline survey (November 2022 and May 2023)

###### 5.1.9. Vegetation Description and Botanic Characteristics

***Description***

The project area is located within the western flank of the forest-savanna transition zone and is highly affected by widespread slash and burn agriculture, such that much of the vegetation is derived and comprises mixed elements of bush fallows, derived savanna and small patches of forest regrowth. The landscape and vegetation description of the core project site (the solar farm site and the transmission line) are given below.

##### The Proposed Solar PV and BESS Site

At the solar site, which is located midway between Koimaya and Youriya ***Figure 5-8:*** *Drone footage of project site*  the vegetation is more or less a mixed species woodland and secondary growth inundated by oil wild palm *Elaeis guineenis*. From observation, the location is historically one that has undergone many years of farming and has been long abandoned, probably due to declining productivity. The derived vegetation and plant community comprises stands of oil palm *E guineensis*, mango trees, *Gmelina arborea* and a few other tree stands, patches of grassland and some open areas that are apparently laterite pans. The patches of grassland is covered in grass species such as *Imperata cylindrica, Pennisitum purpureum* and at the edges of the site are *Panicum maximum*, none of which are of conservation significance. A section of the secondary growth in the site is has a dominance of *Milletia pallens*, which is a small tree species with extensive crown, found across West Africa and has a widespread distribution in Sierra Leone (Burkill, 1985). In parts of the country, the leaves and bark of the plants are used for medicinal purposes. Oil palm *E. guineensis* is the most widespread tree stand and it is apparently routinely harvested for palm oil, whilst some of the stands have been tapped for palm wine.



***Figure 5-8: Drone footage of project site***

No species of plants of global conservation concern were observed in the site, and none of the subhabitats (farmbush, secondary growth and patches of grassland) are of critical conservation importance, ince this is the most common habitat types in the area. No wetlands or flood zones occurs in the proposed project site and so its ecology is purely terrestrial, and its fauna is predominantly characterized by species that are generalist and those that can tolerate disturbance. In general, the vegetation in this area is not radically different from that of the immediate surroundings and comprises elements that are common across most of the areas traversed by the transmission line route in that surrounding. However, its tree density is reasonably high compared to some of the surrounding areas and has no legal protection status.

##### The Transmission Corridor

The ecology of the transmission route and adjacent areas are characterized by open landscape with derived vegetation, remnants of degraded forest, flood zones and swamps, and bush fallows (***Figure 5.9***). From observation, the swampy areas are part of the hydrological network of tributaries, streams and flood zones, especially in the Suctarr swamp area. These are the most important ecologies along the transmission line because they support both biodiversity and local livelihoods through swamp farming (mainly rice) and fishing on the other hand. The long history of slash-and-burn agriculture is the most influential factor that has transformed the vegetation in the area, leading to the prominence of mixed vegetation of farm bush and derived savanna. Farmbush is the fallowing state of abandoned farmland after a couple of years of cultivation. In Sierra Leone, the empirical data for the period of fallowing is 6 to 7 years, but with the growing demand for land for development, housing and agriculture, fallow periods in these areas have declined considerably, accompanied by increasing cultivation of floodplains and swamps.



***Figure 5-9: Vegetation types found along the transmission line route***

Left to right – grassland between Suctarr and the proposed plant site; a patch of oil palm dominated mixed vegetation; a portion of Suctarr swamp.

##### The Swamp

The swamp in the project area is located in the Suctarr village (see Figure 5-10). It is an important ecology along the transmission line because it supports local livelihoods through swamp farming (mainly rice). The stream flowing through the swamp provides water to the local community for various purposes such as bathing, laundering and leisure. The dominant species along the edges of the swamp area are grasses *Andropogon gabonensis* and *Cyperus* *erythorhizos Cyperus haspen* and *Cyperus paniceus* sp.

***Figure***

***5***

***-***

***10***

***:***

***Swamp area in Suctarr Village***

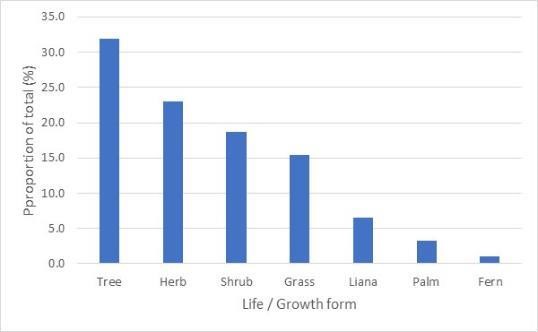


##### Terrestrial Ecology

The terrestrial ecology is mainly remnant of secondary cover mainly comprises fruit trees (such as mangoes and cashew) and a few stands of native forest timber species, such as *Terminalia ivorensis* and *Afzelia africana*, both of which are listed as vulnerable by IUCN (2022). These occurs in places along the transmission line (see ***Table 5.7***. There is a somewhat reasonable tree density in places, interspersed by oil palm stands, which is observed to be cultivated in a few locations. In addition, the landscape in this site, especially along the transmission line is characterized by relatively advanced infrastructure including a hospital and dwelling houses, and crisscrossing waterways and swamps. A more recent change in the landscape is the development of a new airport terminal, runway and facilities, which may have had significant alteration on some portions of the ecology, including clearing of vegetation for construction purposes. Although the airport facilities may be at a reasonable distance from the transmission corridor, the vegetation loss due to its construction may have had some significant effect on the distribution of species such as birds.

A total of 91 species belonging to 37 plant families of vascular plants was identified (Annex XII) across all survey sites on the site and transmission lines. A significant proportion of the plant species encountered were trees (Figure 5.10). Although shrubs also accounted significantly among the growth forms recorded. Most of the tree species are timber species and are used for various purposes ranging for timber, log for the construction of housing, fuel and charcoal production. No globally threatened species were recorded at the proposed site and along the transmission corridor.

The most abundant species recorded along the transmission corridor were *Andropogon gabonensis* (Family Poaceae) and *Chromolaena odorata* (Family Compositae). The grass *A. gabonensis* is found associated with flood zones along streams and IVS, and *C. odorata* dominates farmbush communities, especially along the edges of fallows that are between one and four years. *C. odorata* is considered a serious invasive herbaceous shrub, which is devastating vast areas of farmbush in the country and, according to local farmers, is injurious to crop yield and farm animals. However, some empirical evidence show that the species have been used to enhance fallow soil nutrient replenishment in some agroecosystems, but this has not been tried in Sierra Leone. Randomly and in places along the transmission lines, the most prominent tree stands in the landscape is oil palm *Elaeis guineensis* (both wild and cultivated), which contributes significantly to the economy of the two areas in which the proposed sites occur respectively.



***Figure 5-11: Species recorded for each of the plant life/growth forms***

Another species of interest is *Anisphyllea laurina* (Family Anisophyllaceae), popularly known as fence stick in Sierra Leone. A. laurina is an early pioneer species in plant community succession and once mature it usually harvested from farmbush that are between five and eight years old. The species is extensively used locally for housing construction and scaffolding, and so is a vital commercial product from the fallow holdings of the family, thus a means by which income from farming is significantly enhanced. Trees (29.2%), followed by herbs (26.9), made up the largest growth forms among plant species recorded.

The main site selected for the installation of the solar panels is more or less a mature farmbush with dense wild oil palm *Elaeis guineensis* mixed with *Anisophyllea laurina* and a dominance of *Mellitia thorningii*. Oil palm provides viable long-term socioeconomic benefits to the people through the production of the palm oil, which is a popular ingredient in the daily cuisines of Sierra Leoneans, whilst the tree is also tapped for palm wine, which is extensively drank across all areas in the country *A. laurina* is a very important source of poles for building constriction, whilst *M. thorningii* is a shrub from which medicinal concoction are made to treat schistosomiasis and diarrhoea. So, these small patches of vegetation provide significant ecosystem services to the local communities.

###### *Diversity of Uses*

Of the 91 species of plants recorded during the surveys, 75 were found to be used by the communities around the project site for various purposes ranging from food to wood fuel. Figure 5.1 shows the comparative distribution of uses of plant species by communities. The largest proportion of use of the plant species recorded are for the preparation of medicinal concoctions (41.5%), followed the use as food (33.8%) and for various utilities (14.6%). In almost all uses, there were higher proportion of plants recorded being used for medicinal purposes compared to other uses. This indicates a high dependence of the local population on the plant resources in the area for various uses ranging from food to household utilities. Thus, the small patches of degraded forest cover around them, some of which are found in close proximity to the proposed solar pant site and along the transmission line, are important sources of the wild fruits and plant materials that they use.

0

5

10

15

20

25

30

35

40

45

Medicinal

Food

Utilities

Wood

Timber/log

**Proportion of uses (%)**

**Plant uses**

***Figure 5.1 Distribution of plant species among different plant uses***

##### Diversity of fruit trees

Eight (8) species of fruit trees were recorded as listed in **Table 5.2**in order of their economic value to the local people; the family names and common names are included. The most common and commercially viable ones are Oil Palm *Elaeis guineensis* and Mango *Mangifera indica*. These fruits are very important component of the socio-economic life of the local people. Palm oil, which is an extract from the juicy mesocarp of oil palm is a regular ingredient of local cuisines and so it has a big market in Sierra Leone and now large plantation of the fruit are now being established in different parts of the country to supply international markets. The palm nut is also used to make nut oil and can be sold to local companies for various other uses.

Mango *Mangifera indica* is the most common fruit tree encountered across all zones surveyed along the transmission corridor. The mango fruit is a viable hunger fruit, which comes in several varieties and seasonally provides much need subsistence income during economically difficult period of the year. Up to five varieties of mangos are known in the area, all of which are edible, juicy and sweet when ripe. Mango fruits emerge at the start of the rainy season (April-June), which coincides start of the farming season, during which there is very little food available to the household. Mangos serve to augment the little food and income that is available and to some extent support the farming activities at that point in time.

***Table 5.2: Fruit Trees Recorded in the Project Area***

|  |  |  |  |
| --- | --- | --- | --- |
| **Fruit species** | **Plant Family** | **Common Name** | **% of Economic Importance** |
| *Elaeis guineensis* | Palmae | Oil palm | 30 |
| *Mangifera indica* | Anacardiaceae | Mango | 20 |
| *Cocos nucifera* | Palmae | Coconut | 15 |
| *Ananas comosus* | Bromeliaceae | Pineapple | 10 |
| *Anacardium occidentale* | Anacardiaceae | Cashew | 10 |
| *Musa sapientum* | Musaceae | Banana | 5 |
| *Carica papaya* | Caricaceae | Pawpaw | 5 |
| *Spondias cytherea* | Anacardiaceae | Ambarella fruit | 5 |

##### Fauna

From the data and observations generated, the diversity and distribution of fauna was based on vegetation status and distribution in the selected areas for the study. However, as a consequence of the degraded nature of the vegetation and probably the pressure on the megafauna (birds and mammals), the density and diversity of these taxa were quite low compared to the average viable habitat for wildlife in the country. Trapping pressure for small mammals (ungulates) is generally high in areas with no form of legal protection, as in the case in the project site. However, with the current status of the vegetation, it is expected that the encounter rates for mammals and birds in these locations are very low.

##### Herpeto-fauna

A total of fourteen (14) amphibians and reptiles were recorded in Swamp areas and around the proposed PV and BESS site (see Tables 5.8 and 5.9).

None of the species recorded are globally threatened, or of restricted distribution in the country. Based on the general ecological setting in the area, which has experienced long years of sustained farming and is under constant human pressures, only common disturbance-tolerant species are expected to be present in the site and so its herpetofauna diversity will comprise common species that have widespread distribution and can tolerate some level of degradation.

In terms of amphibians, 10 species were recorded in and around the Suctarr Swamp and along the transmission lines. With the except of *Sclerophrys regularis*, none of the others were recorded within the PV and BESS site. There is no sensitive habitat for amphibians in the area that would suggest the presence of threatened or restricted range species of amphibians.

# Table 5-7: Amphibians Recorded

|  |  |  |
| --- | --- | --- |
| **Amphibians** | **Family** | **IUCN Status** |
| *Afrixlus guadrivittatus* | Hyperoliidae | Least concern |
| *Leptopelis viridis* | Arthroleptidae | Least concern |
| *Xenopus tropicalis* | Pipidae | Least concern |
| *Amnirana galamensis* | Ranidae | Least concern |
| *Conraua alleni* | Conrauidae | Least concern |
| *Ptychadena submascareniensis* | Ptychadenidae | Least concern |
| *Hoplobatrachus occipitalis* | Dicroglossidae | Least concern |
| *Ptychadena pumilio* | Ptychadenidae | Least concern |
| *Slerophrys regularis* | Bufonidae | Least concern |
| *Sclerophrys maculate* | Bufonidae | Least concern |

###### Reptiles

There are 67 species of reptiles known in Sierra Leone; 3 species are endangered including large reptiles. Only four species were recorded during site survey, and all are of least conservation concern. The ecologies in the area most certainly do not support large diversity of reptiles. Apart from the list in Table 5.9, other possible occurrences are the orange flanked skink *Mabouya mabouya* and the African agama *Agama africana*; both are of leasr conservation concern.

# Table 5-8: Reptiles recorded

|  |  |  |
| --- | --- | --- |
| **Reptile** | **Family** | **IUCN Status** |
| Bitis gabonidae | Viperidae | Least concern |
| Dendroaspis viridis | Elapidae | Least concern |
| Opheodrys aestivus | Colubridae | Least concern |
| Agama agama | Agamidae | Least concern |

###### Mammals

The number of species of mammals recorded was four, although a more intensive sampling using small mammal traps would have yielded more small mammal species such as rats and shrews. Generally, the mammalian diversity was low in both areas and so only a few species were encountered or indicated to occur by local people **Error! Reference source not found.**. Across all areas surveyed, the only mammal species encountered were medium to small mammals, one of which is an ungulate (Order Artiodactyla) the other four are rodents (Order Rodentia). Respondents from the local communities reported the presence of Green Monkeys *Chlorocebus sabaeus* at a patch of forest outside the area encompassing the core site and the transmission line. This species was not included in the list because of the fact that it was confirmed that it does not use any of the habitats encountered with the proposed project zones, meaning that the construction of the substation and the installation of the transmission line will not affect the habitats and foraging range of the species.

# Table 5-9: Mammalian species recorded during the survey

|  |  |  |  |
| --- | --- | --- | --- |
| **Common Name** | **Scientific Name** | **IUCN status** | **Order** |
| Maxwell's Duiker | *Philantomba maxwelli* | Least concern | Ungulate |
| Marsh Cane-rat | *Thryonomys swinderianus* | Least concern | Rodent |
| Fire-footed rope squirrel | *Funisciurus pyrropus* | Least concern | Rodent |
| Stripped Ground Squirrel | *Euxerus erythropus* | Least concern | Rodent |
| Brush-tailed porcupine | *Atherurus africanus* | Least concern | Rodent |

###### Avifauna

In total 69 species of 25 avian families were recorded across all sites visited: (*Error! Reference source not found.****11; Annex XII***). There was a good overlap in the diversity of the ubiquitous species, but quite distinct differences in species with specific habitat preferences. Eighteen (18) species were recorded that belong to the Guinea-Congo Forest biome dependent assemblage, which may be due to the existence of patches of degraded forest. Six species of migratory birds were recorded, five of which were of the Afrotropical assemblage and only one Palaearctic migrant. The swamp ecologies along the transmission line provides suitable habitat for migratory waterbirds; the active annual migratory period for Palaearctic migrants starts in December and ends in February and so the time of the survey does not favour the occurrence of species of the Palaearctic assemblages. Afrotropical migrants are nearly always seen around aquatic habitats, but their numbers tend to peak between July and September in response to moisture regimes.

# Table 5-10: Category of Birds Recorded

|  |  |  |
| --- | --- | --- |
| **Species category** | **Lungi Site and Transmission Line** | **National Total** |
| Number of Species | 69 | 642 |
| Number of Families | 25 | 69 |
| Resident species | 64 | 489 |
| Afrotropical migrants | 5 | 45 |
| Palaearctic migrants | 1 | 98 |
| GC biome spp | 18 | 174 |
| UGF endemic spp | 0 | 14 |
| SG Savanna biome spp | 1 | 28 |
| IUCN Threat status Total | 0 | 30 |

*Note that only common birds were recorded at the specific site location.*

###### Butterfly diversity

During the survey a total of 85 species of butterflies were encountered comprising 605 individuals (*Error! Reference source not found.****; Annex XIII***). The species are distributed among five families - Nymphalidae, Pieridae, Papillionidae, Hesperidae and Lycaenidae. Nymphalidaeaccounted for the highest diversityof all species encountered and Lycaenidae had the least. The high occurrence of Nymphalids in both sites is not surprising as they form the largest group of butterflies and they are cosmopolitan, found in gardens with flowers and also degraded areas. Hesperiids and Lycaenids though also cosmopolitan, have their range limited to clearings near forests edges as they depend on shade from forest canopy and near rivers. This was not easily available in the study area as large portion of the concession area is already cleared out for Agriculture and/or construction of houses. None of the species recorded were of global conservation concern and so are listed as least concern in the IUCN Red List (2022). Figure 5.12 shows photos of some of the species encountered in the project area.

# Table 5-11: Species Distribution Among Butterfly Families recorded

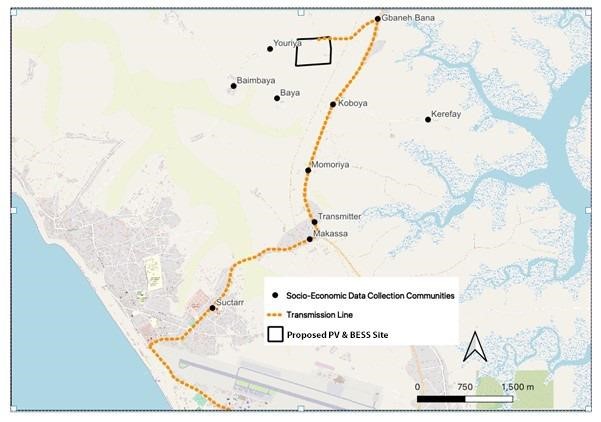
|  |  |  |  |
| --- | --- | --- | --- |
| **Families** | **Solar PV/BESS and environs** | **Transmission line** | **Total** |
| Nymphalidae | 50 | 52 | 55 |
| Pieridae | 14 | 14 | 14 |
| Papillionidae | 5 | 6 | 6 |
| Hesperidae | 6 | 7 | 8 |
| Lycaenidae | 2 | 2 | 2 |
| **TOTAL** | **77** | **81** | **85** |



***Figure 5.2: Photos of some species reported at Lungi. Clockwise, from top left: Euphaedra harpalyce, Graphium***  ***leonidas Bebearia arcadius and Catopsilia florella***

5.2. Socio-Economic Baseline of the Project Area

The socio-economic baseline is significant in determining residents' individual and household characteristics and living conditions as well as community infrastructure and basic social and economic services in the project area. ***Figure 5.3*** shows the communities where household social survey was carried out.



***Figure 5.3: Socio-economic data collection points***

The study aims to assess the potential impacts of the project on the surrounding communities and to identify opportunities to maximize the project's positive contributions to local socio-economic development. The study specifically seeks to:

* Identify and characterize project communities’ economic activity, traditional means of subsistence, revenue sources, and social dynamics.
* Evaluate the project's possible effects on the community's social and economic well-being, taking into account employment opportunities, income creation, and access to essential services.
* Evaluate the project's ability to support regional economic growth, including the establishment of new companies and jobs as well as the development of local supply chains.
* Profer recommendations for project design and implementation that promote positive social and economic outcomes for the surrounding project communities.

Socio-economic information of the communities was compiled through household interviews conducted in November of 2022. In addition to primary data obtained from communities and key informants, secondary data was sourced from various institutions including SSL, World Bank, the Port Loko District Council etc. The objective of socioeconomic baseline is to provide a comprehensive description of the existing social and economic conditions in the project area prior to activities of the proposed project. This baseline further provides a benchmark against which the potential impacts of the project can be assessed. 8 communities around the proposed PV/BESS site were sampled. Randomly administered pre-designed electronic household questionnaires via the KoBoCollect app to respondents in project area villages based on availability and accessibility. A total of 529 survey questionnaires were administered to households in the proposed project area.

The table below details the distribution of the surveyed population and respondents' demographic characteristics.

# Table 5-12: Distribution of survey population and respondents' demographic characteristics

|  |  |  |
| --- | --- | --- |
| **Community** | **No. of Questionnaires administered** | **%** |
| Gbaneh Bana | 308 | 58 |
| Koimaya | 10 | 2 |
| Baya | 14 | 3 |
| Kerefay | 14 | 3 |
| Santigieya | 70 | 13 |
| Youriya | 18 | 3 |
| Baimbaya | 49 | 9 |
| Koboya | 46 | 9 |
| **Total** | **529** | **100** |
| **Gender** | **Freq** | **%** |
| Male | 324 | 61 |
| Female | 205 | 39 |
| **Total** | **529** | **100** |
| **Age** | **Freq** | **%** |
| 19-29 Years | 86 | 16 |
| 30-39 years | 148 | 28 |
| 40-49 years | 131 | 25 |
| 50-59 years | 80 | 15 |
| Above 60 years | 84 | 16 |
| **Total** | **529** | **100** |
| **Household status of Respondent** | **Freq** | **%** |
| Household head | 407 | 77 |
| son/daughter of household head | 53 | 10 |
| father/mother of household head | 12 | 2 |
| spouse of household head | 57 | 11 |
| **Total** | **529** | **100** |
| **Marital status** | **Freq** | **%** |
| Divorced/Separated | 5 | 1 |
| Married | 429 | 81 |
| Single | 58 | 11 |
| Widowed | 37 | 7 |
| **Total** | **529** | **100** |

5.2.1. Community Demographic, Housing, and Infrastructure

The demographic profile of communities surrounding the proposed PV/BESS site is primarily derived from census data and other community records. These records are cross-referenced with information gathered from field observations and Key Informant Interviews (KIIs) between November 2022 and May 2023 (Table 5.13).

***Table 5.13: Demographic and Social Indicators***

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Community Name** | **Approx. no. of houses** | **Approx. population** | **Main Source of drinking**  **Water** | **Other sources of water** | **No. of pre &**  **Pri. Sch** | **No. of Sec. Sch**  **(JSS&SSS)**  **& Tertiary institutions** | **Type of**  **Health**  **Facility** | **No of**  **Churches & Mosques** | **Type(s) of cultural site in village** | **Other Infrastructure in the Community** |
| Gbaneh Bana | 275 | 2,992 | Hand pump  well | Well, stream | 1 | 1 secondary school | CHP | 4 Mosques | Yes (male) | Market |
| Koimaya | 14 | 98 | Hand pump  well | Stream | 0 | 0 | None | 1 Mosque | No | Poultry, Storage  Facility |
| Baya | 9 | 273 | Well | Stream | 0 | 0 | None | 1 Mosque | No | None |
| Kerefay | 20 | 480 | Well | Stream | 0 | 0 | None | 1 Mosque | No | None |
| Santigieya | 70 | 1995 | Well | Stream | 1 | 2 | None | 4 Mosques | No | Community centre Bakery |
| Youriya | 20 | 315 | Well | Stream | 0 | 0 | None | 1 Mosque | No | None |
| Baimbaya | 30 | 690 | well | stream | 0 | 0 | None | 1 mosque | No | Poultry |
| Koboya | 36 | 595 | Well | stream | 0 | 0 | None | 1 mosque | No | None |

###### Source: Gbaneh Bana CHC, Field study May 2023

161

5.2.2. Land Tenure and Land Use

The ownership and administration of land in the Gbaneh Bana/Koimaya community, as in other provincial towns and villages in Sierra Leone, followed a customary scheme in which land is owned by families but held in trust by tribal authorities, comprising the Paramount Chief and the Chiefdom Councillors. The customary law and the Provinces Land Act of 1927 (SLIEPA 2012, p. 7; The Oakland Institute, 2011, p. 18) govern the ownership and transfer of land areas outside the Western Area, rendering the direct purchase of land impossible. Consequently, the paramount chief holds the land in trust for landholding families, who typically lease/sell it to individuals or companies interested in investing.

It is noteworthy that the William Sheka Koroma family claim to own the proposed project site for the PV/BESS construction site but held in trust by the Paramount Chief of the Kaffu Bullom Chiefdom. Therefore, for the land to be utilized for the intended project, it is imperative to establish an agreement between the Government of Sierra Leone and the Koroma family, subject to the consent of the Paramount Chief of the Kaffu Bullom Chiefdom. In due course, as part of the land acquisition process of the project, it is known that the Koroma family, with the consent from the Paramount Chief of the Kaffu Bullom Chiefdom transferred the stated parcel of land (44.7583 Acres) through a willing-buyer willing-seller arrangement at a price voluntarily agreed to by both parties without explicit threat of state expropriation. Therefore, at present the GoSL, Ministry of Lands, Housing and Country Planning has transferred the stated plot of land located in Lungi Port Loko District in the Northern Province of the Republic of Sierra Leone to Ministry of Energy (MoE), fulfilling the necessary steps and with proper documentation including evidence of land sale agreement, payment transfer and conveyance letter for the specified land to MoE, dated 4th July 2023). See Annex VII (A, B, & C) and Annex VIII.

The proposed site appears to have been left fallow to restore its fertility, given its current uncultivated state. Notably, land in the Gbaneh Bana/Koimaya catchment area, including the inland valley swamps, is predominantly utilised to cultivate crops such as cassava, rice, cereals, and tubers. Of particular interest is the prevalent use of palm trees for the production of palm oil. Additionally, there are indications that mango trees, while offering fruit for consumption or sale, are also used for the production of charcoal, which serves as a means of livelihood.

5.2.3. Typical Housing Unit Type

The common dwelling units in the proposed project communities have walls made of cement blocks or burnt bricks, roofs made of corrugated metal/aluminium sheets or wood planks, and floors made of mud or concrete (Table 5.3).

***Table 5.3: Typical Housing Unit Type***

|  |  |  |  |
| --- | --- | --- | --- |
| **A. Wall** |  | **Frequency** | **Percentage** |
| Burnt brick with cement  Burnt brick with mud | 96 |  | 18.5  21.2 |
| 110 |  |
| Cement blocks | 196 |  | 37.6 |
| Mud and sticks/pole | 84 |  | 16.1 |
| Thatch, Straw | 35 |  | 6.6 |
| **Total** | **521** |  | **100** |
| **B. Roof** |  |  |  |
| Concrete/cement | 33 | | 6.4 |
| Corrugated metal/aluminium sheets | 363 | | 69.6 |
| Thatch, Straw | 57 | | 11 |
| Wood, Planks | 68 | | 13 |
| **Total** | **521** | | **100** |
| C. Floor |  | |  |
| Concrete  Mud | 238 | | 45.7  54.3 |
| 283 | |
| **Total** | **521** | | **100** |

***Source:*** *Socio Economic Household Survey November 2022*

5.2.4. Number Households in a Dwelling Unit

The data in Table 5.4 indicates that there is typically one household per dwelling unit in the proposed project area as 53.1 of respondents live in a single household unit. However, according to the 2021 Midterm population and housing census, the average household per dwelling unit in the Northern region is four (4).

***Table 5.4 Number of Households in a Dwelling Unit***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of households** |  |  | **Freq.** | **Per cent** |
| More than three households |  |  | 20 | 3.8 |
| One household |  |  | 281 | 53.1 |
| Three households |  |  | 84 | 15.9 |
| Two households |  |  | 144 | 27.2 |
|  |  | **Total** | **529** | **100.0** |

***Source:*** *Socio Economic Household Survey November 2022*

5.2.5. Livelihood and Economy

Farming and trading are the predominant livelihood sources for communities in the project area, with many community members engaged in these activities to generate income and sustain their families. Agriculture is mainly subsistence-based and is practiced on a small scale, with farmers growing crops such as rice, cassava, and vegetables. The harvested crops are mostly sold in local markets to generate income.

In addition to agriculture, trading is also a significant source of income for many in the area. The popular trading system known as "Lumar" is a common practice in the region. This activity draws participation from communities around the area and also outsiders, providing a significant boost to the local economy through trading. The Lumar system involves traders who purchase goods from other traders and sell them at a higher price to make a profit. This system also helps to distribute goods to other areas within and outside the region, promoting regional trade and commerce.

Fishing is also a livelihood source for some coastal communities in the area. Many coastal communities depend on fishing as their primary source of income. Fishermen commonly use traditional fishing methods to catch fish.

Although mining also takes place in the district, there are no major mining activities known in the primary project area. Despite this, the mining sector contributes to the economy of the region by providing employment opportunities and generating income for communities engaged in the sector.

According to data analysed from the socioeconomic household survey, 64.7% of respondents surveyed in the area are self-employed in agriculture enterprise while 18% are primarily engaged in trading. Formal employment is low in the project area. This could be related to the lack of skills and low level of literacy rate as well as the scarcity of formal jobs in the area. Only 4% of respondents surveyed registered unemployed status and were actively seeking jobs.

Additionally, as shown in Table 5.5, the average monthly income of respondents from their current occupation or economic engagement is between NLE 400 – NLE 800. ***Table 5.5 Average income distribution among household heads***

|  |  |  |  |
| --- | --- | --- | --- |
| **Average monthly income from the main occupation** | | **Freq.** | **Per cent** |
| Le 2100,000 – Le3,000,000 | | 5 | 0.9 |
| Le 3100,000 – Le4,000,000 | | 3 | 0.6 |
| Le1100,000 - Le2m | | 26 | 4.9 |
| Le 201,000 - Le 400,000 | | 73 | 13.8 |
| Le401,000 – Le800,000 | | 296 | 56.0 |
| Le801,000 - Le1m | | 67 | 12.7 |
| Up to Le200,000 |  | 59 | 11.2 |
|  | **Total** | **529** | **100** |

***Source:*** Socio-Economic Household Survey November 2022

5.2.6. Literacy and Education

According to the Ministry of Basic and Senior Secondary Education (MBSSE) 2021 school census data, there are a total of 835 schools in the Port Loko District, which includes: 98 pre-primary schools, 520 primary schools, 161 Junior secondary schools, and 56 senior secondary schools. Of these 835 schools, 785 are public schools, while 50 are private-owned (MBSSE, 2021). The district also has one of the oldest and best-known colleges in Sierra Leone, the Port Loko Teacher's College, which is now part of the Ernest Bai Koroma University of Science and Technology located in Port Loko town.

A significant challenge regarding education in the project communities, including Lungi township and Port Loko district, is the insufficient availability of schools and their inadequate facilities, resulting in limited access for the local population. The primary and secondary schools closest to the PV/BESS site are situated in Gbaneh Bana, which necessitates some children from Youriya and Baimbaya to walk a considerable distance to attend. Despite this, certain households choose to send their children to schools in Lungi township, further away from their respective communities, due to the better quality of education provided. It is important to note that the only road providing access to the primary and secondary schools in Gbaneh Bana from communities like Youriya and Baimbaya is also the same road used to access the project site. Unfortunately, this road is remote and lacks paving. As a result, using the same road during the construction phase of the project could present a significant safety challenge for these children.

Based on the socioeconomic survey data collected, it was revealed that the level of education among respondents in the local project area is low (see Figure 5.4). A considerable percentage of the population has limited or no formal education, leading to low literacy levels in the area. The data shows that 60.1% of respondents reported never attending school. The survey data also shows that only a small percentage of respondents have attained vocational training (0.8%) and tertiary education (0.5%). The low level of education and literacy coupled with the limited pool of technically skilled individuals from the project communities implies that a small number of residents will be employed, especially in skilled roles.

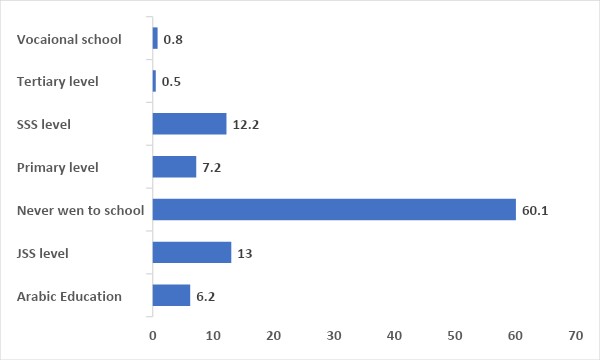
Moreover, the low levels of literacy and educational attainment in the area could pose challenges in engaging the community and their participation and contribution to the project. This could make it difficult to effectively communicate the project's goals and benefits to the community, involve them in the decision-making process, and offer adequate training opportunities. Therefore, it is essential to develop effective strategies for community engagement that take into account the community's literacy levels and educational backgrounds. These strategies may include the use of local languages, simple and easy-to-understand language, visual aids, and community meetings and consultations.

However, these challenges can be mitigated by using the local dialects and other appropriate means as prescribed in the SEP in disseminating key messaging and other forms of community engagement on project related matters. This approach could help to improve communication with the community, enhance their participation and involvement in the project, and promote a greater understanding of the project's objectives and benefits.

***Figure 5.***

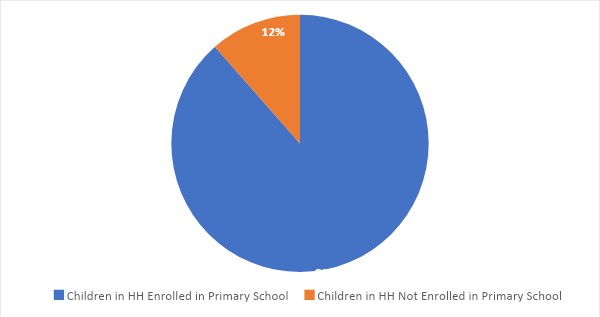
***4***

***Educational status of household head***



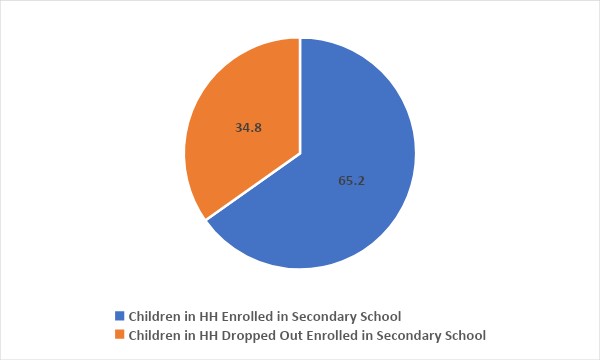
***Source:*** Socio-Economic Household Survey November 2022

On a positive note, in the midst of low literacy rate in the project area, it is noteworthy that stoves are made by households to educate children in their respective households. The survey data on primary enrolment of kids in these communities is encouraging as there is a significant enrolment rate of primary school children. However, more efforts need to be done to further reduce the dropout rate of secondary school children which stands at 34.8% according to the survey data. (See Figure 5.5 and Figure 5.6)



***Figure 5.5: Primary School Enrolment of Children in Household***

Source: Socio-Economic Household Survey November 2022



***Figure 5.6 Secondary school enrolment of children in the household***

Source: Socio-Economic Household Survey November 2022

Upon further analysis, it was found that there is a considerable gender gap in terms of secondary school dropouts, with a higher number of girls leaving school prematurely school than boys. 184 respondents reported that their children had dropped out of secondary school. 72% of the children who do not complete school were girls. The main reason cited for dropping out was teenage pregnancy. See

Table *5.6* below.

***Table 5.6 Reason for Secondary School Dropout***

|  |  |  |
| --- | --- | --- |
| **Reason for child/children not in Secondary school** | **Freq.** | **Percentage** |
| Cost of Secondary Schooling not affordable | 36 | 19.6 |
| To assist households in trading or other income-generating activities | 30 | 16.3 |
| Commercial Bike riding | 13 | 7.1 |
| No Secondary School in Community | 6 | 3.3 |
| Teenage pregnancy | 74 | 40.2 |
| Marriage | 25 | 13.6 |
| **Total** | **184** | **100** |

***Source****: Socio-Economic Household Survey November, 2022*

However, the current government under the leadership of President Julius Maada Bio in 2018 launched the Free Quality Education initiative in Sierra Leone, which offers free primary and secondary education to all students enrolled in government-supported schools. According to the 2021 report from the United Nations International Children's Emergency Fund (UNICEF)’s Sierra Leone Annual Country Report, this initiative has helped to raise the number of children enrolled in all levels of education by 36% (1,984,493 in 2019 vs 2,697,590 in 2021), including pre-primary, primary, and junior secondary school (JSS), and senior secondary school (SSS).

5.2.7. Medical Facility

Lungi has a limited number of hospitals and health centres. The main health care facility in Lungi is the Lungi Government Hospital, which serves as the main referral hospital for the surrounding communities.

The hospital provides basic medical services, including outpatient care, maternal and child health services, and emergency services. However, the hospital is often overcrowded and under-resourced.

There are quite a few other health facilities in the surrounding areas, including the Port Loko Government Hospital, which is the largest hospital in the district. There are also a few smaller health centres and clinics in Lungi and the surrounding villages, such as the Koya Rural Health Center, Gbaneh, the project community, Bana community health post, and the Masimera Community Health Post.

However, these health facilities are often understaffed and under-resourced, leading to inadequate medical care for patients. The limited access to health care in Lungi has significant implications for the health and well-being of the local population. The lack of adequate health facilities and medical personnel especially in remote areas in the district also results in the reliance on traditional healers and herbal medicine by many people in remote areas, which can be ineffective and even harmful.

*Treatment preference and facility*

According to the survey data, Community Health Center (CHC) is the preferred treatment facility for households in the proposed project communities, accounting for 80.2% of all treatment cases.

The nearest medical facility available to communities in the local project area is a community health post in Gbaneh Bana. This health post serves over fourteen (14) communities with a population of approximately 10,577. Unfortunately, the health post only has three functional beds and faces challenges in terms of general facilities and treatment equipment, including a shortage of medicines. Additionally, the lack of electricity is a major challenge as vaccines cannot be preserved and kept in good condition for effective use. Furthermore, the lack of adequate beds underpins the challenge of inadequacies in efficiently responding to the treatment needs of the growing number of patients the facility attends to. Electricity supply to this facility is from a standalone solar PV system, which only powers lighting and a refrigerator during the day. The system lacks battery storage and an inverter. It is, therefore, necessary to improve the facility's capacity and provide other important facilities and hardware to it. Nurses at the CHC were excited at the prospect of the project and look forward to providing medical care and support for the staff, but indicated that this would only be realized if the project could help stock the facility with medical supplies and scale up the existing power supply. Since the proposed project will trigger an influx of persons into the community during the construction phase, it is envisaged that more patients will be available to the facility for medical attention. As the facility is the closest to the project site, it should be capable of attending to the surge in patients and medical emergencies.

The project is fully committed to addressing the challenges faced by the health post and is determined to undertake the necessary measures to improve its capacity and facilities. The lack of electricity, especially for preserving vaccines, is acknowledged as a significant obstacle that needs to be overcome.

In response to these challenges, the project aims to enhance electricity supply to the health centre. It recognizes the significance of scaling up the existing power supply to ensure continuous and reliable electricity for essential medical operations. By addressing these critical needs, the project seeks to support the health post's staff in delivering quality medical care and meeting the treatment requirements of the growing number of patients.

The CDAP incorporates a budget that is included as a component of the ESMP budget for this assistance.

On another note, the prevailing preference for the community health centre as a treatment facility among surveyed households suggests that there is a lower likelihood of the use of traditional medicine and practices by residents in the project communities surveyed/visited. Although traditional medicine is a widely practiced alternative to approved medical treatment in rural areas, including Port Loko District, engagement with medical practitioners in the community health post in the area revealed that the facility receives an outpouring of patients from the communities under their purview and even beyond. They noted that the health post embarks on regular and frequent outreach programs as well as sensitization programs. According to KIIs, some local residents expressed that forests play an essential role for traditional medicine as they provide herbs and leaves used to treat common diseases. However, it should be noted that traditional medicine is not primarily sourced from vegetation at the proposed PV/BESS site. The land has been reserved for the project for over several months, restricting access to the land for local community members who used it for livelihood activities. The land-owning family and community stakeholders have allocated other pieces of land to these individuals. The residents express a strong desire for access to electricity and are willing to provide sufficient support for the project to ensure its realisation. **5.2.8. Communication and Transportation Facilities**

Telecommunications are crucial for societal transformation and development, as they provide communication services, including on-net calls and internet, to improve connectivity among people and communities. In the local project area, there are three telecommunications networks and internet service providers, namely Africel, Orange, and Qcell, but their services are generally poor in most areas within the project location.

Regarding transportation, the road from Lungi to the project area is a highway – tared, and used by a range of vehicles. However, the road leading to the project site from Gbaneh Bana, along the Lungi Port Loko Highway, is unpaved and remains the only motorable road that connects other nearby communities, including Youriya, Baimbaya and Koimaya. The poor state of this road may pose a challenge to the transportation of construction materials to and from the project site, especially during the construction phase. Various upgrades will be required to improve the road, including leveling and other necessary enhancements. These upgrades are essential to ensure a smoother and more efficient transportation experience for users. Leveling the road will involve adjusting its surface to eliminate unevenness, potholes, and other irregularities that can cause discomfort and pose risks to vehicles and pedestrians. Other improvements, such as widening narrow sections, adding road markings, improving drainage systems, and enhancing signage, may also be necessary to enhance safety and optimize traffic flow. Additionally, the road is used by other communities in the area with its users including the elderly, women, and school children, who travel to and from school, thus presenting a major challenge to the safety and general wellbeing of road users in the local communities. Furthermore, the "Lumar" trading activities that occur three days a week may also pose future challenges to road use by the project and the local community during the construction phase. It is essential to address these issues to ensure the safe and efficient transportation of materials and the safety of the local communities thereby not causing significant disturbance for local community people whose reliance on this access road is immense.

5.2.9. Drinking Water Facility

One of the basic requirements for human existence is access to safe and clean drinking water. Drinking water from contaminated sources could be detrimental to human growth and health. Drinking water sources are categorised into improved and unimproved. Protected dug wells, piped water, tube wells or boreholes, protected springs, public taps, etc. are examples of improved sources. Unprotected springs, rivers, streams, open dug wells, etc., are examples of unprotected drinking water sources. Accessibility and availability of water are equally significant, partly because they may burden households, especially girls, who are primarily responsible for fetching water. Improved water sources for drinking are crucial, especially in disease prevention.



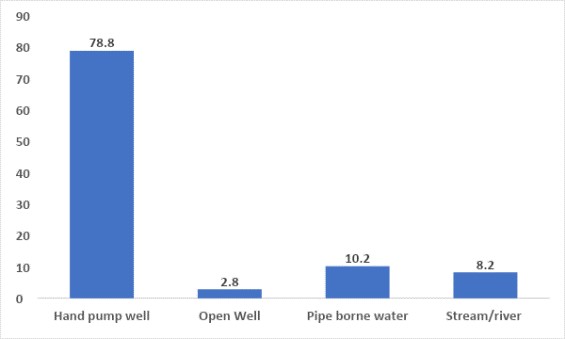
***Figure 5.7: Drinking Water Facility in Gbaneh Bana along the transmission route, 300m from the proposed solar PV & BESS site.***

From the survey data, the primary drinking water sources in the communities are from an improved water source of mainly hand pump wells, as it accounts for 78.8% of households surveyed (during construction period, at project site, the contractor will be responsible to avail drinking water for workers) . Although respondents complained about intermittent shortage of these sources in certain times as a significant challenge, they relatively confirmed that the water is pure and safe for drinking and other domestic use.

***Figure 5.***

***8***

***Drinking water source***



***Source:*** *Socio-Economic Household Survey November 2022*

5.2.10. Sanitation and Waste Management

A healthy environment is one that has suitable sewage treatment and disposal. Therefore, a better sanitation facility is one that hygienically separates human interaction with human faeces. Furthermore, trash needs to be handled and disposed of in a way that preserves and protects the environment. Poor waste management practices put people at risk for illness, exposure to illnesses, and environmental contamination (See Figure 5.9).

Improved sanitation or toilet facilities include flush, ventilated pit latrine, etc. Unimproved sanitation or toilet facilities include hanging toilets or traditional pit latrines, no facility/open defecation (bush, stream), etc.



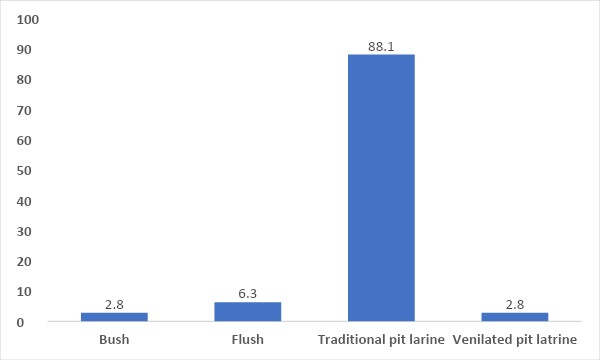
***Figure 5.9 Sanitary facility in the project area***

The survey data revealed a spike in unimproved toilet facilities in the project area, with over 88.1% using the traditional pit latrine. See Figure 5.10.

***Figure 5.***

***10***

***Household sanitary facility***



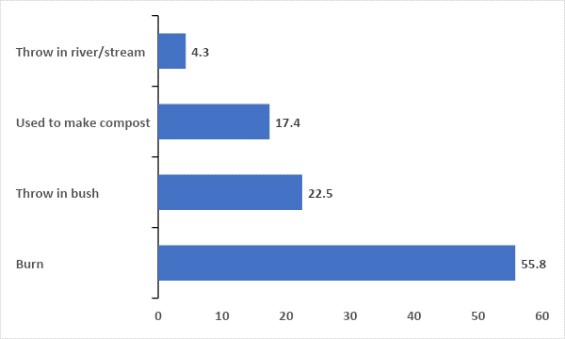
***Source:*** *Socio-Economic Household Survey November 2022*

In terms of waste management practices in communities in the local project area, the common waste disposal means of household-generated waste in the project area is by burning (55.8%). It is worth to note that these methods are not proper and environmentally friendly. It is also not friendly in promoting the well-being of residents as this unprotected method can potentially attract diseases. This improper waste management could be potentially linked to the prevalent diseases in communities in the proposed project area (Figure 5.11).

***Figure 5.***

***11***

***Waste disposal method by households***



***Source:*** *Socio-Economic Household Survey November 2022*

The dumpsite in Lungi (Latitude 8.61148o, Longitude - 13.168020) has been designated for waste disposal (Figure 5.22), but it is not currently in use due to the unavailability of waste dump trucks. It is worth noting that the proposed project will adopt an environmentally appropriate means of waste management, as prescribed in ESMP.



*Figure 5.12 Signage indicating the direction of the Lungi dumpsite*

5.2.11. Power Supply

Despite the fact that Lungi township is powered by a generator supplied by EDSA, communities located in the outskirts of the town, including those in the project area, are not connected to any power supply or electricity generation services. This poses a significant challenge to the socioeconomic development of these communities, as access to electricity is a key driver of economic and social progress. The survey data corroborates this, with 79% of households surveyed in the proposed project area relying on flashlights (known as Chinese lights) as their primary source of lighting. Other sources of energy for lighting households include solar (11.2%), generators (5.8%), and candles (4%). Local residents in the project area have expressed a strong need for electricity and have welcomed the proposed project initiative, committing to support it. Additionally, a significant majority of households in the area rely on firewood as the predominant material for cooking.

5.2.12. Vulnerable Groups

Vulnerable groups in the proposed project area include individuals who are at a greater risk of poverty and social exclusion compared to the wider population. These groups may include women and children who are at a higher risk of experiencing various forms of abuse, such as gender-based violence (GBV) and sexual exploitation and harassment (SEA/SH), isolated elderly people and children, people with disabilities, those grappling with substance abuse. The Resettlement Plan to be undertaken will identify whether any vulnerable groups will be affected by project construction activities. Special support/assistance will be proved for vulnerable Project Affected Persons (PAPs)

Regarding GBV and SEA/SH, a thorough assessment was carried out to understand the prevalence of these issues in the local communities. The assessment targeted the community health post in Gbaneh Bana and the FSU division of the Sierra Leone Police (SLP) in Lungi. The findings revealed the following:

1. The community health post in Gbaneh Bana receives an average of 10 cases of physical assault on women from the local communities in the project area on a monthly basis.
2. Cases are reported to the local police post in the area and referred for medical attention at the community health post. The local police post in the community has been closed for several months after the August 10 alleged insurrection in the country in 2022.
3. These cases are dealt with by the line manager for GBV at the local police post in Gbaneh Bana, which is temporarily closed.
4. Cases are sometimes settled by stakeholders and family members in the community.
5. About one to three cases of rape are reported in two months.
6. The local community health post files reports on medical treatment and caregiving of GBV and SEA/SH victims to the Rainbow Centre.
7. The Family Support Unit (FSU) at the Lungi Police Station hardly receives real-time GBV and SEA/SH cases from the communities in the project area.
8. This could be because most of the cases are handled in the community by family members.

These findings indicate that GBV and not SEA/SH is a prevalent issue in the local communities in the project area, with physical assault on women being the most commonly reported type of violence. However, the temporary closure of the local police post in Gbaneh Bana may result in delays in the response to these cases. The fact that cases are sometimes settled in the community by family members may also indicate a lack of awareness among community members about the legal and medical options available to them. It is encouraging to note that the community health post in Gbaneh Bana files reports on GBV and SEA/SH cases to the Rainbow Centre, which indicates a commitment to addressing this issue in an appropriate manner at the local level. However, the low number of reported cases of rape may indicate a reluctance on the part of victims to report such incidents.

To address these issues, it may be necessary to increase awareness among community members about GBV and SEA/SH and the legal and medical options available to them. This could be done through community meetings, radio programs, and other communication channels outlined in SEP. Additionally, efforts will be made to ensure that the local police post in Gbaneh Bana is reopened as soon as possible to ensure a timely response to GBV and SEA/SH cases. Finally, there is a need for the FSU at the Lungi Police station to improve its communication with the local communities in the project area to ensure that real-time cases are received and acted upon promptly and prevented from being settled at the community or household level.

Furthermore, the survey data shows that more than 15% of households reported having at least one member with a disability or special needs, such as visual or mobility impairments. It is crucial to acknowledge that these individuals may encounter difficulties in accessing the benefits of the proposed project if it is not designed to cater to their needs.

Although it is hoped that the proposed Project would positively affect the economy and livelihood in the Project area and beyond, people belonging to vulnerable groups are more likely to suffer from the Project's potential negative consequences. As a result, the Project's proponent will take great care to ensure that the design and plan are inclusive of everyone and supportive of vulnerable people. The Resettlement Plan (RP) to be undertaken for the project-affected population will specifically identify vulnerable Project-Affected Persons (PAPs) and develop appropriate livelihood support to alleviate the risk of impoverishment.

5.2.13. Language and Ethnicity

Sierra Leone is an Anglophone country. Sierra Leone's official language is English, although Krio is the widely spoken dialect by over 90% of the country’s population. Respondents were asked what language is widely spoken in their household. The household survey data captured that Temne (58%) and Susu (38.3%) are the widely spoken local dialects in households in the project area. This is significant to addressing the means of communicating project messages and general engagement and consultation in the local project area. More on means and channels of engagement is provided in the SEP.

5.2.14. Archaeological and Cultural Heritage

From field study and observations, there are no significant cultural sites or graves that are located on the land that is earmarked for the construction of the PV/BESS. The is important because culture and heritage hold immense importance in the lives of individuals and communities and losing them can have severe social and psychological consequences. Additionally, archaeological sites can provide valuable information about the region's history and heritage, which can help guide future research and education efforts. Hence, they need to be preserved and protected.

While the baseline study did not reveal any Archaeological or Cultural resources, it does not guarantee that none will be discovered during the construction phase. The excavation and construction processes have the potential to reveal previously unknown artefacts or sites of historical significance. Therefore, it is crucial to implement cultural heritage management and preservation efforts when undertaking development projects that involve land acquisition or displacement. To that end, any discovery of artifacts of significant cultural value during the construction phase of the project requires prompt and appropriate action to ensure their protection and preservation.

Correspondingly, Secret societies are fundamentally based on Sierra Leonean culture. These covert associations have tight rules and gender-specific membership requirements. For instance, the traditional culture of young children who are approaching puberty is influenced by the "Poro" for males and "Bondo" or "Sande" for female adolescents.

In these secret societies, young boys and girls are taught essential life skills vital to their survival, adult responsibilities, and social roles. The "Ojeh" and "Hunting" are also two well-known Sierra Leonean secret societies.

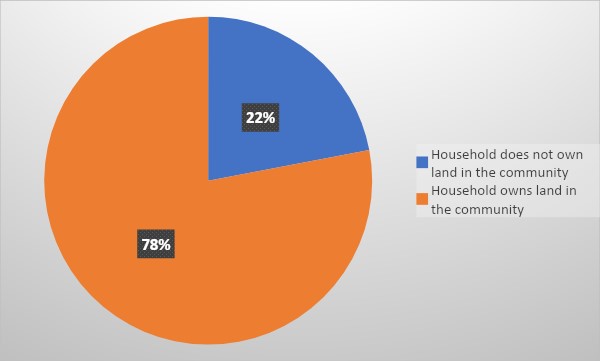
Like other rural parts of the country, the Project area and surrounding communities are known for their love and practice for secret societies. These groups hold their social rites and rituals at sacred cultural locations. Non-members of their secret fold are not permitted in their sacred locations. It is essential to note that the area of the land site designated for the proposed Project does not contain any cultural or secret society sites. However, visitors must respect the cultural rites of communities in the project area.

Through visual observation and discussions or engagement with stakeholders and community residents in the project area during the screening and site investigation, no known archaeological sites were found or reported to exist in the proposed areas. It should be noted that archaeological sites and other cultural sites heritage should be preserved in accordance with ESS8. Any such sites discovered during the Project's operation will be reported to the appropriate Monument and Relic Commission, and steps taken to protect them. A chance find procedure for accidental discovery of artefacts or relics is presented in the ESMP. The project will also recognize intangible cultural heritage, such as rituals and ceremonies, and conduct project activities in such as manner as it will not interrupt or affect such heritage.

5.2.15. Land ownership, Tenancy Status and Housing/Dwelling Type

Land ownership data shows that 78% of respondents own land in the community in the proposed Project area. The site proposed for the PV and BESS facility is claimed to be owned by the William Sheka Kamara family, who are willing to sell the land to the Government of Sierra Leone (GoSL) for the establishment of the proposed project. Family representatives have indicated that the said site is presently transferred from the Koroma family, with the consent from the Paramount Chief of the Kaffu Bullom Chiefdom to Ministry of Energy (MoE) through Ministry of Lands, Housing and Country Planning in a willing-buyer willing-seller arrangement at a price voluntarily agreed to by both parties. All the necessary legal procedures and proper documentations are concluded, including evidence of compensation payment and conveyance letter dated 4th July 2023.

The land has been preserved for over a year now since the family agreed to transfer the plot of land to GoSL. Prior to this, the land was used extensively by community members for livelihood activities, particularly for farming. These individuals paid royalties to the land-owning family for access to the land. However, since the preservation of the land and its transfer to GoSL, access for economic purposes has been restricted. In response, family representatives have indicated that they have allocated other pieces of land elsewhere to those community members who previously utilised the land for their economic activities. Figure 5.13 shows the type of land ownership as reported by respondents.



**Figure 5.13 Ownership of land in the community**

***Source:*** *Socio-Economic Household Survey November 2022*

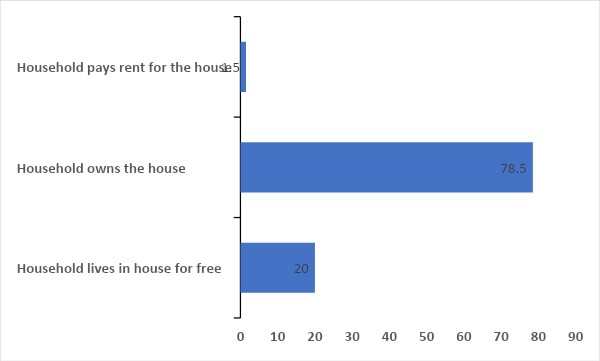
*Tenancy status*

Figure 5.24shows that most of the households in the Project area own the dwelling unit they live in.

***Figure 5.***

***14***

***Ownership status of dwelling unit***



***Source:*** *Socio-Economic Household Survey November 2022*

5.2.16. Respondent's Awareness and Perception of the Proposed Energy Project

Respondents were asked about their perception towards certain aspects of the proposed project. The below Table summarizes the findings on the subject.

|  |  |
| --- | --- |
|  | **(n=529)** |
| ▪ | Knowledge of the Proposed Project: the majority of respondents (69.4%) knows about the project while 30.6% are not aware. |
| ▪ | Feelings about the proposed project: 73.3% are feeling good and 26.7% are indifferent. |
| ▪ | Perceived Positive Outcome of the Proposed Project: the project would bring Electricity to the community (46.9%); Employment for Local Residents (25.1%); Boost Local Economy and Business (17.6%); Improve education (7.4%), the remaining (3.0%) did not respond to the question. |
| ▪ | Perceived Negative Impact of the Proposed Project: Unaffordable electricity tariff (40.8%); Refusing to employ residents (26.7%); No compensation, no livelihood restoration (21.2%); Domestic violence against women and other social issues (5.3%); the rest (6.0%) did not respond to the question. |
| ▪ | Respondent's Proposed Mitigation Measures: Lower electricity tariff (49%); Employ residents, involve the community in employment and management (18%); Proper land acquisition (7.3%); Efficient community engagement (6.1); the other 6.4% of the respondents did not respond to the question. |

***Source: Socio-Economic Household Survey November 2022***

### 6. CHAPTER SIX: ENVIRONMENTAL & SOCIAL RISKS AND IMPACTS AND MITIGATION MEASURES

This chapter identifies and describes the potential environmental and social risks and impacts of the project activities on the biophysical and socio-economic conditions of the environment and communities. Where applicable, it also identifies mitigation measures that will reduce the likelihood of adverse risks and impacts on humans and the environment and enhance the project's positive outcomes. The assessments carried out in this chapter are on potential impacts on overall environmental and social receptors caused by the project activities in the various phases of the project, with mitigation measures recommended accordingly.

Section 3.4 offers a thorough description of the project activities across all its phases, which encompass pre-construction, construction, operation and maintenance, and decommissioning. Each of which has the potential to impact environmental and social parameters. The following are impact-generating activities during the design, planning, construction, operation and maintenance and decommissioning phases of the project:

1. Land acquisition for the PV/BESS site
2. Site preparation
3. Minor excavation and levelling
4. Hauling of earth materials and wastes
5. Cutting and drilling
6. Erection of concrete and steel structures
7. Road upgrade (if necessary)
8. Painting and finishing
9. Clean up operations
10. Landscaping and afforestation

#### 6.1. Positive E&S Impacts

The RESPITE project is expected to significantly improve both human well-being and the environment. Benefits or positive impacts will be enhanced, where necessary. Below are some of the suggested project activities' possible advantages.

#### • Carbon Emissions Reduction

It is envisioned that small business units and households will have increased access to electricity and reduce dependence on diesel and petrol-generating plants that are the main sources of carbon emission in the atmosphere. Since solar energy does not involve carbon emissions, there is expected to be a significant reduction in the carbon footprint of the areas that depend on this source of energy. Rural areas benefit by overcoming the energy barrier with minimal cost compared to sourcing energy from the sequestered carbon in forests. Given the limited forested areas where the solar panels and transmission line will be installed and the absence of critical habitats like nesting sites or endangered species, the impact on carbon sinks resulting from land clearing is considered insignificant when compared to regional carbon emissions. However, once the facility begins operations, it will generate zero emissions, effectively offsetting the initial loss by replacing fossil fuels as an energy source.

#### • Reduced Indoor Pollution

According to Fayiah and Singh (2019), 99% of Sierra Leoneans rely on biomass fuel such as wood and charcoal. Indoor pollution from cooking with these fuel sources is a major contributor to respiratory illnesses in women and girls in Sierra Leone, which occasionally results in mysterious deaths. For example, carbon monoxide is an odourless gas emitted from incomplete combustion of biomass and can lead to dizziness and, eventually, death. Improved access to electricity in households will reduce the use of biomass energy for cooking, heating and drying. This will result in a reduction in the number of people suffering from combustion-related respiratory illnesses and fatalities.

#### • Preservation of Ambient Environmental Conditions

The sun is the main source of solar energy, which generates 173,000 terawatts of energy each second— more than 10,000 times the amount of energy used worldwide. Tapping from this infinite resource has no direct negative impact on local and regional hydrological cycles (weather and climate), flora and fauna, geology, and soils. Solar energy is crucial in the fight against air pollution since solar installations don't burn fossil fuels, which means that by using solar power to generate electricity, greenhouse gas emissions will be reduced significantly. Additionally, they do not generate significant amounts of noise in the area. The primary source of noise is the inverter of the solar panel. Nonetheless, the maximum noise this creates is about 45 dB, which is far less than the recommended threshold.

#### • Improved Security

Criminals utilize the darkness to conceal their mischievous acts and hurt peace-loving citizens. With an increase in the amount of light available in the project area's remote places, security would improve as the lighting in and outside of residences would expose criminals and deter their activities in those areas, thereby protecting homes and assets that might have favourable economic effects for people, households, and the nation.

#### • Improved Delivery of Social Services, Health and Education

Electricity is a fundamental requirement for modern communication technology, including the Internet, which enables various social services such as e-learning, telemedicine, and e-government services. These services can significantly benefit people in remote or underprivileged areas who may not have access to traditional means of receiving social services.

The improvement and extension of electricity to public places such as health facilities, schools and the Lungi International Airport will accelerate the improved delivery of services. In the health sector for example, both the maternity units and the general hospital administration will undergo a comprehensive makeover. Women will no longer deliver under darkness and surgical operations will not be faced with the challenges of a blackout. This would improve the preservation of drugs and vaccines, the health of women and children, and reduce infant and maternal mortality.

In schools, opportunities will be created for students to have more productive hours in school libraries and even at home where study times are often interrupted by frequent blackouts, or the use of nonreliable and unsafe sources of light. Pupils will have more time to study and, if it's financially feasible, access to computers and the internet at home or in the classroom. This is especially significant in terms of contribution to human capital and socio-economic development.

The availability of electricity will also enable the provision of clean water and sanitation services. Water can be pumped and treated with electricity, making it suitable for drinking and hygienic uses. Sanitation and access to clean water are crucial for illness prevention, especially in developing nations.

#### • Employment Generation

The project’s activities will require the establishment of works yard in in the project area for the assembly of equipment and materials, clearance of these works yard, mobilization/transportation, and installation of poles, gridlines, solar panels, batteries, transformers, and accessories. These will create employment in excess of 100 personnel in the short run. EDSA/PIU plans to prioritize the local community for employment purposes, and that foreign job seekers will only be considered where a competent local worker is unavailable to fill in that position. This impact is positive and will affect local retail business owners who would mainly benefit from secondary effects of increased incomes and spending power of construction workers.

During the operation and maintenance phase of solar PV systems, skilled workers are required to perform tasks such as monitoring performance, conducting regular inspections, and maintaining equipment. In a similar vein, ongoing monitoring and maintenance are required for BESS to ensure optimal performance, including testing batteries, replacing defective cells, and monitoring system performance. Moreover, skilled workers are necessary to monitor and maintain equipment, identify and troubleshoot issues, and conduct repairs during the operation and maintenance of transmission lines. These jobs often require specialized skills and knowledge, creating long-term employment opportunities for technicians and other technical personnel. EDSA/PIU will offer comprehensive training programs to skilled local individuals, focusing on maintaining and repairing solar PV systems and their components. Those who excel in the training will be retained and employed during the project's operational phase to ensure continued expertise and competence in managing and servicing the solar PV infrastructure.

In the long term, RESPITE is anticipated to motivate young citizens in the project locations to have career choices in this field. These locals will be encouraged to take up disciplines that advance sustainable electricity generation and supply and become future employees of the EDSA. This will lay a solid foundation for sustainable community involvement in generating and supplying electricity to fellow citizens in the project area.

In addition to career development, electricity will boost local businesses who will be able to improve on the provision of goods and services. Such improvement is brought about thanks to the internet, which will enhance the expansion of markets and building networks around the world. This expansion will create employment opportunities for young citizens locally.

#### • Improved Livelihoods

Lack of reliable electricity is a disincentive towards acquiring household items such as fridges and television sets and their utilization. A direct benefit of electricity is the availability of heating and cooling that would adjust temperatures and make life comfortable. Generally, electricity will improve the living standards of the locals in many ways including the preservation of food using refrigerators. The project communities welcome the project because it will enable families to improve their living standards. The availability of reliable electricity may also attract other investors in the region hence boosting economic development in the region.

#### • Incentives for Small-Scale Enterprises

The youths and young adults today find it difficult to get jobs. Mostly, they see the setting up of small businesses as a way out of the poverty trap. Thus, they now run income-generating businesses such as saloons, barbershops, restaurants, and mini-shops for food and groceries. However, due to the lack of electricity, their operations are hampered and very costly, and some have even abandoned businesses due to a lack of electricity for their operations. The provision of electricity to these areas will increase business opportunities and income for many individuals and contribute to the improvement of livelihood in the country.

#### • Improvement of Local Skills

The Project will provide technical on-the-job training and health and safety training to the local employees, enhancing their skills and capabilities. This training will have a positive impact on their knowledge and way of life. The workforce will primarily consist of skilled and semi-skilled workers, with unskilled positions primarily offered to the local communities, particularly during the construction phase.

##### 6.2. E&S Impact Assessment and Analysis

Key to the preparation of the ESIA/ESMP was the analysis of impacts and proposition of mitigation and management measures. The Impact Analysis was done by: Evaluating how the various project activities would impact the biophysical environment and the socio-economic and economic impacts on residents in the project area.

* The impact assessment and analysis methodology approach include Data and information generated to carry out a baseline characterization of the various biophysical parameters in the project areas.
* Delineated potential changes in the baselines likely to be brought about by the project.
* Carried out an analysis of alternatives and their implications.
* Provided information for the ESMP consultant to develop an environmental management plan.

Impact predictions were by analysing different project activities and envisaging possible environmental changes using established standards and specialist judgements. Four generic rating scales were used for this study’s assessment. These are stage and duration, extent, magnitude and likelihood. **a) Project Phase and Duration**

Describes at which stage of the project the impact is likely to occur Table 6-1*: The Period of Impact Rating*

.

# Table 6-1: The Period of Impact Rating

|  |  |
| --- | --- |
| **Rating** | **Description** |
| Short-term | Construction Phase |
| Medium-term | Operational Phase & Maintenance |
| Long-term | The impact will only cease after the operational phase & Maintenance phase |
| Permanent | Where the impact will occur even after the project decommissioning activity |

#### b) Extent

The scale at which the impact extends across an area Table 6-2*: The Extent of Impact Rating* .

# Table 6-2: The Extent of Impact Rating

|  |  |
| --- | --- |
| **Rating** | **Description** |
| Local (Lungi and affected villages) | Limited to the project site and its close surroundings |
| Regional (Port Loko) | The impact extends beyond the project boundary -at the district level |
| National | The impact extends countrywide |

#### c) Magnitude

The impact's magnitude describes the impact's severity based on the extent to which the impact would change under existing conditions or how it would impact another receptor.

# Table 6-3: The Magnitude of Impact Rating

|  |  |
| --- | --- |
| **Rating** | **Description** |
| Negligible | There is no discernible influence on the environment, and there is no discernible change in people's lifestyles |
| Minor | The influence has such a minimal impact on the environment that natural functions and processes are unaffected, and communities are able to adapt |
| Moderate | Where the impacted environment has been transformed but natural functions and processes have continued, although in a modified form, or where communities have been able to adapt despite certain challenges |
| Major | When natural functions or processes are disrupted to the point where they will cease to exist temporarily or permanently, or the communities affected will be unable to adjust to the changes |

#### d) Likelihood

Likelihood describes the probability of the impact occurring.

# Table 6-4: The Impact Probability Rating

|  |  |
| --- | --- |
| **Rating** | **Description** |
| Unlikely | The possibility of the impact occurring is extremely low or non-existent |
| Likely | There is a possibility that the impact will occur |
| Very likely | The impact will definitely occur |

##### 6.3. Negative Environmental and Social Risks and Impacts

###### 6.3.1. Pre-Construction /Project Planning Phase Risks and Impacts

***i. During the pre-construction phase of the PV, BESS, and transmission line construction***: selecting an inappropriate or flawed design can lead to various negative consequences, including:

* Inefficiency: Choosing a design that is not optimized for the specific project requirements can result in lower energy production for PV systems, reduced storage capacity for BESS, or inefficient transmission line operation. This can lead to suboptimal performance and lower overall project efficiency.
* Cost Overruns: A poor design choice may result in cost overruns due to the need for design revisions, equipment replacement, or additional construction work. This can impact project budgets and timelines.
* Environmental Impact: Inadequate design considerations can lead to unnecessary environmental impacts. For example, if a PV system is not adequately designed to minimize shading on surrounding areas, it may result in the loss of vegetation or disruption to habitats.
* Safety Concerns: A design that does not prioritize safety can lead to increased risks for workers and the surrounding community. For example, inadequate clearance distances for transmission lines or improper placement of BESS can pose safety hazards.
* System Compatibility: Choosing an incompatible design for PV, BESS, or transmission line components can result in compatibility issues, leading to operational inefficiencies, equipment damage, or the need for costly modifications.

**Mitigation Measures:**

To minimize the consequences of selecting an inappropriate design, a comprehensive feasibility studies have been completed (including detailed engineering and environmental and social impact assessments) that involved skilled design experts and take into account pertinent factors such as site conditions, local regulations, and project specifications. Thorough engineering analysis including design/technology alternatives, consultation with stakeholders, and meticulous evaluation of design alternatives are crucial to ensure the choice of a suitable and efficient design for PV, BESS, and transmission line systems.

##### *ii. Loss of land, Assets and Livelihoods*

The land (44.7583 Acres) for the proposed construction of the solar PV and BESS site is presently transferred to Ministry of Energy (MoE) through Ministry of Lands, Housing and Country Planning from the Koroma family, with the consent from the Paramount Chief of the Kaffu Bullom Chiefdom through a willing-buyer willing-seller arrangement at a price voluntarily agreed to by both parties. All the necessary legal procedures and with proper documentation are concluded, including evidence for land sale agreement, payment transfer and conveyance letter for the specified land to MoE (See Annex VII (A, B, & C and Annex VIII).

The land has stands of tree crops and plantations. These will be lost as a result of the project development initiative. No land acquisition will be required for the transmission route which falls within the RoW. There are potential disturbances to economic trees and business stalls in different locations along the route.

**Mitigation measures:**

* Though the land purchase process will have only low economic impact, it is recommended to optimize the benefit for local communities is preference for livelihood opportunities to the families who lose their land due to the project activity. As part of the contractor’s contract, it will be stipulated that contractors are required to prioritize the hiring of workers from the landowning family.
* The Community Development Action Plan (CDAP) will be implemented as it addresses specific community needs.
* The project GRM will be followed onsite. Complaints from the local community members will be timely registered, investigated and resolved.
* Undertake a RP to adequately assess physical and economic/livelihood impacts and determine due compensation packages for affected persons.

##### *iii. Sexual Exploitation and Abuse (SEA) Sexual Harassment (SH) Risks*

During the project planning phase, women and girls (of different social and educational backgrounds) may be exposed to SEA/SH, in such a way that:

* Recruitment phase: Professional women and manual labourers seeking to work for the project may be exposed to SEA by project managers or those leading the recruitment efforts. Given the challenging economic climate that the people of Sierra Leone find themselves, the likelihood of SEA of professional women and manual workers seeking employment exists. There are also risks of sexual harassment during the project life for women who gained employment from supervisors and male colleagues.
* Project Affected Persons: Project-affected persons may also be sexually exploited if a transparent and participatory process of determining compensation for resettlement or livelihood efforts is not employed. Project staff and even community leaders may exploit any information asymmetry to sexually exploit project-affected women by making promises of giving them improved compensation packages.
* Compensation and Relocation: In abusive relationships and communities where chiefs continue to be powerful, women may be deprived of resettlement packages, even though they will be affected equally.

***Mitigation measures:***

The project mitigation measures shall be commensurate to a Moderate risk level and shall include the following measures:

* SEA/SH risk assessment will be integrated in project ESIA/ESMP and Standalone SEA/SH Prevention and Response Action Plan will be developed and implemented,
* The bidding documents for EPC contractors will clearly define the requirements and expectations for contractors and workers contractual obligations will also require the contractor to have a Code of Conduct and training on its obligations under the Code of Conduct on SEA and SH, as well as a SEA/SH Action Plan.

***iv. The lack of community consultations or limited stakeholder consultations*** can result in:

* Overlooking valuable local insights, potentially resulting in projects that don't meet community needs.
* Reduced trust and ownership among stakeholders, potentially resulting in resistance and challenges during project implementation.
* Increased risk of unforeseen negative consequences, such as disruptions to local livelihoods, environmental impacts, or unanticipated social issues.
* Greater likelihood of stakeholder opposition, potentially undermining the project's social acceptance and support.
* Risks to the project's reputation and public relations due to negative community perceptions.
* Missed opportunities for valuable collaboration, which can lead to mutually beneficial partnerships and increased project success.

**Mitigation measures:**

* Implement the SEP: To ensure successful project outcomes, it's crucial to actively engage community members, local leaders, and stakeholders from the project's inception, incorporating their input and addressing concerns through regular consultations. Transparent communication, involving the clear and accurate dissemination of project information, and potential impacts, fosters trust and openness throughout all project phases. RESPITE is dedicated to a comprehensive stakeholder engagement approach, which spans from the initial project planning phase all the way through decommissioning. This commitment is demonstrated by the proactive involvement of project communities and other relevant stakeholders right from the project's inception. This involvement encompasses crucial activities such as land identification and surveys, as well as conducting an environmental and social impact assessment (this report). This assessment actively gathered input, opinions and suggestions from stakeholders and will be disclosed after approval. All of these steps have been meticulously guided by a well-prepared stakeholder engagement plan, a testament to the project’s commitment to inclusive and informed decision-making. See Table 4-1 and Annex IX for records of the project’s stakeholder engagement efforts.

This ESIA/ESMP comprehensively assessed environmental and social risks and impacts, identifying benefits and guiding strategies to mitigate negatives and enhance positive outcomes. Findings will be disclosed to stakeholders.***V. Site mobilization and the transportation of equipment and materials to the site*** especially along the unpaved road from Gbaneh Banah junction to the proposed PV and BESS site and Makasa junction to Suctarr have the potential to induce various impacts that warrant consideration.

* Air quality concerns arise from the fact that unpaved roads, especially when heavily used by vehicle movement, motor exhaust emissions, and earth works, especially during the dry season can generate significant amounts of dust. This dust can contribute to air pollution, potentially impacting both the environment and the health and well-being of nearby communities.
* Elevated noise and vibration levels stem from the activities related to site mobilization, such as the movement of machinery and equipment, earthworks and construction operations which can produce significant amounts of noise. This can potentially affect both the environment and the overall quality of life for residents in close proximity.
* Safety concerns arise from the potential hazards of unpaved roads, which may include uneven surfaces and increased slipperiness. These factors increase the risk of accidents or injuries during transportation activities.
* Road deterioration occurs due to the heightened traffic of heavy equipment and materials on unpaved roads, which accelerates wear and tear, leading to the formation of potholes, and other types of road degradation.
* The impact on water quality arises from runoff on unpaved roads, which can carry sediment and pollutants into nearby water bodies. This has the potential to compromise water quality and harm aquatic ecosystems.

**Mitigation measures:**

#### Air quality Impact

* Implement a vehicle speed limits monitoring system for the project, to help prevent/control dust from vehicles and ensure the use of traffic control signs and speed bumps to reduce speed.
* Apply Sprinklers to prevent high amounts of dust in the air.
* Provide workers with proper Personal Protective Equipment (PPEs) such as face masks or respirators, safety glasses, gloves etc. to minimise dust inhalation
* EDSA/PIU will ensure mandatory break hours during peak traffic hours such as periods of high school children traffic (7:00-8:30 AM and 12:30-1:30 PM-school entry and exit hours).
* Ensure vehicles and equipment transporting equipment and materials are regularly maintained as per manufacturer specifications.
* Road surface will be regularly maintained/compacted to eliminate loose surfaces.

#### Noise and Vibration concerns

* Install low-noise equipment/noise silencers as far as practicable on vehicles.
* Restrict major noise-generating activities during daytime 6:00 AM to 10:00 PM
* During equipment and material movement, honking will be avoided to avoid disturbance to

locals.

* The number of equipment operating simultaneously will be reduced as far as practicable.
* Noise-generating activities civil works will not be carried out at night to avoid disturbing the surroundings communities.
* Workers will be provided with suitable hearing protection, such as earplugs or earmuffs, to be worn when they are in noisy work areas. Regular training and proper fitting of the hearing protection are essential to guarantee its effectiveness and ensure the safety and well-being of the workers.

#### Road deterioration, safety concerns and impact on water quality

* Regular maintenance, prompt repair, proper grading, and compaction of the unpaved road enhances stability, ensures a smoother driving surface, and reduces the risk of accidents due to uneven or slippery conditions.
* Regularly grade and maintain the road to keep it smooth and well-compacted. This helps prevent the formation of ruts and reduces the potential for runoff.
* Conduct routine inspections to identify areas prone to runoff and take corrective action promptly. This may include re-grading, re-graveling, or repairing drainage structures.
* Enforce speed limits and weight restrictions for heavy vehicles to minimize their impact on the road surface and reduce the potential for erosion.

##### 6.3.2. Construction Phase Environmental and Social Risks/Impacts The project construction works will include: ▪ site preparation

* road upgrade (if necessary)
* excavations
* procurement of materials and equipment
* erection of foundations
* construction of buildings/fence
* the installation PV modules, Batteries and other components
* installation and stringing of poles
* Access road used to deliver logistics

##### *i. Climate Change*

According to the World Bank Group, sea level rise threatens low-lying coastal Sierra Leone that will resulting from increased coastal flood events and coastal erosion. These will exacerbate reduction in freshwater quality, population displacement, loss of property, reduction in groundwater resources, and reduced agricultural potential for those coastal areas. Changes in climate patterns are projected to adversely affect human health by increasing the likelihood of diseases such as cholera and diarrhoea. These events are projected to take a toll on agricultural production, infrastructure, people’s homes, public health and biodiversity along the coast. [(https://climateknowledgeportal.worldbank.org/country/sierraleone/vulnerability)](https://climateknowledgeportal.worldbank.org/country/sierra-leone/vulnerability).

The proposed site for the PV and BESS project primarily consists of secondary vegetation, resulting in minimal vegetation cover that needs to be cleared. Additionally, the construction of the transmission line will not involve the removal of vegetation, with only a few instances of tree pruning required. As a result, the impact on climate change is considered negligible, given the limited disturbance to existing vegetation and the surrounding environment. The 40-year baseline data for temperature, precipitation, and relative humidity suggest that climatic patterns remain intact in the area. The scale of climate impact from the RESPITE project is expected to be minimal compared to global or regional contributions to the impacts of climate change. Nonetheless, the project will be designed to support resilience to the impacts of climate change. This is one of the expectations in the long-term outcome of the RESPITE project. Solar power is known to be one of the renewable energy alternatives to energy from fossil fuels that generate significant amounts of greenhouse gases.

#### Climate Change and Natural Hazard Risks Assessment

The climate and hazard considerations for the project[[3]](#footnote-3) present a comprehensive overview of climate change and natural hazard risks, along with adaptation strategies, for the proposed project spanning Liberia, Sierra Leone, Togo, and Chad. The assessment encompasses detailed analyses of wildfires, landslides, flooding, droughts, and extreme heat risks within the project regions, offering key recommendations for mitigation measures.

Risk Assessment and Mitigation: The document systematically dissects identified risks and provides practical mitigation strategies, furnishing essential insights for both the planning and execution phases of the project. It underscores the significance of resilient infrastructure development and underscores the necessity for adaptive measures to ensure uninterrupted service delivery, even in the event of component damage.

Wildfire Risk Management: For instance, in addressing wildfire risk, the document advocates for specific measures such as the adoption of light-duty steel poles and rigorous vegetation management, aimed at mitigating potential damage and safeguarding critical infrastructure.

Flooding Mitigation: Similarly, in flood-prone areas, recommendations include strategic placement of systems in low flood hazard zones, along with the use of deep anchors or beams around transmission poles to reduce flood-induced damage.

Extreme Heat Impacts: The assessment highlights the detrimental effects of extreme heat on energy demand, transmission efficiency, and transformer longevity. It stresses the necessity for capacity adjustments and the implementation of efficient cooling measures to maintain operational efficiency.

Project Alignment with National Goals: Furthermore, the document establishes a clear link between the proposed project and the broader economic and environmental objectives of the respective countries. It emphasizes the positive influence on electricity accessibility, economic growth, emissions reduction, and the fulfilment of national development plans.

In conclusion, this document offers a well-structured and informative evaluation of climate change and natural hazard risks, accompanied by pertinent adaptation strategies. These insights significantly bolster the resilience and efficacy of the project across the target countries.

##### *ii. Reputational risk of procuring materials from vendors involved in forced or child labor*

Risk of forced labour allegations associated with polysilicon suppliers used for solar panels.

**Mitigation measures:**

Market analysis to identify possible sellers of solar panels to the project and requirements in bidding documents as follows:

* Bidders will be required to provide two declarations: a Forced Labor Performance Declaration (which covers past performance), and a Forced Labor Declaration (which covers future commitments to prevent, monitor and report on any forced labor, cascading the requirements to their own sub-contractors and suppliers)
* In addition, enhanced language on forced labor will be included in the procurement contracts.
* The Bank will prior review procurements of solar panels and components to ensure that enhanced provisions are used by the Borrower.

***iii. Inefficiency resulting from the sourcing of construction materials*** can have several significant impacts on the project:

* + Material sourcing difficulties can cause delays in construction, which may lead to an extended project timeline. These delays can impact subsequent project phases.
  + Inefficient sourcing practices may also lead to a lack of thorough quality checks on materials. This can result in the use of subpar or non-compliant materials, potentially compromising the safety and integrity of the project.
  + Inadequate consideration of sustainable sourcing practices can lead to environmental impacts associated with the extraction, production, and transportation of construction materials. This can include increased carbon emissions and habitat disruption.
  + Failure to properly source materials in accordance with local regulations and building codes can lead to compliance issues. This may result in fines, delays, or the need for costly retrofits to meet regulatory standards.
  + Inefficiencies in material sourcing can reflect poorly on the project's management and may lead to reputational damage for the contractor. This can affect future project opportunities and partnerships.

**Mitigation Measures:**

* Establishing a well-structured procurement process is essential. This process should include clear timelines and specifications. It's crucial to verify that potential suppliers possess all necessary licenses and permits. Additionally, ensure that the purchased materials adhere to specified technical, safety, and environmental requirements, to be specified in the Technical Specifications as part of the closure design.
* Implementing a well-structured procurement process with clear timelines and specifications can help reduce delays in material acquisition.
* Establishing rigorous quality checks and inspections for all sourced materials can ensure that only compliant and high-quality materials are used in the construction process.

##### *iv. Ambient Air Quality Deterioration*

The PV/BESS and transmission line construction activities on site have the potential to generate dust and other atmospheric emissions. The associated environmental impacts caused by the construction activities include:

* Increased ambient dust from site clearing and levelling, haulage of material and general construction.
* Emissions from vehicle exhausts; and
* Those employees on site during the construction phase are likely to be affected by the generation of dust.
* The movement of vehicles on the unpaved roads can create dust, which can affect people in close proximity to the road.

The most significant air pollutant during the PV/BESS and transmission line construction include:

* Particulate matter emissions (dust) from earthmoving, stockpiles, vehicles traversing unsurfaced and gravel roads and machinery and equipment use to prepare the site; and
* combustion product emissions (nitrogen dioxide, sulphur dioxide, carbon dioxide and carbon monoxide) from vehicles, machinery and equipment on site

**Mitigation measures:**

* Implement a vehicle speed limit monitoring system on site, to help prevent/control dust from vehicles and ensure the use traffic control signs and speed bumps to reduce speed
* Apply sprinklers to prevent high amounts of dust in air
* Provide workers with proper Personal Protective Equipment (PPEs) such as face mask or

respirators, safety glasses, gloves etc. to minimise dust inhalation

* Stabilize exposed surfaces that are not going to be utilised after construction will be rehabilitated and maintained.
* Ensure stored materials are covered and protected from wind and dampening stored materials where appropriate.
* Minimise vehicles idling motors.
* EDSA/PIU will ensure mandatory break hours during peak traffic hours such as periods of high school children traffic.
* Generators must always be in ventilated locations.
* Ensure vehicles and equipment are maintained as per manufacturer specifications. ***iv.* Noise Nuisance**

The major noise generating sources during the construction phase are vehicular traffic, construction equipment like dozer, scrapers, concrete mixers, cranes, generators, pumps, compressors, pneumatic tools, vibrators etc. The operation of this equipment will generate noise ranging between 75 – 90 dB (A) This will be lower down from 90 dB(A) to 47 dB(A) at 50 m distance from the source and communities around the PV and BESS site are over 500m from the site. These communities though residential are mostly exposed to high level of noise because of proximity to main/busy roads. Noise from the PV and BESS site is expected to affect workers more than neighbouring communities. Vibration effects from excavation activities would be of minimal concern since structures are located over 500 m from the site The population density is very low in the area.

Communities along the transmission line are within 10-15m off the RoW. However, excavation of foundation for the erection of poles takes less time. Given that the transmission route is approximate 10km, it is estimated that 145 poles will be required with a span of 70-80m. It is important to note that the depth of a hole for an 11kv transmission line is approximately 1.5m. Such a depth would take about 45 minutes to be dug with a motorized augur. Therefore, 15 days would be required to dig around 145 poles. The rest of the other tasks including pole erection and stringing of cables will generate less noise.

Noise impacts are likely to be a matter of concern from an occupational health and safety point of view for workers. As indicated, some of the machinery and equipment will generate noise levels exceeding permissible exposure noise limits of 90 dB (A) for an 8-hour working shift. Impacts on occupational workers from exposure to increased noise level are highly anticipated and of significant impact potentially causing stress and hearing impairment, particularly in the absence of Personal Protective Equipment (PPE) given the long-term exposure to the different sources of noise.

**Mitigation Measures:**

* Install low noise equipment/noise silencers as far as practicable.
* Restrict major noise generating activities during daytime 6:00 AM to 10:00 PM.
* Ensure regular maintenance of project vehicles.
* Use of equipment /machines with inbuilt noise enclosure, wherever possible or provision of special acoustic enclosures for individual noise generating equipment’s, wherever possible
* During material movement, honking will be avoided to avoid disturbance to the surrounding community members.
* The number of equipment operating simultaneously shall be reduced as far as practicable.
* Workers will be provided with suitable hearing protection, such as earplugs or earmuffs, to be worn when they are in noisy work areas. Regular training and proper fitting of the hearing protection are essential to guarantee its effectiveness and ensure the safety and well-being of the workers.
* In case of complaints of higher noise levels and uncomforting received from the inhabitants of nearby settlements possibility of putting noise barriers near to the receptor need to be considered

##### *v. Erosion and Loss of Soil Resources*

Soil erosion is a major soil degradation process affecting soil quality not only by directly reducing nutrients and organic matter levels but also by affecting soil properties such as infiltration rates. Because the project’s construction activities will involve site clearing, material handling, and civil works, these may expose the topsoil and render it susceptible to erosion during winds and rainfall. The removal of the topsoil may eliminate the ideal condition for plant growth. Additionally, wind erosion will put dust in the atmosphere and promote exposure to particulate matter. Soil compaction during the backfilling of excavated soils may temporarily affect the natural infiltration of rainwater. Soil contamination may result due to accidental spillage and inappropriate storage of vehicular/machinery oil.

The land clearing for the installation and construction of all the necessary facilities for the running of the project would result in it being exposed to erosion agents, thereby leading to the loss of soil resources. The impact will continue during and after the construction stage if facilities such as the haulage roads are constructed on slopes, comprise laterite material, lack any or adequate drainage and are not shaded by trees but are exposed to erosion agents. Also, there will be an increase in the erosion rate with increase in traffic flow on these roads.

**Mitigation measures:**

* To avoid topsoil removal, stockpiles will be covered and construction activities will be planned in the dry season to minimise the likelihood of runoff.
* If the excavation is done during the rainy season, care will be taken to ensure that all dug holes are filled before the next rainfall.
* Soil overburden from excavation will be placed away from stream banks, along slopes, or in floodplains.
* Loose soil will not be left uncovered before backfilling and the excess soil will be removed after installation.
* The soils in reclaimed areas will be compacted to avoid erosion.
* Implement erosion and sediment control measures such as blankets, traps, silt fences, and sediment basins. These measures help to minimize soil erosion and prevent sediment runoff into nearby water bodies.

Regularly inspect the site for signs of erosion or sedimentation and promptly address any issues.

##### *vi.* Soil Contamination

Some potential sources of soil contamination during construction are:

* Accidental spills or leaks of fuel, lubricants, or other chemicals used for construction equipment or machinery can contaminate the soil.
* Improper disposal of construction waste, including concrete, metal, and other materials, can lead to soil contamination.
* Site grading and excavation activities can disturb the soil and potentially release contaminants that were previously buried or trapped in the ground.
* Soil erosion caused by construction activities can transport sediment and pollutants to nearby areas, contaminating the soil in those locations.
* Construction chemicals used for site preparation, such as stabilizers or concrete additives, may contain harmful substances that can impact the soil.

***Mitigation measures:***

* Ensure proper storage and handling of chemicals and construction materials to prevent spills and leaks. All storage areas (for fuels and lubricants) will be compacted and have bunded containers to prevent soil pollution and appropriate oil separators installed to cover a 24 - hr rainfall event.
* Vehicle service areas must be paved or compacted with proper oil separators.
* Implement erosion control measures, such as sediment basins and sediment fences, to reduce soil erosion and sedimentation.
* Follow best practices for waste disposal, including recycling and proper disposal of hazardous materials.
* All heavy machinery operators and truck drivers will be instructed to stay in designated areas, such as construction sites and roads.
* Implement soil remediation measures if contamination is detected, which may involve removing and replacing contaminated soil or applying soil treatments to reduce pollutant levels.
* Use specifically trained personnel to identify and selectively remove potentially hazardous materials, such as polychlorinated biphenyls (PCBs).
* Use of waste-specific PPE based on the results of an OHS assessment, including respirators, clothing/protective suits, gloves and eye protection.

##### *vii.* Water Contamination

The project activities will impact contiguous or downstream surface and groundwater resources. During construction and operation, there is a high risk of contamination of these water sources from the following activities:

* Sediment transport through surface run-off from excavation, construction activities and equipment operation
* Run-off from dampening systems to control dust emissions and dumping of spoiled material.
* Sanitary effluents from construction workers and operational activities
* Oil and chemical spills from vehicles and other machinery
* Leaks from batteries can leach into groundwater or wash away by surface runoff.
* Washing of solar panels, vehicles and other machinery.
* All other activities causing soil contamination discussed earlier can also cause water contamination.

**Mitigation Measures**

Implement effective sediment and erosion control measures to prevent sediment runoff into water bodies. This includes the use of sediment traps, sediment basins, silt fences, and erosion control blankets to capture and contain sediment.

* Implement proper stormwater management practices to control runoff and prevent the transport of pollutants into water bodies. This may involve the installation of retention ponds or infiltration systems to capture and treat stormwater runoff.
* Establish spill prevention and containment procedures to prevent accidental releases of hazardous substances. This includes proper storage, handling, and labelling of chemicals, as well as providing spill kits and training for workers to respond to spills promptly and effectively.
* Implement a robust waste management plan to ensure proper disposal of construction waste, debris, and hazardous materials. This includes segregating and recycling materials where possible and disposing of waste in accordance with local regulations.
* Conduct regular inspections of construction areas to identify potential sources of water contamination. Promptly address any issues or deficiencies found during inspections and maintain erosion control measures to ensure their effectiveness, including measures on wastewater discharge resulting from the presence of workers on site. ***viii.* Impact on Local Ecology**

The construction phase of the project will be associated with vegetation clearance to create facilities need for construction activities, particularly within the PV and BESS site. This will remove vegetation cover, fragment vegetation corridors and home range for species and disrupt foraging activities. Vegetation, particularly forest cover provides viable habitat for many species, including refugia for juveniles, migratory corridors and foraging grounds. Although the construction phase will be relatively localised, yet the fragmentation of vegetation cover and disruption of corridors could affect foraging options for many birds and butterflies.

In the case of small mammals, their degree of adaptability is relatively high, especially for habitat generalist (for e.g., cane rats and squirrels) and so the attendant changes in habitat could increase their numbers, as their natural enemies decline, and more food become available. In the case of birds, the effect of the construction phase would impact the diversity, distribution and ecological roles they play. Birds are empirically known to be key indicators of environmental change, because of the numerous roles they play in ecological processes. Such roles include pollination, seed dispersal, control of the population of insects and other invertebrates etc. Consequently, any change in the environmental condition by the construction will certainly affect the species composition, distribution and ecology of birds.

The effect on butterflies will be similar to that of birds. Some species of butterflies rely on closed forest floor, edges of streams, small pools of water, swampy and muddy areas. Construction might affect these delicate habitats for butterflies and would affect their diversity, abundance and distribution.

**Mitigation measures:**

The following mitigation measures will be followed:

* Collaborate with local communities to protect small patches of forest in their vicinities. A community-based collaboration is required to conserve the small patches of community forest and sacred groves around the various local communities. In fact, most of the forest dependent species identified are held within these small forest patches, some of which are contiguous with the gallery forest along the streams and swamps. In additionally these forest patches are a vital network of corridors and refugia for wildlife, especially those that forage over a wide range of habitats.
* Control and limit the extent of earth removal stockpiling and dumping in critical areas

There is need to ensure the location for removal, stockpiling and dumping of earth are carefully selected in order to control erosion and sedimentation and loss of agricultural land, particularly during the construction phase. Indiscriminate earth removal and dumping could lead to longterm destruction of habitats for a wide variety of flora and fauna. Steps will be taken to restricted digging of borrow pits and dumping to suitable areas in order to reduce and limit the extent of habitat degradation at the site of the proposed PV and BESS site and along the transmission corridor. Dumping for example will be done in areas remote from water courses and remote from viable agricultural land, whilst unnecessary vegetation clearing will be avoided as much as possible. ***ix. Potential Impacts of construction of poles in the swamp at Suctarr village***

The construction of transmission lines can impact the swamp area in several ways including the following:

* Heavy machinery can crush swamp area vegetation.
* Clearing vegetation for pole installation disrupts the natural swamp habitat, by removing crops, shrubs and other plant life forms affecting dependent flora and fauna.
* Altering the swamp’s ecology through excavation and siltation, may lead to biodiversity loss, impacting various plant and animal species, such as fish, amphibians and some hydrophytes.
* Construction activities cause soil disturbance, disrupting soil macro and micro fauna, which will affect swamp soil composition, structure, functions and nutrient cycling.
* Runoff from construction introduces sediment and pollutants, compromising water quality, and may cause eutrophic conditions that reduce oxygen availability, thereby harming aquatic life.
* Changes in vegetation and habitat create imbalances, favouring certain species and disadvantaging others, leading to shifts in population dynamics thus creating ecological dysfunctions and may cause local extinction of some habitat-dependent species.
* Construction disrupts swamp functions such as water filtration, flood control, and nutrient cycling, affecting overall ecosystem health.
* Introducing poles to the swamp may disrupt microbial and fungal communities essential for nutrient cycling and overall ecosystem health.
* Swamps, habitats for migratory species, may be disrupted by construction, potentially affecting foraging activities, roosting and breeding and migration patterns of aquatic dependent migratory species.
* Vegetation removal increases soil erosion risk in the swamp, and destabilizes edge substate, leading to sedimentation in water bodies, increasing turbidity, reducing water quality, and adversely impacting aquatic ecosystems.
* Most wooden poles are treated with pesticide preservatives like creosote, pentachlorophenol (PCP), and chromated copper arsenate (CCA) to ward off insects, bacteria, and fungi, preventing rot. During use, these poles may leach preservatives into the surrounding soil and groundwater. However, the highest levels are typically found next to the poles, gradually decreasing to normal levels at about 30cm from the pole (Zagury et al., 2003). This contamination may disrupt the ecological balance, harming aquatic life, plants, and organisms in the swamp ecosystem, with broader consequences for its overall health and biodiversity.

#### Mitigation Measures

* Concrete poles are recommended; if wooden poles are chosen, adhere to the Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution (2007), ensuring proper pretreatment at a suitable facility to fix chemicals, prevent leaching, and inhibit surface residue formation on the RoW.

Concrete poles prevent sinking or shifting in swampy terrain, shielding against decay, rot, and water damage. This enhances the resilience of wooden poles in challenging swamp conditions. Alternatively, concrete foundations with an above-ground column can be used for wooden poles in swamps.

* Limit excavation to dry periods when the soil is relatively hard and compact, and vegetation growth is dormant, to control erosion and siltation.
* Restrict equipment entry into the swamp and opt for manual labour whenever possible.

**As the successful EPC contractor is onboard, will provide a work plan (as part of C-ESMP) incorporating the below considerations:**

* Assess the risks or impact of construction or expansion of the project footprint on adjacent swamp areas and sensitive ecosystems. Make recommendations that will inform engineering design based on this assessment.
* Adequate buffer will be established between the facility, TML, access road and the swamp area.
* Construction and operation of the proposed project will take into consideration the recommended mitigation measures relating to local community livelihoods and the conservation needs of the swamp ecologies.
* Minimize the disturbance of the swamp areas, as much as possible, through implementing erosion and sediment control measures, such as silt fences, vegetation, etc. to prevent soil runoff and sedimentation in the swamp areas; limit major civil works, including excavation and materials movement across the swampy areas to the dry Season or non-breeding season and protect the integrity and sustainability of the swampy areas; employ eco-friendly preservatives or treatments; avoid or reduce the use of chemicals, fuels, and other hazardous substances that could contaminate the swamps; using the least invasive techniques and equipment; restoring the site to its original condition after completion; etc.

##### *x. Solid Waste/ Hazardous Generation and Management Issues*

Solid wastes to be generated during construction activities and stringing of cables include construction wastes, food/packing materials littered by workers, scrap copper wires, and cables. Solid wastes would also include vegetation from clearing, soils excavated during earthworks, concrete etc.. Construction wastes will not be allowed to accumulate on the construction site but will be collected promptly and removed regularly from the site. Wastes if not managed, can be spread all over the site and outside the project footprint. These have the potential to contaminate surface water bodies flowing in proximity to the construction sites. Additionally, they can cause aesthetic “eye-sore” and serve as a breeding ground for disease-carrying organisms. Hazardous wastes from construction activities include:

* Chemicals and solvents used in cleaning, painting, or equipment maintenance.
* pollutants such as oils, fuels, or heavy metals
* Discarded or damaged electrical components and equipment, such as batteries or transformers, can contain hazardous materials like lead or mercury.

**Mitigation Measures:**

EPC contractor will implement the waste management plan which involves the following prevention/mitigation measures:

* During construction, construction and inert waste will be stockpiled at an appropriate location within the project site and subsequently disposed of at the Lungi dumpsite.
* Indiscriminate disposal of solid waste shall be strictly prohibited.
* Implement the waste management plan for handling hazardous waste stream.

Development and implementation of a sustainability policy and practice by the contractor that includes waste reuse, recycling, and reduction.

* The sustainability policy will allow the incorporation of a waste management plan in project management and contract specifications.
* Collaboration with relevant local authorities to enforce appropriate sanitation and other bylaws.
* Waste management by burning will be prohibited. ***xi. Health and Safety Hazards for workers***

During the construction of the proposed facility, there are several risks related to labour and working conditions that need to be considered:

* Physical hazards: Construction sites can be hazardous environments, with risks such as falls, being struck by objects, or being caught in-between equipment. If proper safety protocols are not followed, workers may be exposed to accidents and injuries while working with heavy machinery, equipment, and materials.
* Electrical hazards: Solar PV systems and transmission lines involve working with high-voltage electrical components. This poses a significant risk of electric shock, arc flash, or electrocution if workers are not adequately trained, safety procedures are not strictly followed, or there are faults or malfunctions in the electrical systems.
* Working at heights: Construction activities often require working at elevated heights, such as installing solar panels or erecting transmission poles. This presents a risk of falls if proper fall protection measures, such as harnesses, guardrails, or scaffolding, are not in place. Inadequate safety measures can result in severe injuries or even fatalities.
* Ergonomic risks: Construction tasks can involve repetitive motions, heavy lifting, and awkward postures, leading to musculoskeletal disorders and injuries if workers do not have proper ergonomics training and if appropriate equipment, such as lifting aids or ergonomic tools, is not provided.
* Chemical exposure: Construction activities may involve using chemicals, such as adhesives, solvents, or sealants. Workers may be exposed to harmful substances, leading to respiratory issues, skin irritations, or other health problems if proper safety protocols, ventilation systems, and personal protective equipment (PPE) are not used.
* Noise and vibrations: Construction sites can generate high noise levels from machinery, equipment, and construction activities. Prolonged exposure to excessive noise can cause hearing damage if proper hearing protection measures, such as earplugs or earmuffs, are not implemented. If not adequately controlled or mitigated, vibration from equipment or tools can also adversely affect workers' health, including hand-arm vibration syndrome.
* Fatigue and long working hours: Construction projects often involve demanding schedules and long working hours, which can lead to fatigue and increased risk of accidents. Fatigue impairs concentration, coordination, and decision-making abilities, posing hazards to workers and compromising overall safety.
* Worker accommodation and welfare: In remote project locations, providing suitable accommodation, sanitation facilities, and access to healthcare services for workers can be a challenge. Inadequate living conditions, lack of proper rest areas, or insufficient access to healthcare can affect worker well-being, morale, and overall performance.
* Compliance with Labour Standards: Risks may arise if labour laws and standards, such as fair wages, working hours, occupational health and safety regulations, and worker rights, are not adhered to. Non-compliance can lead to unfair treatment, exploitation, inadequate training, lack of GRM, or other violations that compromise worker safety and well-being.

**Mitigation measures:**

The labour management plan is a crucial component of the project's overall approach to mitigating risks and ensuring the health and safety of workers during the project life cycle. This plan outlines specific measures and strategies to address potential hazards and promote a safe working environment. The following measures can be implemented to address the risks associated with labour and working conditions during the project implementation.

* Provide comprehensive training to workers on occupational health and safety practices, including hazard identification, proper use of PPE, and emergency response procedures. The Contractor shall have a safety officer who will conduct daily toolbox talks with workers regarding the occupation health/safety topic Conduct thorough risk assessments to identify potential hazards and implement appropriate control measures. Regularly monitor and review safety protocols to ensure their effectiveness.
* Install guardrails, safety harnesses, and safety nets to prevent falls from heights. Ensure workers are adequately trained in fall protection measures and consistently enforce their use.
* Implement strict protocols for working with high-voltage electrical components, including lockout/tagout procedures, grounding, and regular equipment inspections. Provide workers with adequate training on electrical safety practices.
* Provide training on proper lifting techniques and ergonomics to minimize the risk of musculoskeletal disorders. Use mechanical aids, such as hoists or lifting equipment, to reduce manual handling tasks where possible.
* Follow proper handling, storage, and disposal procedures for chemicals used during construction. Provide workers with appropriate PPE, such as gloves and respiratory protection, and ensure adequate ventilation in areas where chemicals are used.
* Implement measures to control excessive noise levels, such as using noise barriers or providing hearing protection. Regularly maintain and inspect equipment to minimize vibration levels.
* Establish policies to manage working hours and prevent excessive fatigue. Schedule regular breaks and rotate tasks to avoid prolonged physical and mental exertion. Encourage open communication to address fatigue-related concerns.
* Ensure adequate and suitable living conditions for workers, including comfortable accommodations, sanitation facilities, and access to healthcare services. Monitor and address any issues related to worker well-being and welfare.
* Adhere to the Sierra Leone labour laws and regulations and the ESS2, ensuring fair wages, reasonable working hours, and proper worker protections. Establish mechanisms for workers to report grievances and provide channels for resolving disputes. ***xii.* Community Health and Safety**

Community health and safety concerns associated with the project include:

* Communicable Diseases: Migrant construction workers who engage in risky sexual behaviours and face limited access to healthcare and prevention resources are at a higher risk of contracting Sexually Transmitted Infections (STIs) such as Human Immunodeficiency Virus (HIV)/Acquired Immunodeficiency Syndrome (AIDS), syphilis, and gonorrhea. Furthermore, there is a potential for these diseases to be transmitted to community members who may engage in sexual activities with them. COVID-19 is predominantly transmitted through respiratory droplets expelled when an infected individual coughs, sneezes, talks, or breathes heavily. Additionally, it can spread by touching surfaces or objects that have been contaminated with the virus and then touching the face, particularly the eyes, nose, or mouth. Due to its high level of contagion, COVID-19 can be easily transmitted from one person to another, resulting in outbreaks and community-wide spread.
* Noise and Dust related issues: Construction activities often generate excessive noise and dust leading to disturbances and inconvenience for the community. Prolonged exposure to high noise levels can cause stress, sleep disturbances, and adverse effects on mental health and cognitive functioning.
* Electrical Safety/fire hazards: Solar PV projects involve the generation and distribution of electricity. Improper installation, maintenance, or handling of electrical components can pose risks such as electric shocks, short circuits, or fire hazards.
* Chemical and Hazardous Materials: Solar panels contain various materials, including potentially hazardous substances such as lead, cadmium, and other toxic elements. Improper handling or disposal of these materials can pose environmental and health risks.
* Electromagnetic Fields (EMFs): The presence of electrical infrastructure in a solar PV project can create electromagnetic fields. Prolonged exposure to electromagnetic fields created under the transmission lines directly affects human health, particularly children's brain development.
* Construction and Traffic Safety: During the construction phase, increased traffic, heavy machinery, and construction activities can pose safety risks to the community, including pedestrians and drivers.
* Access and Security: Solar PV projects often require fenced areas or restricted access for security purposes. Concerns may arise regarding limited community access to the surrounding areas or potential safety risks associated with restricted access.

**Mitigation Measures:**

To address community health and safety concerns related to the project, several mitigation measures will be implemented:

➢ Communicable Disease

**Mitigation measures for STIs prevention and management will include:**

* *Awareness and Education*
* Conducting educational campaigns and training sessions on STI prevention, transmission, and safe sexual practices for workers and community members
* Distributing informational materials in multiple languages (English and local languages) to ensure understanding and awareness
* Facilitating easy access to healthcare services, including STI testing, treatment, and counselling, for both workers and community members.
* Collaborating with local healthcare providers or establishing on-site medical facilities to provide necessary care and support.
* Promoting and providing free condoms to workers and community members to encourage safe sexual practices and reduce the risk of STI transmission.
* Ensuring the availability of condoms in convenient locations such as rest areas, clinics, and community centres.
* Establishing peer education programs where trained individuals educate their colleagues and community members about STI prevention, safer sex, and the importance of regular testing.
* Creating support groups or networks to encourage open discussions, address concerns, and provide assistance related to sexual health and STI prevention.
* Covid-19 guidelines will be followed ([*https://www.who.int/emergencies/diseases/novelcoronavirus-2019/advice-for-public*)](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public)

#### Noise and Dust related issues

All mitigations for noise and air quality apply **Electrical Safety**

* Adherence to electrical codes, regulations, and safety standards during the design, installation, and maintenance of the solar PV system.
* Proper training and certification of personnel involved in the installation and maintenance of electrical components.
* Regular inspections and maintenance to identify and address potential electrical hazards promptly.

#### Chemical and Hazardous Materials

* Following proper handling, storage, and disposal procedures for solar panels, especially at the end of their lifecycle.
* Adhering to environmental regulations and guidelines for the safe management of hazardous materials.
* Implementing appropriate measures to prevent the release of hazardous substances during installation, maintenance, or dismantling processes.

#### Fire Hazards

* Installation of fire detection and suppression systems in and around electrical components.
* Regular inspections and maintenance of electrical equipment to identify and rectify any potential fire hazards.
* Developing emergency response plans and conducting drills to ensure a prompt and effective response to fire incidents.

#### Electromagnetic Fields (EMFs)

* Ensuring compliance with established safety limits for electromagnetic radiation.
* Conducting periodic monitoring and assessment of EMF levels to verify compliance with regulations.
* Implementing appropriate signage and communication to inform the community about EMFrelated safety measures and precautions. **Construction and Traffic Safety**
* Implementing the traffic management plan to minimize disruption and ensure the safety of pedestrians and drivers.
* Providing clear signage and barriers to indicate construction zones and hazards.
* Conducting regular safety briefings and training sessions for construction personnel.

#### Access and Security

* Establishing clear protocols for community access to the project area, including designated entry points and visitor management systems.
* Ensuring proper fencing and security measures to prevent unauthorized access and potential safety risks.
* Regular community engagement, effective communication, and transparency regarding the project's health and safety measures will also help address community concerns and foster trust between the project developers and the community.

##### *xiii.* Impact on Water Resources

Water needs during construction would be limited to sanitary water and minimal amounts of water for construction (such as spraying for dust prevention). During construction, a bore hole will be dug on site to cater for water needs. Construction will last for about 16 months. Water resources is not scarce in Lungi, except at the peak of the Dry Season. The town experiences a significant amount of rainfall throughout the year. The region's climate is characterized by a tropical rainforest climate, which typically entails high humidity and abundant rainfall. The proximity of Lungi to the coast further contributes to its wet climate, as coastal areas often receive more precipitation compared to inland regions. Therefore, pressure on community water resources will be moderate during the Dry Season but can be significant during the Dry Season.

***Mitigation Measures:***

• A borehole will be sunk on the project site for project activities to avoid the risk of exerting additional pressure on community water supply. A comprehensive hydrologic study/ monitoring will be conducted for at least 1 year to assess the project's potential impact on community water resources. The main goal of the study is to determine the water budget of the area, which involves quantifying the various components of the water cycle, including precipitation, evapotranspiration, surface water runoff, and groundwater recharge. The study will involve collecting and analysing data on precipitation patterns, including seasonal changes in rainfall amounts. This information will provide insights into the availability of water resources in the area and help determine if the project aligns with the local hydrological conditions.

Additionally, evapotranspiration measurements will be undertaken to understand the amount of water lost to the atmosphere through evaporation from land surfaces and plant transpiration. This data will be crucial in estimating the water demand of the local ecosystem and determining if the project's water usage aligns with the available supply.

Furthermore, the study will also assess surface water runoff, which refers to the water that flows over the land surface into streams, rivers, or other bodies of water. By examining the flow patterns and volumes, the project's potential impact on local water resources can be evaluated.

Groundwater recharge, the process by which water replenishes underground aquifers, will also be studied. This will involve monitoring groundwater levels and assessing the rate at which water is replenished naturally. By understanding the recharge rates and the existing groundwater resources, the study will help determine if the project's water usage could potentially impact the local aquifer.

Alternatively, since Lungi experiences a significant amount of rainfall throughout the year, water harvesting can be practised. Also, the water used for washing PV panels can be collected and treated for reuse.

##### *xiv.* Impact on Cultural/Archaeological Resources

Cultural resources are non-renewable resources that are critical to human existence, history and culture. Cultural/archaeological sites are places and objects of beauty, cultural, historical, scientific, social, or spiritual value. The Potential effects on cultural heritage assets can generally be avoided through careful routing and/or site selection. This impact assessment did not find the likelihood that the project construction activities would impact cultural resources, and archaeological and historical sites. However, because of its significance, it is worth discussing the concern of potential impacts on cultural/archaeological resources.

***Mitigation Measures:***

The project construction activities will avoid alignments and locations that cut through known cultural sites. Cultural resources uncovered during works will be handed over to the National Monuments and Relic Commission for preservation or preservation of the site. In the unlikely event that cultural resources are found (chance finds) during works, the work will immediately suspend, while the commission will be invited to handle the artifacts. The Chance Finds procedure is included in this report. ***xv.* SEA/SH Risks**

* Female workers may be subjected to exploitative situations where their vulnerability is taken advantage of, such as through coercive actions or abuse of power dynamics.
* Instances of physical, verbal, or psychological abuse may occur, creating an unsafe and hostile working environment for women involved in the project.
* Women may experience unwelcome advances, inappropriate comments, gestures, or other sexual harassment that undermine their dignity and create discomfort or fear.
* Construction sites and accommodation facilities can be breeding grounds for gender-based violence, including sexual assault, rape, or other forms of violence targeting women and girls based on gender.
* Project workers may be significantly better off financially than many members of projectaffected communities and may use their financial resources to exploit or abuse women and girls in those communities sexually. This exploitation and abuse may continue throughout the project's life.

**Mitigation Measures:**

* All measures mentioned for the pre-construction risks.
* Implement the SEA/SH action Plan by following measures such as reporting mechanisms, support services, gender-sensitive facilities, supervision, and grievance mechanisms can help mitigate these risks and promote a culture of respect and gender equality on the worksite. Regular monitoring and evaluation are essential to ensure the effectiveness of these measures and to continuously improve the prevention of SEA/SH during construction.

##### *xvi.* Influx of labour

The influx of labour during the project's construction phase can result in diverse impacts on local communities, encompassing economic, socioeconomic, social, and environmental dimensions.

The presence of many workers/job seekers in the community can lead to changes in the local socioeconomic dynamics. There might be an increased demand for housing, transportation, and other services, which can stimulate the local economy. However, it can also put pressure on existing infrastructure and public services, such as healthcare, education, and utilities, requiring additional resources to meet the needs of workers and residents.

Also, the interaction between project workers/job seekers and the local community can foster cultural exchange and create opportunities for learning and understanding between different groups. However, it can also lead to social tensions, especially if there are cultural, language, or behavioural differences between the workers, job seekers and the residents.

Additionally, an external labour force can disrupt local community power dynamics. This may be particularly relevant in terms of gender relations, where male jealousy and gender-based violence can be triggered due to perceived interactions between project workers and local women. As a result, abusive behaviour can arise not only between project personnel and individuals residing near the project site but also within the households of those affected by the project.

**Mitigation measures:**

**i.** Engage with local communities early in the project planning phase to understand their needs, concerns, and aspirations. Foster positive interactions and understanding between the incoming workers and the local community through cultural exchange programs, language support, and community engagement initiatives. Promote mutual respect, tolerance, and collaboration to minimize social tensions.

* As part of the Labour Management Plan, it is essential to ensure the provision of sufficient accommodation and related facilities to accommodate the influx of labour.
* Strict enforcement of health and safety regulations ensures the well-being of workers and prevents public health risks.
* The implementation of the CDAP can foster a positive relationship between the project and the local community by ensuring that the project directly benefits the community.

##### *xvii.* Tension from unrealistic expectations from communities

Potential tension arising from unrealistic expectations in communities is a common challenge faced during project implementation. When community members hold high or unrealistic expectations regarding the benefits, they believe a project will bring, it can lead to disappointment, frustration, and conflict if those expectations are not met.

One of the primary reasons for such tensions is misunderstandings or miscommunications between the project proponents and the community. If the project's objectives, scope, or potential impacts are not clearly communicated or if there is a lack of transparency in sharing information, community members may form exaggerated or unrealistic ideas about the project's benefits.

Additionally, factors such as historical experiences, and past promises from other projects may influence the community's expectations. They might base their expectations on assumptions derived from previous development initiatives, leading to anticipation of greater benefits than what the current project can realistically deliver.

Moreover, community members may have different perspectives and priorities, and their expectations may vary based on their individual needs and aspirations. These diverse expectations can create tensions if not adequately addressed and managed.

**Mitigation Measures:**

It is essential to manage expectations throughout the project's lifecycle. The following measures will mitigate potential tension from unrealistic community expectations:

* Implement the project Stakeholder Engagement Plan (SEP)
* Regular updates and progress reports can help keep the community informed about the project's developments and potential changes. This ongoing communication fosters trust and demonstrates the project's commitment to addressing community needs while being realistic about the benefits it can provide.
* Building partnerships and strong relationships with local stakeholders can also contribute to managing expectations effectively. By involving community leaders, local organizations, and influential individuals, the project can gain valuable insights into the community's priorities and concerns and ensure that their expectations align with the project's objectives.
* Proactive engagement, transparent communication, and a commitment to managing expectations throughout the project's lifecycle. By fostering open dialogue and setting realistic goals, projects can build trust, enhance community support, and create a positive and cooperative environment for successful implementation and lasting positive impacts.

##### *xviii.* Exclusion of vulnerable groups

The project development may also lead to the exclusion of vulnerable and disadvantageous groups and have disproportionate impacts on them. Some of these social impacts are as follows:

* Energy poverty perpetuation: Exclusion from the project can reinforce the energy poverty experienced by vulnerable groups, limiting their access to clean and affordable energy sources and impeding their socio-economic progress.
* Economic inequality: Excluding vulnerable groups from the development phase can exacerbate economic disparities, as they may miss out on employment opportunities, job training, and potential economic benefits associated with the project.
* Limited community engagement: Failure to involve and consult with marginalized communities in the decision-making process can result in limited community engagement, reduced trust, and feelings of disenfranchisement.
* Limited Access to Information: Vulnerable groups may have restricted access to project-related information, making it difficult for them to fully understand the implications of the project and their rights.
* Disruption of Livelihoods: The project can disrupt the livelihoods of vulnerable groups, particularly if they rely on informal or marginalized economic activities. This can lead to economic insecurity and exclusion.
* Inadequate Compensation or Assistance: Vulnerable groups may face challenges in negotiating fair compensation or receiving appropriate assistance for their losses. This can further marginalize them and exacerbate their vulnerability.
* Inequality in Employment Opportunities: During job hiring, vulnerable groups may face barriers in accessing these opportunities due to discrimination or lack of skills training.
* Social cohesion and well-being: Exclusion from the benefits of the solar project can contribute to social fragmentation, widening the gap between different social groups and undermining overall community well-being.
* Limited Grievance Mechanisms: Vulnerable groups may encounter challenges in seeking resolution for grievances related to the project, particularly if there are inadequate or inaccessible mechanisms in place.
* Environmental justice concerns: Disproportionate impacts, such as increased environmental pollution or inadequate mitigation measures, can arise if vulnerable communities are not included in project development, leading to environmental justice issues.

**Mitigation Measures:**

To address issues of inclusion and protection of vulnerable groups, the following measures will be followed:

* Implement the SEP.
* Establish clear and accessible channels for disseminating project-related information to vulnerable groups.
* Actively involve vulnerable and disadvantaged groups in decision-making, seeking their input and addressing their specific needs and concerns
* Prioritize hiring from local communities, including vulnerable groups, to ensure that employment opportunities and economic benefits are accessible to all.
* Allocate resources to community development initiatives, such as supply of SEA/SH response toolkit as part of the SEA/SH action plan for health center at Lungi to enhance social well-being and cohesion.
* Ensure fair and transparent compensation mechanisms based on thorough assessments of losses incurred by vulnerable groups.
* RP will incorporate tailored livelihood support measures for vulnerable PAPs.
* EDSA/PIU will ensure the GM structure is accessible and transparent and further caters specifically to the needs of vulnerable groups. Ensure that grievances are addressed promptly, and feedback is provided to the affected individuals or communities.

###### 6.3.3. Operational and Maintenance Phase Impacts

Moderate-scale land-disturbing activities and associated impacts are anticipated during the operation phase.

1. Routine maintenance activities, such as cleaning panels, inspecting electrical connections, and replacing faulty components.
2. Regularly monitoring the performance parameters of batteries, such as voltage, current, and temperature, to detect any abnormalities or degradation.
3. Monitoring the transmission line for any faults, damage, or abnormal conditions using sensors, telemetry systems, or visual inspections
4. Both on- and off-site maintenance of access roads may be required after rainfall events (e.g., blading and sediment removal from culverts)
5. Vegetation maintenance would be required within the solar array.

##### • *Waste Generation and Management Issues*

Following the construction phase, there will be limited waste production during the operational phase. The anticipated wastes during operation will include:

1. Domestic waste
2. Industrial waste (oil, oily rags, scrap metal replaced machine components, broken panels and batteries etc.)
3. Sanitary waste from the septic tanks, and

**Mitigation Measures:**

* Use a 3-bin system so that food waste and recyclables viz. paper, plastic, glass, scrap metal waste etc. are segregated and stored in designated waste bins/ containers. The recyclables will be periodically sold to local recyclers while food waste will be disposed through govt. approved waste handling agency. E-waste (viz. broken solar cells, etc.) will be collected in a different bin and follow guide on disposal of in ***Annex VI.***
* Ensure broken solar panels are properly packed, disassembled as per operator’s manual and SOP. Non-hazardous components and materials will be transferred to the Lungi Landfill site for disposal, while hazardous materials will be transferred to a facility to be designated and agreed on with EPASL.

##### ➢ *Impact on Local Ecology*

Impacts during operation phase are likely to be restricted to the maintenance activities within the project site like ground cover clearing under PV arrays and from internal road network within site. Apart from a relatively small direct loss of habitat, the shading of the soil by the solar panels is likely to impact reptile composition in these areas, as the shading is likely to alter soil temperatures which has direct implications for cold-blooded animals.

**Mitigation measures:**

1. Fencing and lighting along the project boundary must be properly maintained all through the project lifecycle.
2. Grow weed suppression species beneath the panels.

##### • *Noise Nuisance*

Noise disturbance arising from the operation of a BESS facility is a noteworthy issue for nearby communities and the environment. BESS installations comprise diverse equipment and components that can produce noise during charging, discharging, and other operational processes. The excessive noise may disrupt the lives of residents residing in close vicinity to the BESS facility, causing discomfort, sleep disturbances, and a decline in their overall well-being. Furthermore, prolonged exposure to elevated noise levels can result in adverse health effects, including stress, anxiety, and hearing impairments, particularly impacting vulnerable groups such as children and the elderly.

**Mitigation Measures:**

To address noise nuisance from the BESS facility during operations, the following mitigation measures can be implemented:

* Construct sound barriers or acoustic enclosures around noisy equipment to minimize the propagation of sound beyond the facility.
* Regularly monitor noise levels and ensure compliance with local noise regulations and standards.
* Employ noise-reducing technology, such as low-noise fans, mufflers, and vibration isolation for the BESS facility equipment.
* Regularly maintain equipment to minimize noise emissions and conduct ongoing monitoring to ensure noise levels remain within acceptable limits.

###### *i. Ambient Air Pollution*

There is no point or fugitive sources of air pollutants. In operational phase, project does not envisage any major air pollution sources. Since major source of emission into the ambient air will be absent during the operational phase therefore impact is negligible. However, as a good management practices following measures are suggested:

* Vehicles and equipment used on this facility will be go through the regular emissions tests mandatory for annual renewal of vehicle licenses as required by law.
* Since the investment is designed to be economically viable, procurement and maintenance of new vehicles and equipment will be factored into the capital and operational costs.
* Restrict movement of vehicles on unpaved surface within the site

###### *ii. Change in Landscape and Visual Amenity*

There are a no existing man-made features including power lines within the project solar PV site. However, the proposed development will result in a significant change to the local landscape character. At the operational phase, a solar station will likely impact the overall sense of place of the wider area. The PV panels will cover up to approximately 18 hectares in total and the PV arrays will be seen from visual receptors in the area.

**Mitigation Measures:**

Mitigating measures should be carefully considered to minimize the impact on the landscape and visual amenity. These measures may include:

* Using colors and materials that blend with the natural surroundings reduces the visual contrast between the infrastructure and the landscape.
* Raising awareness among the community about the project's benefits and the efforts taken to mitigate visual impacts, fostering understanding and acceptance.

###### *iii. Occupational Health and Safety Issues*

Occupational health and safety issues associated with the project's operations include:

* Electrocution/ Electrical Shocks from installations at the site or from fallen transmission poles and cables, especially following a storm. Maintenance and repair personnel are often prone to these shocks, often due to negligence, recklessness or a general failure to follow standard safety procedures. These may occur when the skin comes in contact with live power lines, etc. The severity of the shock depends on voltage, current, time of contact, etc.
* Fire outbreak caused by an electrical short circuit.
* Possible injuries associated with working at height.
* Diseases due to unhygienic condition

**Mitigation measures:**

The same mitigation during construction will be followed.

###### *iv. Community Health and Safety Issues*

* Traffic Movement: In operational phase, very few (2-3 nos.) vehicles will be required for commuting to site office. The risk of accidents still exists though on a low scale.
* Risk of Electrocution: Risk of Electrocution is anticipated in the operational phase of the project due to exposure of members of the community to electric shocks from fallen transmission lines following severe storms. Outsiders are usually not permitted within restricted areas, and barrier walls are erected enforced this. To minimize the risk of fallen transmission lines/poles, the risk will be factored into the choice and design of electric poles (i.e., concrete, steel frame or wooden). Taking all these points in consideration, with distribution buffer area, duration short and intensity low, the significance of impact can be taken as low.

**Mitigation measures:**

* EDSA/PIU will implement the traffic management plan throughout the project lifecycle
* Implement health and safety plan
* Ensure noise and air pollution is minimized
* Restricted entry into PV and BESS facility
* Boundary wall and restricted entry in project site
* The emergency preparedness plan will be implemented
* All safety measures during construction will be followed

###### *v. Emergency Situations*

Emergency situations may arise from various activities and conditions within and outside of the Solar facility. These will include, but not limited to; natural disasters, civil unrest, plant equipment or process failures, vehicle accidents, bushfires, which could have severe consequences on the project if no emergency response plans have been put in place.

**Mitigation Measures:**

The emergency response plan will be implemented and updated as the need arises.

###### *vi. Reflectivity and Solar Panel Glare on Neighbours and Aviation*

The use of cheap panels and non-certified installers might create minor glare that can annoy residents, communities and pilots, especially when they are installed in large quantities. Solar panels are made up of PV cells, which convert sunlight into electricity. Cells are usually made up of silicon that absorb sunlight greatly and emit light particles call photons. And when those photons hit a reflective surface, they can cause glare which is a harsh uncomfortably bright light. Because of this uncomfortable bright light, monocrystalline silicon cells which absorb better sunlight than other solar cell are often used in high-end solar panels. The best PV cells are only about 80% efficient at absorbing sunlight and the remaining 20% is reflected as photon. Most of those photons are emitted perpendicular to the surface of the cell, so they don’t cause much glare. Thus, the impact is minor and localized. In some case, if they are emitted at low angle, they might hit reflective surface to create unconfutable bright light which might cause disturbance for pilots and also affect residents and community members. PV modules exhibit less glare than windows and water.

**Mitigation Measures:**

* The final design and alignment of the solar panels will be communicated to and discussed with the Lungi Airport Authority for approval prior to installation.
* The project will use high-quality PV cells.
* The project will use Monocrystalline silicon cells which is the best option for reducing reflection and glare.

###### *vii. Pressure on Water Resources*

In the operation phase, water is required for module cleaning throughout the project life cycle. Additionally, water will be needed for sanitary uses at the facility. Once the borehole is dug during construction, this can be used for the purposes of the operational phase.

Water resources is not scarce in Lungi. The town experiences a significant amount of rainfall throughout the year. The region's climate is characterized by a tropical rainforest climate, which typically entails high humidity and abundant rainfall. Lungi's proximity to the coast further contributes to its wet climate, as coastal areas often receive more precipitation compared to inland regions. Therefore, pressure on community water resources can be low.

**Mitigation Measures:**

Mitigation during the construction phase apply.

6.3.4. Decommissioning Phase Impacts

The proposed PV/BESS facility has a lifespan of approximately 20-30 years if the specified periodic maintenance is performed. After this economic lifespan, the infrastructure will be upgraded and replaced with newer or more advanced technology unless there is no need for a replacement. In that case, the facility will undergo complete decommissioning, involving disassembling and removing all infrastructure from the site. Also, in cases where a transmission line is decommissioned without being repurposed, the decommissioning process usually involves the removal of all infrastructure if it is no longer necessary or has reached the end of its useful life. Decommissioning will prioritize maintaining site access integrity and conducting necessary rehabilitation activities.

Wherever feasible, the components would be disassembled, with a focus on reusing and recycling them. In cases where recycling or reuse is not possible, proper disposal methods in compliance with regulatory requirements will be followed. Additionally, functional components could be donated to local schools and clinics, where they can be installed to bring benefits to the local community.

Wastes generated during project decommissioning may include:

* End-of-life solar panels and PV modules
* Battery storage systems and components
* Electrical equipment and wiring
* Support structures and mounting systems
* Construction and demolition debris
* Unused or expired chemicals and materials
* Packaging materials and containers
* Residue or byproducts from cleaning and maintenance activities
* Waste from dismantling and demolition processes
* Miscellaneous hazardous or non-hazardous waste materials associated with the project.

##### *(i) Waste Generation and Management Issues*

During the decommissioning phase, the major risks anticipated is the challenge of disposing and recycling solar panels, batteries, transmission line materials, and other components. These items often require specialized handling and recycling facilities to ensure proper and environmentally responsible disposal. Sierra Leone has limited recycling infrastructure, especially for specialized materials like solar panels and batteries. The country lacks the necessary facilities, equipment, and technologies required for effective recycling. Improper disposal of the decommissioned components can lead to increased waste generation and pose a risk of environmental contamination, affecting the health and safety of the local community. It is crucial to address these challenges appropriately to mitigate potential negative impacts on the environment and the community. However, the Sierra Leone Electricity and Water Regulatory Commission (SLEWRC) provides guidance in handling these components. (See Annex VI).

#### Waste Management Issues from PV arrays and batteries

The decommissioning of PV modules is seen as an environmental challenge for the solar industry. PV arrays typically consist of large number of individual PV panels, each containing various materials such as glass, metals (aluminium or galvanize steel), antireflection coating (typically silicon nitride), protective encapsulation material (e.g., ethylene-vinyl acetate or EVA) and semiconductors. Additional components of PV panel and includes plastic covers, junction boxes, and electrical wiring which are not directly involved in the conversion of sunlight to electricity.

The primary semiconductor material used in monocrystalline solar which will be used in this project is silicon, which does not contain lead or cadmium. Silicon is a non-toxic and abundant element commonly found in sand. However, it’s important to note that while monocrystalline solar panels themselves do not contain lead or cadmium, there may be trace amounts of these substances in the manufacturing processes or in other components used in the panel construction. For example, the solder used to connect the solar cells in the panel may contain small amounts of lead, although lead-free solder is increasingly used in solar panel manufacturing to reduce environmental impact.

While the concentrations are generally low and do not pose significant risks during their operational life, proper disposal and recycling are important to prevent these materials from leaching into the environment. Efficient collection and transportation systems need to be established to ensure that decommissioned PV panels are properly handled and transported to appropriate recycling facilities. Logistics and coordination for the collection and transportation of waste from scattered PV installations can pose logistical challenges.

***(ii) Ambient Air Quality Deterioration*** The potential for air pollution may include:

* Dust and particulate matter released during dismantling and demolition activities.
* Emissions from equipment and vehicles used in the decommissioning process.
* Disposal of waste materials, which might release harmful substances into the air if not managed properly.
* Potential for the release of hazardous materials if not handled and stored appropriately.

**Mitigation Measures:**

Follow the mitigation measures for the construction phase.

##### *(iii) Noise Nuisance*

* Operation of heavy machinery and equipment during the decommissioning process
* Demolition and dismantling activities that generate loud noise levels.
* Transportation of materials and waste, especially if it involves noisy vehicles and equipment. **Mitigation Measures:**

Follow the mitigation measures for the construction phase. ***(iv) Occupational Health and Safety Issues***

During project decommissioning, several occupational health and safety issues may arise for the workers involved in the process. Some of the key concerns include:

* Workers may encounter hazardous materials during decommissioning, such as asbestos, lead, and other toxic substances.
* Dismantling structures and equipment can pose risks if not properly planned and executed.
* Some decommissioning tasks may involve working in confined spaces, which can be hazardous due to limited access, poor ventilation, and potential exposure to toxic gases or lack of oxygen.
* During decommissioning, workers may encounter live electrical systems or encounter electrical hazards from exposed wires.
* The use of heavy machinery and equipment during decommissioning poses risks of injuries or accidents if not operated safely.
* Workers may be at risk of falling from heights during dismantling activities, such as when removing rooftop solar panels or structures.
* Decommissioning tasks may involve heavy lifting, pushing, or pulling, leading to musculoskeletal injuries if not performed with proper techniques or equipment.
* Noise and vibration from machinery and equipment used during decommissioning can cause hearing loss and other health issues if workers are not adequately protected with appropriate PPE.

**Mitigation measures:**

* Proper training, provision of PPE, and safe handling procedures are essential to protect workers from exposure.
* Workers must be cautious about potential collapses or falling debris.
* Proper training and safety protocols are critical for working in confined spaces.
* Proper lockout/tagout procedures and electrical safety protocols are necessary to prevent accidents.
* Proper training, maintenance, and supervision are essential for safe machinery operations.
* Fall protection measures must be in place and utilized.

##### *(v) Community Health and Safety Issues*

During the decommissioning phase of a project, community health and safety issues may arise, and it is essential to address these concerns to protect the well-being of nearby residents and communities. Some of the key community health and safety issues during decommissioning include:

* Dismantling and demolition activities can generate dust, which may contain hazardous materials. Dust particles can be carried by the wind and affect the air quality in nearby communities, potentially leading to respiratory problems and other health issues.
* Decommissioning activities involving heavy machinery and equipment can generate significant noise levels, leading to noise pollution for nearby residents. Prolonged exposure to loud noise can have adverse effects on hearing and overall well-being.
* Increased construction and transportation activities during decommissioning can lead to higher traffic volumes and potential road safety hazards for both workers and residents.
* The handling and disposal of hazardous materials during decommissioning may pose risks to the community if not managed properly. Accidental spills or improper waste disposal can result in environmental contamination and health hazards. **Mitigation Measures:**

To address community health and safety issues during decommissioning, EDSA/PIU and contractors should take proactive measures, such as:

* Implementing dust control measures to minimize airborne particles
* Using noise barriers and scheduling noisy activities during less sensitive hours
* Complying with local traffic regulations and ensuring road safety during transportation
* Properly managing and disposing of hazardous materials following the waste management plan
* Engaging with the community and addressing concerns through open communication and transparency

##### *(vi) Water contamination*

During the decommissioning phase of a project, water contamination can be a significant concern if not properly managed. Some of the key sources of water contamination during decommissioning include:

* Dismantled materials, such as batteries and electronics, may contain hazardous chemicals that can leach into the soil and eventually contaminate groundwater or nearby water bodies.
* Accidental spills of fuels, lubricants, or other chemicals during decommissioning can result in runoff that carries pollutants into nearby streams, rivers, or lakes.
* Construction and demolition activities can lead to soil erosion, which may carry sediment and pollutants into water bodies, impacting water quality and aquatic habitats.
* Improper disposal of decommissioned materials, such as metals, plastics, or chemicals, can lead to direct contamination of water bodies if they are not disposed of in accordance with environmental regulations.
* Inadequate stormwater management during decommissioning can result in increased runoff and the transport of pollutants into waterways. **Mitigation Measures:**

Some measures to address water contamination risks include:

* Training workers on spill prevention measures and having response protocols in place to address spills promptly.
* Ensuring that all decommissioned materials are disposed of in accordance with the Waste Management plan to prevent leaching.
* Implementing erosion control measures, such as sediment barriers to prevent soil erosion and sediment runoff into water bodies.
* Implement the Stormwater Management plan to properly manage stormwater runoff from the decommissioning site to prevent the transport of pollutants into waterways.

**6.4. Summary of RESPITE’s E&S Impact Assessment and Analysis**

# Table 6-5: Summary of the assessment and analysis of the project E& S impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Risk & Impact** | **Receptor** | **Extent** | **Duration** | **Likelihood** | **Magnitude** |
| **Preconstruction Phase** | | | |  |  |
| Selecting an inappropriate or flawed design | The project/Humans | National | Permanent | Very Likely | Major |
| Loss of land, Assets and Livelihoods | Humans | Local | Permanent | Very Likely | Minor |
| SEA/SH Risk | Humans | Local | Long-term | Very Likely | Moderate |
| The lack of community  consultations or limited stakeholder consultations | Humans | Local | Long-term | Unlikely | Major |
| Risks associated with site mobilization and the transportation  of equipment and materials to the site | Humans /Biodiversity | Local | Short-term | Very Likely | Moderate |
| Inefficiency resulting from the sourcing of construction materials | The project/Humans | National | Long-term | Very Likely | Moderate |
| **Construction Phase** | | | |  |  |
| Climate | Humans/  Biodiversity | Local | Short -term | Unlikely | Negligible |
| Ambient Air Quality Deterioration | Humans | Local | Short -term | Very likely | Moderate |
| Noise Nuisance | Humans /Biodiversity | Local | Short-term | Very Likely | Moderate |
| Water Contamination | Humans /Biodiversity | Local | short-term | Very Likely | Moderate |
| Soil contamination | Biodiversity | Local | Long -term | Very Likely | Moderate |
| Pressure on Water Resources | Humans | Local | Short-term | Likely | Minor |
| Impact on Local Ecology | Biodiversity | Local | Long-term | Very Likely | Moderate |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Risk & Impact** | **Receptor** | **Extent** | **Duration** | **Likelihood** | **Magnitude** |
| Solid Waste/ Hazardous Generation and Management Issues | Humans/  Biodiversity | Local | Long term | Very Likely | Moderate |
| Erosion and Loss of Soil Resources | Biodiversity | Local | Long -term | Very Likely | Moderate |
| Occupational Health and Safety Hazards for Workers | Humans | Local | Long -term | Likely | Moderate |
| Community Health and Safety | Humans | Local | Long-term | Very Likely | Moderate |
| Impact on Cultural/Archaeological Resources | Humans | Local | Short-term | unlikely | Negligible |
| Tension from unrealistic expectations from communities | The project | Local | Long term | Likely | Major |
| Operational Phase | | | | | |
| Waste Generation and Management Issues | Humans/  Biodiversity | Local | Long term | Very Likely | Moderate |
| Pressure on Water Resources | Humans | Local | Long-term | Likely | Minor |
| Impact on Local Ecology | Biodiversity | Local | Short -term | Very Likely | Moderate |
| Nuisance noise | Humans/  Biodiversity | Local | Short-term | unlikely | Minor |
| Ambient Air Pollution | Humans | Local | Short-term | unlikely | Minor |
| Change in Landscape and Visual  Amenity | Humans | Local | Long-term | Very Likely | Minor |
| Occupational Health and Safety  Issues | Humans | Local | Short-term | Very Likely | Minor |
| Community Health and Safety Issues | Humans | Local | Short-term | Very Likely | Minor |
| Emergency Situations | Humans | Local | Short-term | Very likely | Moderate |
| **Decommissioning Phase** | | | | | |
| Community Health and Safety Issues | Humans | Local | Short-term | Likely | Moderate |
| Ambient Air Quality Deterioration | Humans | Local | Short-term | Likely | Minor |
| Noise nuisance | Humans | Local | Short-term | Likely | Minor |
| Water Contamination | Humans/Biodiversity | Local | Long-term | Likely | Moderate |
| Waste Generation and Management Issues | Humans/Biodiversity | Local | Long -term | Very Likely | Moderate |

### 7. CHAPTER SEVEN: PROJECT ALTERNATIVES

This Chapter examines possible alternatives to the proposed project, including the construction and operation of a PV/BESS system at Gbaneh Bana, Lungi. This is crucial as it enabled EDSA/PIU to make knowledgeable judgments about both the project location/site and the technologies that would be used during its development. This procedure also ascertained that the Project's operations are appropriately situated and financially feasible with respect to technical and environmental considerations. For the analysis of project alternatives, the following scenarios have been considered:

#### 7.1. The No Project Alternative

The domestic demand for electricity in Sierra Leone is still largely unmet due to the absence of a steady and dependable public power supply. Only 15% of the total population and about 2.5% of the rural population currently have access to electricity (GOPA International Final Design Report, October 2022). The proposed project’s development is fundamental to Sierra Leone’s development plan. Thus, to abandon this project in its entirety is not considered a logical or feasible alternative. This major transmission line and PV/BESS plant's development will contribute to increasing Sierra Leone’s access to electricity when completed, but could not be replaced, by small-scale energy projects.

HFO power generation will play a part in the energy mix but over-reliance would prejudice both GoSL’s sustainable growth targets and its energy security due to the astronomical rise in the price of HFO as the Russian-Ukraine war intensifies. Given that the power sector is small, with less than 150 MW of energy capacity connecting less than 150,000 customers, the demand side management would not be appropriate, nor effective if Sierra Leone over-rely on HFO generators. Given these circumstances, further consideration of alternatives in the remainder of this section will therefore concentrate on alternatives considered within the overall project, and on how environmental social and engineering issues have been assessed within different alternatives identified.

#### 7.2. Location Alternatives

To decide on the most suitable locations for the construction of 10 MWac PV and 6 MVA BESS, different possibilities were explored including the following:

* the climate and the Global Tilt Irradiation (GTI) which determines the stance of the sun as well as the seasonal number of daylight hours at Gbaneh Bana, Lungi.
* The presence of Lungi International Airport
* Land parcel physical characteristics-slope of the available land and orientation towards the south or north (depending on the hemisphere location).
* Land parcel size to avoid self-generated shadows.
* Surrounding terrain of infrastructure which sometimes cause shadows.
* Availability and title or ownership of land at Gbaneh Bana
* Access to the site/safety of community members
* Evacuation of power to the National grid
* Skilled and unskilled labour and social structure for the construction and operation of the PV and BESS at Gbaneh Bana
* The overall suitability of the environment with regard to factors such as its social effects, usage of water, and the health of the ecosystem.

**7.3. Technology and Equipment**

#### 1. Renewable vs Conventional Sources

Several renewable and non-renewable energy sources can be used to produce electricity. When compared to non-traditional sources like solar, wind, hydro, etc., conventional power generation has a high financial, environmental and social cost. Renewable energy systems are clean energy sources with low carbon emission.

The technical performance values of the grid impact study report and the design report for Lungi conducted by an independent consultant have determined BESS and PV as the most practicable option for this Project. However, the solar PV considered for this project utilises energy from the sun that is limitless and free. This power generation method does not create greenhouse gases and, therefore, is eco-friendly. There are no emissions during operation.

A major concern with the PV/ BESS system is because of their limited lifespan, solar batteries must eventually be disposed away/recycled, and solar panels must be recycled. This ESIA report will propose known ways to handle these waste streams. Once the recommended measures are followed, the impact will be minimal.

Though the Choice of technology is normally an engineering decision, however, this section will consider other factors such as site conditions, availability of appropriate materials, labour, cost and requirements for construction, operation and maintenance.

#### 2. Choice of Solar Panels

There are two main types of solar panel models: mono-facial and bi-facial. Mono-facial panels have a silicon solar cell on one side and are commonly used. Bi-facial panels, on the other hand, are designed to generate energy from both sides and are typically used in locations with high albedo factors. However, the land at Gbaneh Bana Lungi has economic trees, plantations, grasses, and several dead palms, which provide a very low albedo factor. According to utility-Solar Photovoltaic developer’s guide done by WB, fresh grass has an albedo factor of 0.26, which reduces to approximately 0.15 when dry. Therefore, a bifacial panel is not viable for the proposed PV/BESS project at Gbaneh Bana Lungi. It is worth noting that the albedo factor in Lungi and Sierra Leone, in general, is not as high as that of land covered with snow, which typically has an albedo factor of approximately 0.8. Bi-facial panels can absorb both direct and reflected irradiation.

Bi-facial panels are thus more effective and can be considered where land parcel size is a premium which is not the case in Gbaneh Bana Lungi and the surrounding area of the solar field contains reflective material which is not the case also because the land at Lungi is not covered with snow. The Albedo factor and the premium nature of the land normally determine if bi-facial panels would be worthy to investment in. The bi-facial panels are usually more expensive, and an overall cost benefit analysis will be made before choosing this technology. However, we recommend EDSA/PIU to use the Mono facial panels as the most feasible alternative.

#### 3. Choice of Solar Cells

Crystalline silicon (c-Si) solar cells are the most common solar cells in use because of its stability, efficiency and reliability.

Crystalline Silicon is a feasible option for this project because it is more environmentally friendly to dispose or recycle although the initial investment costs are high as it is the most expensive solar component.

#### 4. Solar Panel Installation Systems

There are two main types of solar panel systems: fixed tilt and tracking systems. The fixed tilt system is the simplest one to install, configuring solar panel strings at a fixed tilt angle based on seasonality and proximity to the equator. This type of system is a favourable option for the site at Gbaneh Bana Lungi due to its proximity to the equator and the low maintenance cost involved. While tracking systems are another option for solar panel installations, they are much more complex.

The proposed design of PV is fixed tilt at an angle 10o which is susceptible to form ‘glare’ an uncomfortable bright light produced that disturbed one’s vision. However, the proposed project will use monocrystalline silicon cells which reduce this uncomfortable reflection. Also, the strategic orientation of the PV panels opposite each other (east and west) couple with coating the PV surfaces with anti-reflective paints and painting the frames with black diminishes the effect. Notwithstanding, because the location of the airport is at lungi the project area, fixed tilt is not a best option therefore this study recommends the panels to be mounted on tracking system so that the tilt angle will be adjusted whenever issues of glare are raised at Lungi.

#### 5. Choice of Inverters

The brain of the Solar PV is the inverter. Three options of inverters will be considered for this PV/BESS project at Lungi which are: central inverter; string inverter and micro inverter central inverter centralises the power output in one place for the conversion of electricity from DC to AC.

String inverters are the most credible, tried-and-tested, and cost-efficient inverter available in the market. String inverters are extensively popular because they are smaller in size compared to the central ones and guarantee better Maximum Power Point Tracking (MPPT) capability.

Micro inverters provide the most progressive technology with its plug-and-play feature. String inverters, in contrast to central inverters, have a smaller size and can be conveniently replaced in case of malfunction without the need for heavy equipment or skilled labour. These inverters also provide a significant level of backup and plant accessibility. As a result, string inverters offer improved performance, flexibility, and productivity. Additionally, if a part of the solar facility is shaded or dusty while the remainder is exposed to the sun or clean, the system will continue to operate at maximum capacity. Thus, string inverter is the feasible alternative option for this PV/BESS project in Lungi.

#### 6. Choice of Batteries

Batteries: When building a PV, normally three battery options are considered i.e. Flooded Lead Acid; Sealed Lead Acid (SLA) and Lithium Iron phosphate (LiFePO4) batteries. This project is envisaged to use LiFePO4 batteries. Though LiFePO4 batteries have considerably higher initial cost, but they do not require maintenance and have longer lifespan. In terms of end-of-life management lead-acid batteries have a successful recycling infrastructure, however, the process is energy-intensive and produces harmful emissions, including lead dust and sulphuric acid. LiFePO4 batteries, while having a less established recycling infrastructure, are gaining attention for their 'green' disposal. The materials in LiFePO4 batteries are less harmful, and innovative recycling methods that are less energy-intensive are being developed. More importantly, given their longer lifespan, the need for recycling or disposal is deferred significantly compared to lead-acid batteries. Additionally, components of these batteries do not contaminate the environment. *Error! Reference source not found.* below compares Lithium Iron phosphate (LiFePO4) batteries with SLA.

Also, for substation protection and control equipment two battery options are considered which are SLA and Nikel Cadmium (NiCad) batteries. This project envisaged to use NiCad batteries because of better energy density, cycle life, and charging speed. Environmentally, Cadmium is toxic and highly hazardous to the environment. Disposal and recycling of NiCad batteries must be handled carefully. If properly recycled, they are less harmful than when disposed of improperly.

# Table 7-1: Comparison of Lithium Iron phosphate (LiFePO4) and Sealed Lead Acid (SLA) Batteries

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Context** | **Lithium Iron phosphate (LiFePO4)** | **Sealed Lead-acid (SLA)** |
| **1.** | Energy Efficiency | LiFePO4batteries are generally more energy efficient. They can store and discharge energy with higher efficiency, resulting in less energy loss during the charging and discharging process. This can be especially important for maximizing the utilization of solar energy. | SLA are generally less energy-efficient than LiFePO4batteries. |
| **2.** | Depth of Discharge | LiFePO4 batteries can typically handle a higher depth of discharge (DoD) compared to SLA batteries. DoD refers to the percentage of the battery's capacity that is discharged during each cycle. LiFePO4 batteries can often tolerate deeper discharges without significant impact on their performance and lifespan, allowing for better utilization of the stored solar energy. | SLA handle a lower depth of discharge compared to LiFePO4batteries |
| **3.** | Cycle Life | LiFePO4batteries generally have a longer cycle life compared to SLA batteries. This means they can withstand a greater number of charge and discharge cycles before experiencing a noticeable decrease in their capacity. A longer cycle life is advantageous for solar energy storage systems as they are subjected to daily cycling. | SLA batteries generally have a lower cycle life compared to LiFePO4 batteries. |
| **4.** | Energy Density | LiFePO4batteries have a higher energy density than SLA batteries. This means they can store more energy in a smaller physical footprint, which is beneficial when space is limited. | SLA have a lower energy density as compared to LiFePO4batteries. |
| **5.** | Maintenance | LiFePO4 batteries are typically maintenance-free. | Sealed lead-acid batteries may require more maintenance compared to  LiFePO4batteries. They often require periodic checks of the electrolyte levels and topping up with distilled water. |
| **6.** | Cost | LiFePO4batteries have high upfront cost and low operation and maintenance cost | SLA batteries have low upfront cost and high operation and maintenance cost |

218

##### 7.4. Transmission Route Alternatives

The feasibility of the proposed transmission line is evident since it only traverses the Suctarr swamp area, without any significant environmental repercussions or relocation concerns.

Option 2, on the other hand, would intersect numerous swamps as it passes through Youriya and Baimbaya, requiring the costly construction of bridges for access.

Option 3 would follow the main Lungi highway, cutting through the urbanized parts of town, but it is not a viable choice as it would result in significant resettlement issues.



***Figure 7-1: Alternative transmission route***

##### 7.5. Choice of poles

The PV/BESS project intends to use wooden poles for 11kV overhead in Lungi. This might be because wooden poles are readily available as there is a local supplier in the country or because wooden poles might cost less than steel poles or concrete poles.

On the flip side, wooden utility poles can pose several environmental, health, and safety (EHS) issues including decay and rot, fire hazard, chemical treatments, and maintenance challenges. This poses a safety risk as the poles may become unstable and collapse. Wood is combustible, and wooden poles can catch fire in the event of wildfires, lightning strikes, or accidents involving electrical equipment. This can lead to power outages, and property damage, and potentially endanger human lives.

Wood is susceptible to insect infestation, such as termites and wood-boring beetles. These insects can weaken the pole's structure, potentially causing it to fail.

To increase the lifespan and resistance of wooden poles, they are often treated with chemical preservatives. However, these treatments can contain hazardous substances like pentachlorophenol (PCP) or chromated copper arsenate (CCA). Improper handling or disposal of these chemicals can be harmful to the environment and human health.

While steel poles if improperly treated or damaged during installation, it can be exposed to rust and corrosion. The concrete poles option is not part of the engineering concept design but has wide range of application more especially in areas with weather-related issue. Concrete is more naturally durable and resists to salt and other climate-related damage. Therefore, on an environmental and durability ground concrete poles are more feasible for this project.

### 8. CHAPTER EIGHT: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

To ensure effective management of the environmental and social risks and impacts identified during the assessment, a set of Environmental and Social Management Plans (ESMPs) will be created. These plans will detail mitigation and management measures throughout the construction and operation of the PV and BESS facility, as well as the transmission line. The PIU and the EPC contractor will develop and implement such plans.

Consistent with the WB ESF policy, and the EHS guidelines, which recognize EPA-SL Acts, guidelines, and Procedures, the ESMP will detail:

1. The actions to be carried out during the project implementation to eliminate, reduce to acceptable levels, reverse, or offset negative environmental and social effects, and
2. the measures needed to allow the implementation of these measures.

The results of the impact assessments have been used to prepare this ESMP. Furthermore, this ESMP approximates the budget required for implementing the management plans and measures.

#### 8.1 ESMP Objectives

It is expected that the implementation of the ESMP will accomplish the goal of always approximating to the environmental and social baseline conditions, or even better, through the following objectives:

* effectively managing the actual E&S risks and impacts during the project implementation phase;
* compliance with project permitting requirements.
* ensuring satisfactory environmental and social performance; and
* serving as best practice reference for future projects.

#### 8.2 ESMP Methodology

The methodology for developing the ESMP includes two stages: the data and information gathering stage and the development of the ESMP. The data and information gathering stage includes desk reviews of documentation, observations, and measurements during site visits and stakeholder engagement. The ESMP development stage involves a detailed description and analysis of the project’s potential impacts and the mitigation measures to be adopted to reduce the likelihood of those impacts. Also included is the description of the environmental and social management, and monitoring framework; a description of stakeholder engagement strategy and findings from the preliminary consultations for the ESMP; monitoring and training cost; implementation schedule and responsibilities; and the cost and budget for the implementation of the ESMP. Figure 8.1 provides a summary of the approach that this ESMP followed.

***Figure***

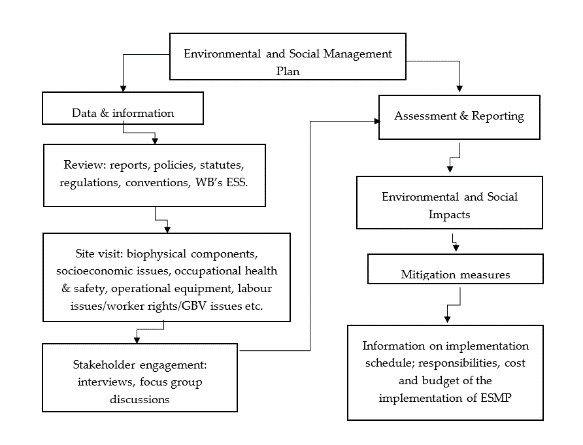
***8***

***.***

***1***

***:***

***ESMP Flow Chart***



The ESMP comprises of mitigation, monitoring, and institutional/management measures that will be implemented during the project's implementation to eliminate or offset negative environmental and social risks and impacts or decrease them to acceptable levels. The ESMP also includes the measures and actions needed to implement these measures. The content of the ESMP includes the following:

1. **Mitigation:** The ESMP identifies measures and actions in accordance with the mitigation measures that reduce potentially adverse environmental and social impacts to acceptable levels. The plan will include compensatory measures, if applicable. Specifically, the ESMP: 
   1. identifies and summarizes all anticipated adverse environmental and social risks and impacts (including those involving locals or involuntary resettlement);
   2. describes - with technical details - each mitigation measure, including the type of impact to which it relates and the conditions under which it is required (e.g., continuously or in the event of contingencies), together with designs, equipment descriptions, and operating procedures, as appropriate.
   3. estimates any potential environmental and social impacts of these measures; and
   4. considers, and is consistent with, other mitigation plans required for the project (e.g., for involuntary resettlement, locals, or cultural heritage).
2. **Monitoring:** The ESMP identifies monitoring objectives and specifies the type of monitoring, with linkages to the impacts assessed in the environmental and social assessment and the mitigation measures described in the ESIA. Specifically, the monitoring section of the ESMP provides (a) a specific description, and technical details, of monitoring measures, including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions; and (b) monitoring and reporting procedures to (i) ensure early detection of conditions that necessitate particular mitigation measures, and (ii) furnish information on the progress and results of mitigation.

#### C. Capacity Development and Training

* To support the timely and effective implementation of environmental and social project components and mitigation measures, the ESMP draws on the environmental and social assessment of the existence, role, and capability of responsible parties on-site or at the agency and ministry level.
* Specifically, the ESMP provides a specific description of institutional arrangements, identifying which party is responsible for carrying out the mitigation and monitoring measures (e.g., for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training).
* To strengthen environmental and social management capability in the agencies responsible for implementation, the ESMP recommends the establishment or expansion of the parties responsible, the training of staff and any additional measures that may be necessary to support the implementation of mitigation measures and any other recommendations of the environmental and social assessment.

1. **Implementation Schedule and Cost Estimates:** For all three aspects (mitigation, monitoring, and capacity development), the ESMP provides (a) an implementation schedule for measures that must be carried out as part of the project, showing phasing and coordination with overall project implementation plans; and (b) the capital and recurrent cost estimates and sources of funds for implementing the ESMP. These figures are also integrated into the total project cost tables.
2. **Integration of ESMP with the project:** The Borrower’s decision to proceed with a project, and the Bank’s decision to support it, are predicated in part on the expectation that the ESMP (either standalone or as incorporated into the ESIA) will be executed effectively. Consequently, each of the measures and actions to be implemented will be specified, including the individual mitigation and monitoring measures and actions and the institutional responsibilities relating to each, and the costs of so doing will be integrated into the project’s overall planning, design, budget, and implementation.

##### 8.3 ESMP Implementation

The existing implementation arrangements of the Enhancing Sierra Leone Energy Access Project (ESLEAP) (P171059) and Sierra Leone Energy Sector Utility Reform Project (ESURP) (P120304) shall be maintained for RESPITE Project in Sierra Leone (including, inter alia, the relevant E&S instruments, LMP, Code of Conduct and SEA/SH Mitigation and Action Plan).The ultimate responsibility for executing the management plans and ensuring that the EPC contractor complies with their management plans and all relevant mitigation measures related to their operations lies with EDSA/PIU, who will enforce this obligation through contract terms and oversight. The PIU will take the lead in executing this project. There is already an established Environmental and Social Management Unit (ESMU) in the EDSA/PIU that aligns with the roles and responsibilities detailed in *Error! Reference source not found.****.***

# Table 8-1: E&S Management: Key Roles and Responsibilities

|  |  |
| --- | --- |
| **Position** | **E&S Responsibility** |

|  |  |
| --- | --- |
| **EDSA/PIU** |  |
| Project Coordinator | Responsible for the overall environmental and social risk management of the project. Provides leadership, guidance, and project-level information on E&S issues for all stakeholders and ensures the adequacy of ToRs for E&S related consultancies. Overseeing all environmental and social risk management training and capacity building. Ensure that the relevant E&S obligations are included in contracts/Ensure that the contractor is legally obliged to deliver E&S requirements in the final contract (including, inter alia, the relevant E&S instruments, LMP, code of conduct and SEA/SH Mitigation and Action Plan). Ensure that all contractors operate in a manner consistent with the ESS, including project specific ESCP requirements. Ensure that the project design and specifications adequately reflect the recommendations of the ESIA/ESMP. Review quarterly E&S reports and send them to the WB. |
| Social Specialist (with gender background) | Responsible for all social and gender-related issues. Oversees all stakeholder engagements, SEA/SH plan, resettlement plans, manages the GRM, and liaises with all project managers to ensure requirements are understood and followed. |
| Environmental Specialist | Responsible for all environmental issues of the Project. Oversees the implementation of broader project and site-specific environmental plans. Liaises with all project managers to ensure requirements are understood and followed.  Acquire the necessary Environmental permits for the project. |
| Citizen Engagement Specialist | Support project implementation activities related to stakeholder engagement & public consultations. |
| Environmental/ OHS Consultant | Inspect workplaces, and minimize or eliminate hazards from processes, such as incorrect/ unsafe working methods, and materials. Supervise and enforce project works are performed within health and safety SL government, WBG ESHS, BIIP, guidelines, procedures, principles and goals. Working closely with contractors. |
| Social Consultant | Inspect workplaces, and minimize or eliminate hazards from processes, such as incorrect/ unsafe working methods, and materials. Supervise and enforce project works are performed within health and safety SL government, WBG ESHS, BIIP, guidelines, procedures, principles and goals. Working closely with contractors. |
| GBV Specialist | The key position in overseeing and supporting the project in the implementation of activities and plans developed by the GBV/SEA/SH Prevention and Response Action Plan-RESPITE. |
| Project engineer | Understanding Project E&S commitments and responsibilities and ensuring these are integrated into all construction and operational plans and procedures and roles and responsibilities, including those of contractors. |
| Supervising Engineer | The supervising engineer (a consulting firm) is responsible for mobilizing an Environmental, Social and Safety Expert for day-to-day monitoring of the contractor’s works and during major construction activities. If unforeseen issues |
|  | observed, the Supervision Consultant/Owner Engineer will recommend appropriate actions to the contractor to overcome or mitigate the problem.  The supervising engineer oversees project implementation and collaborates closely with other members of the project implementation team (E&S and Health & Safety). They will be tasked with not only ensuring that the construction and installation phases adhere to specifications and timelines but also with meticulously overseeing, E&S performances and compliance monitoring, quality control measures. This includes conducting regular inspections, overseeing testing procedures, and verifying that all components of the solar and BESS systems meet the requisite standards. |
| **EPC Contractor** |  |
| **Position** | **E&S Responsibility** |
| Project Manager | Responsible for E&S performance and adherence to relevant guidelines and regulations. Ensuring that adequate budget, resources and authority are provided to the EHS team. Review monthly E&S progress reports and send them to the project coordinator |
| E&S Officers (preferably 2 staff) | Ensures that E&S project requirements (including but not limited to the preparation of C-ESMP, Workers GRM, CoC and regulatory compliance) are met. Prepare monthly E&S progress reports and send them to the Project Manager |

The ESMU will need to interface with several MDAs to ensure the smooth and efficient function of the ESMP. The Environmental and Social Specialists will compile quarterly progress reports on ESMP compliance to be sent to the Project Coordinator throughout the project construction period. Contractors shall also be supervised to ensure design compliance and quality assurance of the construction activities. Consistent with this ESMP, the Contractor must prepare a contractor ESMP (C-ESMP) that explicitly outlines and displays the environmental and social responsibilities, accountability, and liability of their employees. Before commencing the project activities, the Contractor will prepare the C-ESMP and submit it to the PIU for approval. The C-ESMP will undergo a review process, and upon approval from the PIU and World Bank, the Contractor can proceed with project mobilization and construction.

The ESMU will also ensure that its hired contractors deploy an environmental officer and a social officer to manage social (including labour and community) issues on site.

###### 8.3.1 Source of Funding

The activities related to the ESMP are financially supported through the project's allocated funds, and this allocation is included in the Annual Work Plan & Budget (AWPB).

##### 8.4 Development of Specific Management/Project Plans (Framework and Minimum Requirement)

Specific management plans will be developed to help address specific environmental and social issues, risks, and impacts related to the project activities throughout the project lifecycle. The specific management plans will conform to the WB ESF and Good International Industry Practice (GIIP). The core management plans required to manage the E&S risks and impacts identified in chapter 6 have been identified as the following *Error! Reference source not found.****.***

# Table 8-2: Environmental and Social Project Level Plans

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Plan Name** | **Timing** | **Activity/Risks & Impact Identified in Chapter 6 or International Good Practice** | **Responsibility** | **Related** **ESS/ EHS** |
| Labour  Managemen  t Plan  (LMP)/ Code of Conduct | Project lifecycle | Activities related to labour risks, such as accidents.  Child labour and forced labour risks.  Discriminatory policies and practices that deny equal opportunity.  Migrants or seasonal workers associated risks.  Labour disputes, restrictions on freedom of association and collective bargaining Risk of labour influx or gender-based violence  Workers’ retaliation  Sexual harassment discriminatory policies and practices  Risk of sexual exploitation and abuse  Risk of Sexually Transmitted diseases/infections  Occupational, health and safety  Conflict in workers' responsibility  Delayed/underpayment of workers  Sanitary inconveniences  The LMP developed by the PIU can be adopted | EPC (Construction &  decommissioning)            PIU (throughout the project  lifecycle) | **ESS2** |
| Emergency Preparednes s and Response  Plan | Project lifecycle | Construction  Fire at the construction site that fire extinguishers cannot put out; a fire caused by a short circuit at the plant and equipment throughout the construction and, operation & maintenance phases.  Severe injury or death of an employee or subcontractor at work caused by a non-workrelated illness or work-related accident.  An endemic illness outbreak among a sizable portion of construction workers as a result of contaminated drinking water and unsanitary working conditions.  The collapse of any structure.  Protests by the local community or other stakeholders at any stage of the project lifecycle in response to complaints. | EPC (Construction & decommissioning)            PIU  (Operation) | **ESS2, ESS4** |
| Prepare CESMP and associated |  | Assess and implement measures to manage the security risks of the project, including the risks of engaging security personnel to safeguard project workers, sites, assets, and activities. Such measures shall be reflected in the ESMP guided by the principles of proportionality and | EPC (construction & decommissioning) and PIU (throughout the project  lifecycle) |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Plan Name** | **Timing** | **Activity/Risks & Impact Identified in Chapter 6 or International Good Practice** | **Responsibility** |  | **Related** **ESS/ EHS** |
| managemen  t plans |  | GIIP, and by applicable law, in relation to hiring, rules of conduct, training, equipping, and monitoring of such personnel. |  |  |  |
| Waste  Managemen  t Plan | Project lifecycle | Several waste streams (Construction and demolition waste, Hazardous waste, Solid waste, and liquid waste) are generated during the construction and operation & maintenance phases of the project. | EPC (construction & decommissioning) PIU (operation and maintenance) |  | **ESS3, EHS** |
| Road Safety and Traffic  Managemen  t Plan | Project lifecycle | The risk of accidents from vehicles plying the access road along nearby communities and also used by children going to school and women going to the market | EPC (construction decommissioning) PIU (operation  maintenance) | & and | **ESS4** |
| Occupation  Health and  Safety  Managemen  t Plan | Project lifecycle | Exposure of the workforce to health and safety risks could lead to severe injury or even death.  As a major construction project, risks will include falls, slips, working in confined spaces, use of heavy equipment and hazardous materials etc.  The OHS Plan is designed to ensure that all work tasks in construction and operations are risk-assessed and safe systems of work and associated training are in place according to best industry practice. | EPC (construction decommissioning) PIU (operation  maintenance) | & and | **ESS2** |
| Cultural  Heritage & Archaeologi cal Chance Finds  Procedure | Constructi on | Although no archaeological sites have been definitively identified within the project's boundaries, there remains the possibility that the project could impact such sites. Therefore, a chance finds procedure must be implemented to investigate and appropriately manage any archaeological discoveries that may occur during construction. Additionally, there is a risk of losing sacred sites, including trees, rocks, shrines, bushes, and water bodies, as well as burial grounds. These will be identified and protected to the greatest extent possible. | EPC contractor |  | **ESS8** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Plan Name** | **Timing** | **Activity/Risks & Impact Identified in Chapter 6 or International Good Practice** | **Responsibility** | **Related** **ESS/ EHS** |
| Grievance  Redress  Mechanism | Project life cycle | issues related to land use, resettlement, compensation, and community health and safety, SEA/SH labour conditions Environmental risks etc. | EPC (during construction & decommissioning)    EDSA/PIU  (Throughout the project  lifecycle) | **ESS2,**  **ESS5,**  **ESS10** |
| Resettlemen  t Plan | Preconstructi on | Land acquisition  Displacement of persons using the land for agricultural purposes or other livelihood sources Identification of all communities and individuals affected by physical and/or economic displacement by the project or environmental impacts requiring their relocation  Development and implementation, via a consultative process, of programmes to provide replacement housing, land, access to resources, and ecosystem services (whichever is applicable) | EDSA/PIU / hire consultant | **ESS5** |
| Stakeholder  Engagement  Plan (SEP) | Project lifecycle | Local organizations such as religious, health, and educational institutions, as well as traditional authorities and community members, will likely anticipate being informed about the project's progress and consulted on critical matters that may impact them. This may include local authorities being kept up to date on the project's development and seeking input and feedback from community members on relevant issues.  A mechanism for addressing grievances will be in place to ensure that complaints or concerns regarding the project's effects are acknowledged, and a just and transparent process is implemented to resolve them.  The SEP developed for the project can be adopted | EDSA/PIU | **ESS10** |
| Community Developme  nt Action Plan (CDAP) |  | * Electrify the Newton communities, including **Gbaneh Bana communities**, by installing 11kV and low-voltage lines and transformers and providing guidance on how to apply for service connections. * Access road to be rehabilitated encompassing activities such as improvements of the road surface quality, safety, and overall functionality. * Support Health Service in Lungi, Gbaneh Bana community Health Post, with basic SEA/SH response toolkit with the aim of meeting emergency demands by community members and project workers. The project will also supply a comprehensive GBV response kit | EDSA/PIU | **ESS10** |
| **Plan Name** | **Timing** | **Activity/Risks & Impact Identified in Chapter 6 or International Good Practice** | **Responsibility** | **Related** **ESS/ EHS** |
|  |  | accompanied by awareness campaigns and training as part of the SEA/SH Action Plan to address immediate evolving needs.   * Emphasis will be given on the recruitment of Local workforce during the implementation of the proposed RESPITE project. * Implement Stakeholder Engagement Plan (SEP) developed for the project, including GRM. |  |  |

The plans will be considered "living documents" that are subject to frequent review and update as necessary to ensure their continued relevance and effectiveness. EDSA/PIU has developed a labour management plan, stakeholder engagement plan and Grievance Mechanism for the project.

The following provisional plans have been developed by the consultant:

**8.4.1 Emergency Preparedness and Response Plan**

#### *Purpose*

EDSA/PIU will develop a site-specific Emergency Management Plan that can be implemented effectively in case there is an emergency so that the loss of life and damage to properties and natural resources can be minimized. This plan will detail a series of emergency procedures that EDSA/PIU & its Contractors will follow to ensure readiness for and respond to emergency circumstances throughout the project's lifecycle. Below is a list of potential emergencies that could happen at the project site and their likely causes:

* Fire at the construction site that cannot be put out by fire extinguishers; also, fire caused by a short circuit at the plant and equipment throughout both the construction and operation& maintenance phases.
* Serious injury or death of an employee or subcontractor at work caused by a non-work-related illness or work-related accident.
* An endemic illness outbreak among a sizable portion of construction workers as a result of contaminated drinking water and unsanitary working conditions.
* The collapse of any structure.
* Protests by the local community or other stakeholders at any stage of the project lifecycle in response to complaints.
* Accidental spills at magnitudes that require emergency evacuation of staff and communities.

#### *Emergency Management*

In order to ensure effective management of emergency or crisis situations, the following actions will be followed:

* A contract will be signed with the CHC at Gbaneh Banah/ the Lungi Government Hospital to provide timely medical care (including ambulance services) in the event of an emergency on site.
* A list of important telephone numbers such as fire brigade (at the airport), health care facility/practitioner, police station, and focal person for the Office of National Security (ONS) will be displayed at all the prime locations at the site.
* It is important to maintain regular communication and coordination with the Lungi police station, the Port Loko District Council administration, the Paramount Chief, and Chiefs of project communities (especially Gbaneh Bana, Koimaya, Youriya, and Baimbaya).
* The staff and contractual workers from both EDSA/PIU and EPC contractors will receive training on their responsibilities and emergency preparedness. All site employees will be instructed to follow the existing contact channels in case of an emergency.

#### *Responsibilities*

The Senior Environmental Management Specialist will be responsible for implementing this procedure, which includes:

* Ensuring that emergency preparedness measures are in place.
* Offering training to on-site personnel on how to report emergencies, and to office staff on how to respond to emergency calls from the on-site team.
* Taking immediate action and coordinating efforts during an emergency

##### 8.4.2 Occupation Health and Safety Management Plan

The Occupational Health and Safety Management Plan outlines the comprehensive approach to ensuring the safety and well-being of all personnel involved in the project, including workers, contractors, and visitors. The plan addresses potential hazards and risks specific to solar PV and BESS installations and aims to prevent accidents, injuries, and occupational illnesses.

During the construction, operation & maintenance and decommissioning phases at project sites, the wellbeing of employees and contractual laborers will be safeguarded by adhering to Occupational Health and Safety (OHS) standards. The OHS Management measures implemented will meet the regulatory requirements outlined in the ESS2, EHS guidelines, Factories Act of 1974, Employment and Employees Act (Consolidated Act of 1960)

OHS measures to be adopted at all phases of the project include:

* Develop and enforce safe work practices and standard operating procedures for specific tasks, including installation, maintenance, and operation of solar panels and BESS components. Train workers on these procedures to ensure they are aware of safety protocols.
* Follow the emergency communication system and emergency preparedness plan
* Provide and ensure the wearing of Personal Protective Equipment (PPE) i.e., gloves, helmets, ear plugs, safety belts, safety boots, fall protection gear etc.
* Provide comprehensive training for all workers involved in the project, including the use of PPEs, training on hazard recognition, equipment handling, emergency response, and relevant safety regulations. Verify that workers are competent to perform their assigned tasks safely.
* Establish effective communication channels to disseminate safety information and create a reporting system for identifying and addressing safety concerns or incidents promptly.
* Provide fire extinguishers and sand buckets at all strategic locations to deal with any incident of fire
* Sufficient light and ventilation will be provided for workers working in confined spaces.
* During construction and decommissioning, appropriate signage will be placed throughout the construction/work area
* First Aid kits will be available in all work areas to promptly manage injuries that may occur on-site. These kits are equipped with essential medical supplies and equipment to provide immediate assistance to injured personnel. The availability of First Aid kits ensures that any injuries are addressed promptly, helping to minimize the severity of the injury and providing initial care until professional medical help can be obtained.
* Standard Operating Procedures (SOPs) will be developed for operational activities that may pose potential occupational health and safety risks. Set guidelines for safely handling, storing, and transporting solar panels, batteries, and other components. Ensure proper equipment and techniques are used to prevent accidents during material handling.
* Using the Material Safety Data Sheet (MSDS) is a fundamental safety measure in workplaces that deal with hazardous chemicals or substances.
* Contractors will be responsible for periodically cleaning work areas and ensuring that hygienic conditions are maintained on the site, while also supervising the cleaning process during construction. PIU/EDSA will be solely responsible during the operation and maintenance of the facility.
* In cases of extreme natural climatic conditions such as heavy rain, and thunderstorms, workers will be required to cease work for their own safety.
* Ensure provision and maintenance of drinking water and sanitation facilitation for workers in accordance with the provision of WHO guidelines.
* Regular inspections will be conducted to ensure compliance with the above measures, and any nonconformities or grievances related to OHS issues will be recorded.
* Record and report workplace accidents, diseases, and incidents.
* Offering sufficient accommodation facilities to workers is essential to safeguard their welfare and cultivate a secure and efficient work environment. The provided facility will include provisions for proper hygiene, sanitation, safety, and security services, ensuring a comfortable and protected living space for the workers.
* Provide comprehensive safe sex education and making condoms readily available thereby promoting sexual health and reducing the risk of STIs, HIV/AIDS and other communicable diseases
* Ensure COVID -19 guidelines followed

##### 8.4.3 Waste Management Plan - Framework and Minimum Requirement

The Waste Management Plan (WMP) will be applicable to wastes generated during the pre-construction, construction, and operation & maintenance and decommissioning of the PV/BESS facility. The Waste Management Plan is a dynamic document that is subject to regular review and enhancements as the project advances and innovative waste management practices emerge. Non-hazardous solid waste and wash water from panel washing are the project's main waste sources. The WMP is meant to operate as a roadmap for EDSA/PIU and the contractor(s) to efficiently manage wastes throughout the project life cycle. By adhering to this plan, the PV and BESS facility can actively promote environmental sustainability and showcase a commitment to responsible waste management approaches. It shall be a requirement for contractors to develop and implement a site-specific waste management plan (WMP). The plan shall address management of all solid and liquid refuse that result from project activities. The WMP will provide guidelines on waste reduction, segregation, collection and disposal practices in accordance with international best practices, to avoid deterioration of the natural environment and negative impacts on the health and safety of workers and the communities in the project areas. The following are essential elements of the WMP:

#### ➢ Waste Identification and Segregation

1. Identify the different types of waste generated, such as construction debris, packaging materials, electronic waste, and hazardous materials.
2. Segregate waste at the source to facilitate proper handling and disposal.

#### ➢ Waste Collection and Storage

1. Provide designated waste collection bins at appropriate locations within the facility for easy waste disposal by workers and visitors.
2. Store waste securely to prevent littering and reduce the risk of environmental contamination.

#### ➢ Recycling and Reuse

1. Establish a recycling program to divert recyclable materials from the waste stream. This includes materials like cardboard, plastic, glass, and metals.
2. Explore opportunities for reusing materials on-site or in other construction projects to minimize waste generation.

#### ➢ Hazardous Waste Management

* Properly segregate hazardous waste from non-hazardous waste and clearly label containers to prevent mixing and ensure safe handling.
* Store hazardous waste in secure and designated areas to prevent leaks, spills, or unauthorized access.

#### ➢ Construction Waste Management

* Implement waste reduction measures during the construction phase, such as accurate material ordering and efficient use of resources.
* Recycle construction waste materials, such as concrete, asphalt, and metal, whenever possible. ➢ **Operation and Maintenance Waste**
* Establish protocols for handling waste generated during routine maintenance activities, such as replacing worn-out equipment parts and cleaning materials.
* Encourage the use of eco-friendly maintenance products and materials.

#### ➢ Decommissioning and End-of-Life Management

* Ensure waste removal, recycling, and proper disposal of equipment and components at the end of their life cycle.
* Ensure environmentally safe disposal or recycling of decommissioned solar panels and batteries.

#### ➢ Waste Tracking and Reporting

* Keep records of waste generation, collection, recycling, and disposal activities for monitoring and reporting purposes.
* Share waste management performance data with stakeholders and regulatory authorities as required.

#### ➢ Staff Training and Awareness

* Provide training to staff and contractors on waste management practices, emphasizing the importance of proper waste handling and disposal.
* Raise awareness among employees and contractors about the facility's commitment to environmental responsibility and waste reduction.

During the construction phase, the EPC contractors will oversee the management of waste generated, such as construction debris, packaging materials, paint containers, and filters. More detailed discussions on measures for managing solid and hazardous waste are provided below:

* All non-hazardous solid waste, both recyclable and non-recyclable, generated on-site will be gathered and kept in a temporary waste storage facility. From there, all waste will be sent to appropriate facilities for recycling and disposal.
* Reusable waste items such as wooden pallets, cardboard boxes from packing materials, empty cement bags, and construction debris, will be given to community residents who need them.
* During the project's operational phase, waste management measures will be implemented to handle generated waste effectively. Waste collection bins will be strategically placed at suitable locations within the project area to facilitate the proper disposal of waste materials.
* To ensure responsible and compliant waste management practices, EDSA/PIU will engage the services of a certified waste management company. This company will be responsible for the regular collection of waste from the designated bins and its proper disposal in accordance with local regulations and environmental guidelines.
* Ministry of Energy/ EDSA, in collaboration with EPA-SL will sign MoU to engage a private sector known as KRISS Enterprise (licensed by EPA-SL). It aims to assist the project in proper handling and disposal of hazardous wastes generated from used and expired Solar Batteries from designated RESPITE project sites, Lungi and Newton, for a period of fifteen years (after the battery life cycle of operation), in compliance with Sierra Leone environmental regulations, mitigating potential risks to the environment and public health aspects.

##### 8.4.4 Road Safety and Traffic Management Plan

The Road Safety and Traffic Management Plan is a comprehensive strategy that encompasses the entire lifecycle of the project, including the construction, operation & maintenance, and decommissioning phases. Its primary objective is to prioritize the safety and well-being of all individuals involved in the project, including workers, visitors, and the general public, by efficiently managing traffic and mitigating potential road-related hazards. By adhering to this plan, the project ensures that traffic flows smoothly within and around the facility, reducing the risk of accidents and injuries. Proper traffic control measures, such as speed limits, signage, and designated lanes for vehicles and pedestrians, are implemented to enhance road safety. The plan also considers the coordination with local authorities and communities to minimize disruptions to existing road networks and ensure seamless traffic movement during construction and decommissioning activities.

Through the implementation of the Road Safety and Traffic Management Plan, the project demonstrates its commitment to the highest safety standards and emphasizes its responsibility towards the welfare of workers, visitors, and the local community. The plan is subject to regular monitoring and periodic reviews to assess its effectiveness and identify areas for improvement. This proactive approach allows for timely adjustments and enhancements to further enhance road safety and ensure the successful and incidentfree execution of the project. By continuously prioritizing road safety, the project upholds its commitment to sustainable development and responsible practices, fostering trust and goodwill within the community and stakeholders.

During the various project phases, specific measures will be implemented to ensure safety and efficiency. These measures include:

The movement of project vehicles will be limited to specific access routes.

* To ensure the safety of residents and minimize traffic disruptions, appropriate signage will be installed at key traffic junctions along the vehicular access routes for the construction phase. These signs will prevent any deviation from designated routes and maintain safe speeds near residential areas.
* The use of horns near sensitive areas such as schools and settlements will be restricted.
* Vehicular movement near sensitive locations, such as schools and hospitals, will be strictly controlled.
* Drivers of project vehicles will receive training in traffic and road safety operations, while road safety awareness programs will be organized in collaboration with local authorities to educate school children and commuters on traffic safety rules and signage.
* Finally, EDSA/PIU and its contractors will implement a "No Drug No Alcohol" policy to prevent road accidents and incidents.

Speed limits will be established

* Inform local communities about project-related road activities, including construction schedules, potential traffic disruptions, and safety precautions.
* Project GRM will establish communication channels to receive feedback and address road-related concerns from residents.

Specific measures will be undertaken during each project phase thus:

##### i. Construction Phase

* Identify access points for construction vehicles and establish designated construction entrances and exits to manage traffic flow.
* Implement speed limits and traffic signs within the construction site to regulate vehicle movement and ensure safe operations.
* Temporary parking facilities will be provided within the project site/work area to prevent road congestion.
* Traffic timing will be coordinated to minimize disruption during periods of high commuter traffic (especially periods when children go to and from school).

##### ii. Operation & Maintenance Phase

* Develop a traffic management system for ongoing operation and maintenance activities, such as routine inspections and equipment servicing.
* Designate parking areas for staff and visitors within the PV and BESS facility to minimize parkingrelated hazards.

##### 1. Decommissioning Phase

* Plan for the efficient removal of equipment and materials during decommissioning, considering traffic implications and potential road closures.
* Coordinate with local traffic authorities to establish detour routes if needed, ensuring smooth traffic flow during decommissioning activities.
* All construction phase measures apply.

###### 8.4.5 Storm Water Management Plan

The Storm Water Management Plan for the project's construction, operation and maintenance, and decommissioning phases entails a comprehensive approach to managing stormwater runoff and mitigating potential environmental impacts. The plan aims to prevent unregulated stormwater runoff from flowing into nearby natural drainage channels, surface water bodies, and public or private properties. To achieve this, the following measures will be implemented as part of the SWMP.

In general, the project will adhere to the following measures:

* Incorporate best management practices to minimize stormwater pollution, such as the use of permeable pavements, and rain gardens.
* Adopt practices that promote infiltration and groundwater recharge to reduce stormwater runoff.
* Develop spill prevention plans to prevent accidental spills of hazardous materials that could contaminate stormwater runoff.
* Establish procedures for responding to spills promptly and effectively.
* Regularly monitor stormwater quality to assess the effectiveness of the management practices.
* Raise awareness among workers and contractors about stormwater management practices and the importance of preventing stormwater pollution.

Educate the local community about the facility's efforts to protect water quality and the environment. **ii. Construction Phase:**

* Implement erosion and sediment control measures to prevent soil erosion and minimize sediment runoff into nearby water bodies.
* Establish temporary sediment basins or sediment traps to capture sediment-laden stormwater runoff from construction areas.
* Use appropriate stormwater management practices, such as silt fences, straw wattles, and rock check dams, to contain and control runoff.

**iii. Operation & Maintenance Phase:**

* Regularly inspect and maintain stormwater management facilities, such as retention ponds, swales, and infiltration basins, to ensure their effective functioning.
* Manage potential contaminants within the facility to prevent their release into stormwater runoff. **iv. Decommissioning Phase:**
* Implement erosion control measures during the decommissioning process to prevent soil disturbance and runoff.
* Properly manage and dispose of decommissioned materials to avoid stormwater pollution.

###### 8.4.6 Chance Find Procedure

This procedure delineates the steps that will be taken if previously undiscovered cultural resources are discovered during project construction or operation. EDSA/PIU shall ensure that these procedures are included in projects' bidding and contract documents.

Heritage resources, particularly archaeological resources, hold significant historical and scientific value and are vital components of a community's cultural identity and traditions.

In Sierra Leone, the National Museum is responsible for the management of the country's cultural heritage, including archaeological sites and artifacts. In the case of chance finds the National Museum will be notified immediately. They will then assess the discovery and determine if further investigation is necessary. If further investigation is required, the National Museum will oversee the excavation and documentation of the find in accordance with national laws and regulations.

In the course of excavation or construction, the Contractor may encounter various archaeological sites, historical remnants, artifacts, and other features, including graveyards and individual graves. In such a situation, the Contractor shall:

* work in the immediate surrounding will be stopped to avoid further disturbance of the find.
* The area around the chance find will be secured to prevent unauthorized access and to protect the find from damage or theft
* Authorities at the National Museum will be notified immediately about the discovery
* Photographs and notes including (GPS coordinates) will be taken to document the find's location, context, and any associated artifacts or features.
* Experts at the National Museum would excavate the find and assess its significance, including its age, rarity, and potential cultural value, to determine if further investigation is required.

In accordance with the guidance of the relevant authorities, work in the area may either resume, with necessary measures taken to avoid further disturbance to the discovery or related cultural heritage resources, or the PIU/EDSA may choose to modify the project's design or reroute.

###### 8.4.7. Error! Reference source not found.Community Development Action Plan (CDAP)

The Community Development Action Plan (CDAP) for this project is geared towards undertaking certain development initiatives to improve the existing ones to improve the lives of the population in the project communities. This plan has been developed through successive consultations with residents in the project communities.

8.4.7.1 Views from the Project Communities

From the findings of the socio-economic survey and consultations with residents in the project area, the following development projects have been identified for consideration by the project.

1. **Providing access to electricity**: as already discussed in the previous sections of this ESIA, it is the priority request of the communities in Lungi study area. Therefore, EDSA is committed to electrify the Gbaneh Bana communities in the project site. As per Sierra Leone Electricity Act of 2011, Article 36 (2) (a) The Authority (EDSA) shall not extend supply to premises; (b) more than 200 metres from the nearest supply point. Thus, EDSA can only be able to provide the necessary accessories (provision of transformers, poles, conductors, etc.) and makes ready for the last mile connection. With the appropriate arrangement and technical support from EDSA, the communities will take the responsibility to electrify their houses or institutions accordingly. Based on the information gained from experts of EDSA, the estimated cost for the last mile connection, including the meter or instrument for recording the quantity of electricity supplied or consumed, for a single-phase transformer, is about $ 100.00 (equivalent to 2,300.00 New Leones). A budget of $112,294.56 is earmarked for the stated community development plan (subject to modification).
2. **Rehabilitation of the existing access road: t**here is a dirt road stretching over 1 kilometer from the Gbaneh Bana junction that leads to the proposed PV and BESS site, will be rehabilitated as part of this project Community Development Plan (CDAP). The rehabilitation works will include ***improvements of the road surface quality, safety, and overall functionality.*** During the recent consultations, EDSA has clearly communicated to the communities and relevant stakeholders on the exact scope of works to be performed on the existing access road rehabilitation program. The GoSL in collaboration with relevant authorities, such as the Sierra Leone Roads Authority (SLRA), Sierra Leone Road Safety Authority (SLRSA), and EDSA will be involved in the successful execution of this access road rehabilitation. These authorities possess the necessary expertise and jurisdiction to manage road infrastructure and road safety in Sierra Leone. A budget of $10,271.62 is earmarked for the stated community development plan (subject to modification during detailed technical planning of the road).
3. **GBV (SEA/SH) Support to Health Service in Lungi:** common to nationwide context, the health facilities in the project area lack adequate resources to serve their populations, with insufficient equipment and basic medical supplies, however the healthcare facility will be provided with GBV (SEA/SH) support through Campaign and awareness raising, multi-sectorial supports and Legal supports to survivors or victims as part of the CDAP component with the aim for meeting emergency demands by community members and workers of the project. A budget of $20,000.00 is allocated by the project for the specified action plan. There is lack of essential items and

resources that aid in the immediate response and support for survivors of gender-based violence. Thus, the project will supply a comprehensive GBV response kit to Gbaneh Bana CHC to address immediate needs. The kit will be accompanied by awareness campaigns and training, with regular assessments to ensure responsiveness to evolving needs. These interventions will be provided by the project before the contractor mobilizes thereby guaranteeing adequate facilities both for the community and workers of the project (the budget for GBV related part of the CDAP is included in the SEA/SH Prevention and Response Action Plan, that is under preparation by the projectEDSA).

8.4.7.2 CDAP Implementation Arrangement

The existing local governance structure at Lungi will be used to form a Community Development Management Committee (CDMC) which will steer the development process of the CDAP. Members of this committee will serve on a voluntary basis, driven by their commitment to serving the community and contributing to its progress.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Activity** | **RESOURCES/DESCRIPTION** | | |  | **ESTIMATED BUDGET (USD)** | **RESPONSIBILITY** | **TIMELINE** |
|  | **Provision of**  **transforme**  **rs** | **Provision of**  **Poles accessories** | **Provision**  **Conductors** | **of** | **(Estimated cost for supply of Poles, Transformers, and accessories)** |  |  |
| **Support to**  **Gbaneh Bana**  **Community**  **electrification** | 2 X 250 kVA Transforme  r | 50 X 11kV  Poles  125 X 11kV  Poles | 3km  5km |  | $112,294.56 | EDSA/MoE | 5-8 months |

EDSA/PIU will be responsible for the implementation, monitoring and evaluation of the CDAP plan in collaboration with CDMC. The monitoring activities will be conducted on quarterly basis. Meetings will be held monthly to discuss on the implementation status and monitor the progress of the CDAP identified activities.

Proposed Membership of the Community Development Management Committee include:

* The Port Loko City and District Council
* Community Headmen
* Councillors
* Religious leaders (Christian/Muslim)
* Leaders of the youth groups
* Women's leader
* A representative of the tribal groups

#### Community Development Action Plan (CDAP)

# Table 8-3: CDAP Budget (2024) Lungi Site

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
| **Access Road**  **Rehabilitation** | Hiring of Excavator & machinery | | Provision of  Fuel for the  Road upgrade | $10,271.62 | EDSA/MoE | 1-3 Months |
| **Support for Gbaneh Bana**  **Health Center** | GBV (SEA/SH) support will be given to the Health facility through Awareness campaign, multi-sectorial supports, Legal supports and GBV response services to survivors/victims. | |  | $20,000.00 | EDSA/MoH | 1-2 Months |
| **GRAND TOTAL** |  | | | ***$142,566.18*** |  |  |

N.B: The above costs are estimated and subject to change with marginal error when actual figures are obtained.

##### 8.5 Environmental and Social Management Plan

The ESMP has been developed in accordance with the policy discussed in the earlier sections, aiming to assess the proposed project's compliance with EPA-SL regulations, guidelines, and the World Bank E&S Framework. Consequently, the ESMP will undergo regular reviews to ensure its effectiveness.

# Table 8-4: E&S Management Plan

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Proposed**  **Activity/Impact Source** | | **Potential Risk and Impact** | **Mitigation Measures** | **Responsibility** | **Cost of Mitigation (USD)** |
| Selection inappropriate design | of | The impacts of selecting an inappropriate design include inefficiency and wasted resources, leading to inefficiencies in project execution. It can result in cost overruns and additional expenses due to the need for redesign or rework. Poor functionality and performance can undermine the project's success and user satisfaction. Safety risks and hazards may arise due to inadequate design considerations. Limited scalability and adaptability can restrict the project's ability to accommodate future needs or expansion. Negative environmental impacts can occur, such as excessive energy consumption or waste generation. Finally, selecting an inappropriate design can cause reputational damage to stakeholders, affecting their credibility and relationships. | Comprehensive feasibility studies (including detailed engineering and environmental impact assessments currently being prepared subject to public disclosure upon approval by WB and the proponent) involve skilled design experts and consider pertinent factors such as site conditions, local regulations, and project specifications. Thorough engineering analysis including design/technology alternatives, consultation with stakeholders, and meticulous evaluation of design alternatives have been made which are crucial to ensure the choice of a suitable and efficient design for  PV, BESS, and transmission line systems | EDSA/PIU | To be determined (TBD) |
| Forced labour  allegations  associated with polysilicon suppliers used for solar panels | | The forced labour allegations associated with polysilicon suppliers used for solar panels introduce a notable and concerning impact on the project. These allegations raise ethical, social, and potentially legal concerns involving accusations of labour practices that | Market analysis to identify possible sellers of solar panels to the project and requirements in bidding documents as follows:  Bidders will be required to provide two declarations: a Forced Labour Performance Declaration (which covers past performance) and a Forced Labor Declaration (which covers | EDSA/PIU | TBD |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | violate human rights and ethical standards. Such allegations can affect the project's reputation and stakeholder trust. the project may face increased scrutiny from regulatory bodies and the public, potentially leading to legal and financial repercussions. | future commitments to prevent, monitor and report on any forced labour, cascading the requirements to their sub-contractors and suppliers).  In addition, enhanced language on forced labour will be included in the procurement contracts. |  |  |
| Inefficiency resulting from the sourcing of  construction materials | * Project delays, affecting subsequent phases and extending the timeline. * Inadequate material quality checks, compromising project safety. * Compliance issues leading to fines, delays, or costly retrofits. * Reputation harm impacting future opportunities and partnerships. | * ensure that potential suppliers possess all relevant licenses and permits and that the purchased materials meet technical, safety and environmental requirements to be specified in Technical Specifications as part of the closure design. * This helps reduce delays in material acquisition and ensures compliance with technical, safety, and environmental and social requirements. * Rigorous quality checks and inspections guarantee the use of compliant, high-quality materials in construction. * ensure that potential suppliers possess all relevant licenses and permits and that the purchased materials meet technical, safety and environmental requirements specified in Technical Specifications as part of the closure design. | EDSA/PIU | TBD |
| Lack of community consultations or limited stakeholder consultations | • Potential tension from unrealistic expectations held by the communities about benefits created by the project reduced trust and ownership, causing resistance during implementation. | * Implement the SEP, which calls for continuous engagement throughout the project lifecycle. * Contractors shall engage stakeholders upon mobilization. * Early management of disputes. | EDSA/PIU Contractor | $ 45,000 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | * Higher risk of unforeseen negative consequences on livelihoods, environment, and social aspects. * Possible legal or regulatory compliance issues. * Increased stakeholder opposition, undermining social support. * Missed collaboration opportunities for mutually beneficial partnerships and project success. | * Proactive community engagement. * Transparency and realistic information about the project's impact and benefits are essential to manage expectations effectively and prevent conflicts. * Regularly review and update project progress to manage expectations effectively and avoid potential tensions. |  |  |
| Implement CDAP | • Implement CDAP | * Electrify the Lungi communities, including Gbaneh Bana involving the installation of 11kV and low-voltage lines, along with transformers, as well as providing guidance to communities on how to apply for service connections. * The existing access road to be rehabilitated encompassing activities such as improvements of the road surface quality, safety, and overall functionality. * Support to Health Service in Newton, Gbaneh Bana CHC with basic equipment, supplies and medical facilities with the aim for meeting emergency demands by community members and workers of the project. The project will supply a comprehensive GBV response kit accompanied by awareness campaigns and training to Gbaneh Bana CHC to address immediate evolving needs. * Emphasis will be given on the recruitment of local workforce during the implementation of the proposed RESPITE project. EDSA is dedicated to facilitating the recruitment | EDSA/PIU | **$*142,566.18*** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | | | process as responsive as possible to local realities, as per skill sets and qualifications of community groups. It will be a stipulation in the contractor's agreement.  Implement Stakeholder Engagement Plan (SEP) developed for the project, including GRM. |  |  |
| Project planning | Loss of or reduced access to land, assets and livelihoods |  |  | * Undertake a Resettlement Plan (RP) to assess any physical and/or economic displacement impacts and determine due compensation packages for affected persons. The RP shall be implemented prior to commencement of any physical works of the project. * Compensate farmers at full replacement value for loss of assets and livelihood disturbances as per the GoSL legislation and ESS5. * The Community Development Action Plan (CDAP) will be implemented as it addresses specific community felt needs. * Project GRM will be implemented. Complaints from PAPs will be timely registered, investigated and resolved.   • | EDSA/PIU | Project cost |
| Site mobilisation and transportation of materials,  Construction works and decommissioning - machines and equipment, vehicle  traffic | Generation of dust  and other atmospheric emissions | | | * Water will be used to dampen roads, tracks and/ or stockpiled material, especially under windy conditions * Any exposed surface that is not going to be utilised after construction will be rehabilitated and maintained; * Traffic control measures aimed at reducing the entrainment of material by restricting traffic volumes and reducing vehicle speeds | Contractor | $35,000 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | * Covering and protecting stored materials from wind and dampening stored materials where appropriate. * Cover vehicles that transport dusty materials * Sweeping and dampening down working areas regularly to prevent the build-up of fine waste dust material; * Provide workers with appropriate PPEs to minimise dust inhalation * Implement a vehicle speed limit monitoring system on site to help prevent/control dust from vehicles and for health and safety purposes * Regular inspection of site vehicles’ emissions * Limit vehicles idling motors to no more than 2 minutes * During construction, pay special attention to reducing emissions from generators. Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites. Service all equipment regularly to minimise emissions. * The total footprint area to be disturbed/developed will be kept to a minimum by demarcating the construction areas and restricting construction to these areas only. |  |  |
| Site mobilisation and transportation of materials,  Construction works and decommissioning - machines and | Increase in ambient noise levels around site and access routes | * Plan construction activities to avoid or limit noisy work during sensitive periods, such as late evenings, nights, or weekends, when people are more likely to be affected by noise. * Provide workers with appropriate noise gear when they work in noisy areas | Contractor | $15,000 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| equipment, vehicle traffic, BESS facility operation |  | * Switch off equipment when not in use * Train construction workers on the importance of noise control and the proper use of equipment to minimise noise emissions. * Choose construction equipment and machinery that produce lower noise levels or use noise-reducing technologies. Regular maintenance of equipment can also help keep noise levels in check * Place noisy equipment or activities away from sensitive receptors, such as residential areas, schools, and hospitals. * Use portable, Sound/ Noise level meter and Air Quality Meter for ad hoc noise and air quality measurements and monitoring. * Organise truck loading and unloading, as well as handling operations to reduce construction noise on the site. * Avoid the use of unnecessary alarms, horns, and sirens. * Install high-efficiency mufflers on appropriate construction machinery. * Implement noise reduction techniques at the BESS facility, such as employing soundproof enclosures or vibration-damping measures. * Proper maintenance and cleaning of batteries are essential for their efficient and quiet operation. * Use the best available work practices on-site to keep occupational noise levels minimal. |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Labour influx | Worker’s health and safety/community health and safety | * Implement the Health and Safety Management Plan; * Identify potential hazards to workers and residents, particularly those that could be fatal and implement necessary preventive and protective measures * Implement the Labor Management   Procedures (LMP).   * Implement the Road Safety and Traffic Management Plan * Restrict access to the facility * Follow the noise and air quality mitigation measures | Contractor | $ 22,000 |
| Leaching of soluble chemical pollutants and hydrocarbons, erosion of  construction material stockpile | Soil contamination | * All storage areas (for fuels and lubricants) will be compacted and have bunded containers to prevent soil contamination and appropriate oil separators installed to cover a 24 -hr rainfall event * Vehicle service areas must be paved or compacted * Implement Storm Water Management Plan * Create and maintain a hazardous material registry that lists the locations and quantities of hazardous compounds, as well as how they are stored and disposed of * If contamination has been reported, determine the source of the contamination and contain the contaminated area. Isolating the source or implementing controls surrounding the impacted site may be used to limit the damage. Remediate the contaminated land with the best possible technology | Contractor | $ 15,000 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | • Inactive Stockpiles (stockpiles not scheduled to be used within 14 days) will be covered with plastic sheeting or sandbags placed at the toe of stockpiles. |  |  |
| Surface runoff from the project site carries pollutants into nearby water bodies | Deterioration of water quality | Standard procedures to control and minimize surface and groundwater pollution will be implemented. These include:   * Maintain bonding of all facilities that store hazardous materials * Maintain washing and ablution facilities * Provide and maintain solid waste collection facilities * Provide spill kits and monitor spills; and * Monitor vehicle oil leaks. * Erosion will be prevented at disturbed areas through water diversion berms and proper stockpiling of soil. Ensure stockpiles are placed on a free draining location so as to limit erosion loss * Implement the Storm Water Management   Plan   * Progressive rehabilitation of all areas affected by construction to prevent erosion. * Store construction materials, fuels, and chemicals away from water sources and implement spill prevention and response protocols. * Conduct regular inspections to identify and address potential sources of water pollution At decommissioning: * Carefully remove equipment and infrastructure to minimise waste generation | Contactor | $25,000 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | and prevent spillage of hazardous substances.  • Dispose of decommissioned materials according to the proper waste management plan, considering recycling or repurposing options |  |  |
| Site preparation, construction of buildings and installation of components | Ecological disturbance (especially the construction of poles in the Suctarr swamp) | In the case of sensitive habitats like swamp, care should be taken to avoid the following:   * dumping construction waste and stockpiling excavated material into streams in swampy environments. These materials would choke aquatic life and distort hydrological cycles within that local area and further downstream. * Spillage of oil and other potential contaminants and pollutants into streams and swampy environments is unacceptable and should be prevented at all costs. Pollutants can obliterate many biodiversity resources like fish and the substrate for farming, which will be a disaster for the local livelihoods.   For construction activity in the swamp, implement these specific measures to minimise disruption to swamp ecology.   * Utilize specialised installation methods like concrete foundations for wooden poles to reduce soil disturbance and safeguard swamp stability. There shall not be any utilization of chemicals for vegetation control. * Excavate during dry periods when soil is firm and vegetation is dormant to control erosion and siltation. | Contractor | $25,000 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | * Minimize equipment entry into the swamp; prioritize manual labour when feasible. * Care shall be taken to avoid the deposition of laterite from the installation of powerlines and other facilities into the swamp and pilons or poles should not be installed in the middle of the swamp. Once installed, powerlines can also serve as roosting locations for some migratory passerines such as the common swallow.   **As the successful EPC contractor is onboard, will provide a work plan (as part of C-ESMP) incorporating the below considerations:**   * Assess the risks or impact of construction or expansion of the project footprint on adjacent swamp areas and sensitive ecosystems. Make recommendations that will inform engineering design based on this assessment. * Adequate buffer will be established between the facility, TML, access road and the swamp area. * Construction and operation of the proposed project will take into consideration the recommended mitigation measures relating to local |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | community livelihoods and the conservation needs of the swamp ecologies.  ▪ Minimize the disturbance of the swamp areas, as much as possible, through implementing erosion and sediment control measures, such as silt fences, vegetation, etc. to prevent soil runoff and sedimentation in the swamp areas; limit major civil works, including excavation and materials movement across the swampy areas to the dry Season or non-breeding season and protect the integrity and sustainability of the swampy areas; employ eco-friendly preservatives or treatments; avoid or reduce the use of chemicals, fuels, and other hazardous substances that could contaminate the swamps; using the least invasive techniques and equipment; restoring the site to its original condition after completion; etc. |  |  |
| Site preparation, construction of buildings and | Loss of biodiversity due to project construction activity. | * Construction activities will be limited within the project area. * Implement effective sediment and erosion control measures to prevent sediment runoff | Contractor | $25,000 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| installation  components | of | Habitat destruction and soil disturbance as a result of land clearing, excavation and construction. | into water bodies. This includes the use of sediment traps, sediment basins, silt fences, and erosion control blankets to capture and contain sediment. Ensure these measures are properly implemented within the project boundary and along the project access road alignment, restrict land clearing to what is absolutely necessary; all sloped areas must be stabilized to ensure proper rehabilitation is effected and erosion is controlled random movement of heavy machinery at construction sites shall be avoided; the contractor will be responsible to ensure that all cleared surfaces and exposed areas to be re-vegetated to its original state at all worksites after completion of work.  Comprehensive tree inventory will be completed in the RP development and CESMP should ensure that project design leads to minimal trees being cut for the project and compensatory planting of the trees that are cut (with 1:2 ratio replantation). |  |  |
| Construction activities |  | Population Movement/Labour influx | * Implement the LMP * Incoming workers can rent private houses. * Implementing Community Development Action Plan (CDAP) and community engagement initiatives can foster harmony between new arrivals and local communities. * Strict enforcement of health and safety regulations ensures the well-being of workers and prevents public health risks. | Contractor | $15,000 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Construction and operation | Potential Conflict from Issues Related to Labour | * Implement the LMP (including CoC and Workers GRM) * The recruitment policy used to employ people on the project must be fair, transparent and clearly communicated to the local population * Local community structures (such as town/village headmen) will be involved to assist with communicating the proponent's intention to give preference to the existing labour force; and * Awareness will be raised regarding relevant social and community issues among all employees who will be in contact with local villages during construction. This awareness could be raised during the induction of employees, or can be addressed during toolbox talks, with the aim of increasing sensitivity to local norms and customs, and awareness amongst contractors and workers of appropriate and acceptable behaviour * The local community procurement policy and strategy & procedures will be defined, * Integrated job profiling as a first step in career progression planning will be introduced, * Gender-specific recruitment programmes and female targeted bursaries will be initiated, * Needs/opportunity assessments in terms of procurement will be commissioned. | Contractor EDSA/PIU | $ 25,000 |
|  | Exclusion of vulnerable groups | • The project will actively involve vulnerable and disadvantaged groups in decisionmaking and allocate resources to community | EDSA/PIU | $5,000 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | development initiatives to enhance social well-being and cohesion through the CDAP. |  |  |
| Presence of workers during Construction and Operational phases | Spread of communicable diseases including HIV/AIDS | * Awareness and education on the prevention of STIs and safe sex practices * Provide health care services for workers * Provision of condoms | Contractor, EDSA/PIU | $30,000 |
| Waste Generation activities during  Construction,  Operational and decommissioning phases | * Improper waste management can lead to environmental pollution, habitat disruption, and soil contamination * Inadequate disposal methods may result in soil and water contamination, posing environmental and health hazards * Inadequate planning for waste disposal can lead to soil and water pollution, as well as potential harm to local ecosystems. | The Waste Management Plan will be implemented for the life span of the Project. The Waste Management Plan highlighted the following:   * identified waste streams, temporary management and final disposal procedures. * Waste management procedures to be implemented which reduce the need for disposal of materials by re-use on and / or offsite * Provision of an on-site collection service. * Waste streams to be kept segregated. * Adequate provision of waste disposal containers at strategic locations around the site. * training of workers in waste management and safe handling of wastes. | Contractor,  EDSA/PIU | $52,000 |
| At the conclusion of the project's  lifecycle | Job losses at the end of the project lifecycle. | * At the end of construction, the EPC contractor will introduce job transition programs to assist impacted employees in securing alternative job placements or receiving skills training for various roles within the renewable energy sector or other industries. * The workforce will be empowered to develop skills that will equip them to obtain employment in other sectors of the economy; | Contractor, EDSA/PIU | $15,000 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | • Local partners will be supported to diversify economy.  • |  |  |
| Construction  Activities | Removal of Cultural Sites | * The chance find procedure will be implemented and sites will be demarcated where applicable; * A Stakeholder Engagement Process and grievance procedure are in place to, inter alia, address impacts and concerns related to heritage sites; | Contractor | $5,000 |
| Existence of the  project  infrastructure and Decommissioning | Landscape and Visual Intrusion  (Changes in the surrounding landscape and the visual appearance of the project site.) | * Efforts will be employed to maintain the construction site in a neat and orderly condition during the construction phase; * Designated areas for material storage, waste sorting and temporary storage, batching and other potentially intrusive activities will be created and screened off to the extent as feasible; * Security lighting at the facility will require one that is movement activated rather than permanently switched on, to prevent unnecessary constant illumination; * At decommissioning, the site will be restored to its original condition or repurposed | Contractor | $10,000 |
| Impacts on workers health and during the Construction,  Operation & maintenance and  decommissioning  activities | * Unconducive working environment * Falls, being struck by objects, or caught in-between equipment can occur if safety protocols aren't followed. * High-voltage components pose risks of electric shock, arc flash, or electrocution without proper training and safety procedures. | • Health and Safety Management Plan has been developed and will be implemented  The principles of prevention and control underpin management of risks to health and safety at the workplace. These are well established principles and widely applicable. The focus of action and consideration will be given to prevention of risk in the first place, particularly in terms of elimination at the source or substitution e.g. of a less hazardous | EDSA/PIU/Con  tractor | $45,000 |
|  | * Falls can happen without proper fall protection measures like harnesses, guardrails, or scaffolding. * Repetitive motions, heavy lifting, and awkward postures can lead to musculoskeletal disorders without proper training and equipment. * Improper handling of chemicals can lead to respiratory issues or skin irritations. * High noise levels and uncontrolled vibrations can cause hearing damage and health issues. * Demanding schedules can lead to fatigue, impairing concentration and decision-making abilities. * Inadequate living conditions and lack of access to healthcare can affect worker well-being. * Non-compliance with labour laws can lead to unfair treatment and exploitation. * Specific groups face challenges or disadvantages in the workplace, requiring special consideration and protection. | substance, rather than immediately considering risk management/control measures. Psychosocial issues and general health issues will also be considered along with the safety risks and risks to health caused by physical, chemical, and biological agents. |  |  |
|  |  | **Total Budget ($)** | | **$ 409,000.00** |

##### 8.6 Environmental and Social Monitoring

Monitoring is vital for the sustainability of development projects as it helps understand the complex interactions between people, natural resources, biodiversity, and various factors involved. These interactions create a new environment, making it difficult to predict post-project conditions accurately. To address this, critical parameters will be monitored during both construction and operation phases. Monitoring allows for early issue detection, timely remedial actions, and validation of initial assessments. It ensures the effectiveness of mitigation measures throughout project operation and provides valuable data for predicting scenarios in similar projects. In summary, monitoring is crucial for effective mitigation, prompt issue detection, and building an information database for future environmental and social predictions.

To comply with the EPA’s regulations, the project proponent is required to submit quarterly monitoring reports once construction commences. These reports will be prepared and submitted by external consultants, acting on behalf of EDSA/PIU, to ensure an accurate and independent assessment of the project's environmental impact.

In addition to the quarterly monitoring, EDSA/PIU is taking proactive measures to enhance environmental monitoring during the project's construction phase. Portable environmental monitoring devices will be procured to conduct weekly monitoring. These devices are designed to measure various environmental parameters, such as air quality, noise levels, water quality, and other relevant indicators. As part of the environmental monitoring equipment, EDSA/PIU will also procure portable, lightweight, hand-held monitors (Sound/ noise level meter and air quality meter) for ad hoc noise and air quality measurements to be used by PIU and Supervision Consultant. These robust and reliable portable meters provide instantaneous results which can be used to monitor the contractors' performance and quickly address deficiencies and later can be used during the operation of the plant. The results can also be used to resolve noise and dust complaints from the impacted communities. Weekly monitoring is essential during the construction phase as it allows for real-time data collection and quick identification of any potential environmental issues or deviations from the approved environmental management plan. By closely monitoring the project's environmental performance on a regular basis, EDSA/PIU can promptly address any concerns and implement necessary corrective actions.

###### 8.6.1 Compliance Monitoring and Corrective Action

Non-compliance with conditions of the ESMP/C-ESMP will be considered a violation of the appointment contract, and the EPC contractor will be held accountable. The contractor will be deemed non-compliant with the ESMP/C-ESMP if:

* If there is proof of violating the provisions of the ESMP, the environmental specifications, or the CESMP devised by the Contractor within the construction site's limits or areas of contractor responsibility, it will be considered non-compliance.
* Negligence results in environmental damage.
* Construction-related activities take place outside the defined boundaries of the site;
* The Contractor fails to comply with corrective or other instructions issued by the environmental specialist within a specific time; or
* Inadequate response by the Contractor to complaints lodged by the public or authorities

###### 8.6.2 Reporting and Review

The requirements listed below must be considered when reporting and documenting:

* Documents related to the ESMP must be reviewed periodically and make necessary updates.
* EDSA/PIU will conduct monthly audits on the environmental and social performance of the project's construction phase.
* A post-construction audit will be undertaken by an external consultant
* Records will be maintained for the results of internal, external, and informal environmental reviews, and the recommendations made will be used to identify the items that require action and
* The EPC contractors will have a contractual obligation to fulfil all reasonable recommendations, and the implementation of these actions will be evaluated by EDSA/PIU.

# Table 8-5: ESMP Monitoring Program

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Monitoring Parameter** | **Location** | **Methodology** | **Frequency** | **Institutional Responsibility** | **Cost of**  **Monitoring**  **(USD)** |
| SO2, NO2, O3, PM2.5., PM10, | Project footprint | Use an Air quality meter | Quarterly upon  commencem ent of  construction | Consultant | 9,000 |
| Noise level  measurement in dB(A) (Portable, sound/ noise level meter and air  quality meter) | Consistent with Air quality location | Sound level meter | Twice a week during construction | Consultant | 6,000 |
| (Surface water quality- Physio-chemical and microbiological analysis) | Communities  around the project  site | Water sample collection and analysis | Quarterly upon  commencem ent of  construction | Consultant | 12,000 |
| Purchase of portable Environmental monitoring equipment to be used by EDSA/PIU (includes portable, Sound/ noise level meter and air quality meter for ad hoc noise and air quality measurements to be used by PIU and  Supervision Consultant) | Project footprint and communities around the project  site | Use of Air, noise probes and water quality test kit | Twice a week during construction | EDSA/PIU | Budgeted under  Newton Site for use in both sites. |
| Hydrologic monitoring | Project site and nearby community | See Methodology below | At least for a year | PIU/Consulta nt | 26,000[[4]](#footnote-4) |
| Field inspection and document review: | |  |  | PIU/Consulta nt | 25,000 |
| Materials handling, use & storage of hazardous substances | Project site | * Availability of Material Safety   Data Sheet (MSDS) papers/control sheet available on site at all times   * Proof of training of contractor personnel | Monthly | PIU |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Monitoring Parameter** | **Location** | **Methodology** | **Frequency** | **Institutional Responsibility** | **Cost of**  **Monitoring**  **(USD)** |
|  |  | * Photographic evidence of compliant use, handling, and storage * Availability of bunded areas, drip trays etc. * Disposal certificates available, where necessary |  |  |  |
| Solid waste  management | Project footprint | Field inspection and document review:   * Proof of contractor SWMP * proof of waste management throughout the site * A waste collection site of appropriately placed and demarcated * Separate waste bins are available on site and waste generated is separated into the relevant bins * Disposal certificates of disposal at licensed facilities to be provided | Monthly | PIU |  |
| Dust control | Project and Access roads | Field inspection and document review:   * Evidence of dust suppression * Availability of nose masks and appropriate use by   workers | Monthly | PIU |  |
| Stormwater management | Project footprint | Field inspection to see if the contractor is implementing measures for the control and management of runoff | Monthly | PIU |  |
| Erosion &  sedimentation control | Project footprint | Field inspection to see if the contractor is implementing measures for the control and management of erosion and sedimentation | Monthly | PIU |  |
| Emergency procedures | Project site | Field inspection and document review: | Monthly | PIU |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Monitoring Parameter** | **Location** | **Methodology** | **Frequency** | **Institutional Responsibility** | **Cost of**  **Monitoring**  **(USD)** |
|  |  | * names and contact details of responsible personnel and emergency services must be made available to all staff and will be clearly displayed at relevant locations at the site * evidence of training in events of fire; accidental leaks and spillages |  |  |  |
| OHS Issues | Project site | Document review/field inspection:   * No. of incidences and accidents * No. of toolbox talk * Records of OHS training received by workers * Availability and use of appropriate PPEs | Monthly | PIU |  |
| Traffic and road safety | Project  Communities along access roads | * Document review: * No. of incidences and accidents * No. of training on road safety * Signs installed to prohibit accident * Record of community complaints | Monthly | PIU |  |
| SEP/ Community  Relations | Project site, communities | Field inspection and document review:   * Evidence of contractor GRM * Records of complaints * No. of grievance resolved/not resolved * Number of meetings held with communities * No. of community awareness, training, sessions conducted. | Monthly | PIU |  |
| **Monitoring Parameter** | **Location** | **Methodology** | **Frequency** | **Institutional Responsibility** | **Cost of**  **Monitoring**  **(USD)** |
| LMP and SEA/SH plan | Project site Project communities Accommodation  facility | • Evidence of contractor GRM • Records of complaints  No. of grievance  resolved/not resolved | Monthly | PIU |  |
| CDAP | Project site, Gbaneh Bana communities, Health facilities | * Gbaneh Bana village electrified. * Access road rehabilitated. * Gbaneh Bana CHC equipped with basic emergency equipment, materials and supplies. | Monthly and Quarterly | PIU | CDAP Budget |
|  |  | **TOTAL** |  |  | **$78,000** |

###### 8.7 Incident and Accident Reporting

EDSA is committed to report incidents and accidents related to the project, as stipulated in the project ESCP. Incidents that will be reported to the WB include the following types: Fatality, Lost Time Injury, Acts of Violence/Protest, Disease Outbreaks, Displacement without Due Process, Child Labor, Forced Labor, Unexpected Impacts on Heritage Resources, Unexpected Impacts on Biodiversity Resources, Environmental Pollution Incident, Dam Failure, Violence on the Basis of Sexual Orientation and Gender Identity (SOGI), Discrimination on the Basis of SOGI, Sexual Exploitation, Sexual Abuse, Sexual Harassment.

The World Bank needs to be notified promptly, within 48 hours of any incident or accident related to the Project which has, or is likely to have, a significant adverse effect on the environment, communities, the public or workers, including, inter alia, cases of SEA/SH and accidents that result in death, or serious or multiple injuries. The PIUs will need to provide sufficient detail regarding the scope, severity, and possible causes of the incident or accident, indicating immediate measures taken or that are planned to be taken to address it. The report should also include any information provided by any contractor or supervising entity. A record of indicative incidents is still required to identify any potential trends to be mitigated, e.g., repetitive similar incident, or repeat offender contractor, etc.

Key information in the incident report shall respond to the following questions:

* *What was the incident? What happened? To what or to whom?*
* *Where and when did the incident occur?*
* *What is the information source? How did you find out about the incident?*
* *Are the basic facts of the incident clear and uncontested, or are there conflicting versions?*
* *What were the conditions or circumstances under which the incident occurred?*
* *Is the incident still ongoing or is it contained?*
* *Is loss of life or severe harm involved?*
* *How serious was the incident? How is it being addressed? How is the response?*
* *What, if any, additional follow up action is required, and what are the associated timelines?*

With respect to SEA/SH, the Project Manager will confirm if an investigation of SEA/SH misconduct will be carried out, after considering whether it will be safe to investigate and whether the employer’s misconduct (accountability and response framework) investigation process is appropriate for undertaking the investigation in a survivor-centric manner. The WB will not request or be given an investigation report from the employer but will use the records available from the Project Manager for its internal Environment and Social Incident Response Toolkit (ESIRT) process.

For all other incidents, the PIUs will provide the information to the WB team as quickly as possible and ideally within 10 days. The WB team will review the investigation report and incident form, and if necessary, request further clarification or information with respect to the causes of the incident. (Refer Annex XVII for Incident Reporting Forms).

###### 8.8. Environment and Social -Related Training

A national E&S firm (consultant) will be recruited by the PIU to provide training to all employees and subcontractors involved with the proposed project about the ESMP. Each person will be aware of and understand their obligations and duties detailed in this ESMP.

Managing an ESMP requires a range of skills and knowledge related to environmental management and sustainability. Overall, effective management of an ESMP requires a deep understanding of environmental issues and sustainability principles, as well as strong communication and stakeholder engagement skills. Continuous training and professional advancement can aid environmental managers in keeping abreast of the most current best practices and regulatory mandates.

# Table 8-6: Capacity Building Plan

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Capacity**  **Building**  **Activities** | **Training Topics** | **Target Audience** | **Timeframe** | **Organization**  **Responsible for training** | **Cost (USD)** |
| Community health and  safety | Disease Prevention and  Control,  Public Health Education,  Environmental Health,  Injury Prevention,  Health Equity and Social Determinants of Health,  Community Policing and  Crime Prevention, | PIU staff, project workers, contractors  Traditional  Leaders Ward  Development  Committees, Local Councils, religious leaders, school managers, youth | During project mobilization | Consultant | $10,000 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Health Promotion and  Lifestyle Interventions,  Community Engagement and  Participation | leaders/groups, Women’s  groups/leaders |  |  |  |
| Stakeholder  engagement | Building Trust and Relationships with  stakeholders,  Conflict Resolution and  Management,  Engaging Marginalized or  Underrepresented  Stakeholders,  Monitoring and Evaluation of Stakeholder Engagement,  Ethical Considerations in  Stakeholder Engagement,  Lessons Learned and Best  Practices | PIU staff, project workers, contractors  Traditional  Leaders Ward  Development  Committees, Local Councils, religious leaders, school managers, youth  leaders/groups, Women’s  groups/leaders | Before mobilization | Consultant | $ 5000 |
| GM | Dispute resolution management and grievance redress  Trust & Consensus Building  GBV  Project Grievance Redress  Systems | Members of  Grievance Redress  Committees, | Before the  commencement of Civil Works of  the Project | Consultant | $5,000 |
| Specific aspects of  environmental and social  assessment | Introduction to World Bank’s ESF  Preparation of Environmental Monitoring reports.  Responsibilities of  Contractors etc. in implementing  Project ESMPs | PIU staff, project workers, contractors  Traditional  Leaders Ward  Development  Committees, Local Councils, religious leaders, school managers, youth  leaders/groups, Women’s  groups/leaders | Before the  commencement of Civil Works of  the Project | Consultant | $6,000 |
| Occupational  Health and  Safety | Occupational Hazard  Identification and Risk Assessment  Workplace Safety Policies and Procedures  Personal Protective  Equipment (PPE) | PIU staff, project workers, contractors  Traditional  Leaders Ward  Development  Committees, Local Councils, religious | Before the  commencement of Civil Works of the Project | Consultant | $ 10,000 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Occupational Health  Promotion  Ergonomics and Workplace Design  Occupational Health  Surveillance  Occupational Health and  Safety Training  Workplace Emergency  Preparedness  Occupational Health and  Safety Management Systems  Occupational Health and Safety Regulations and  Compliance | leaders, school managers, youth  leaders/groups, Women’s  groups/leaders |  |  |  |
| SEA/SH awareness, prevention, reporting and management  protocols | Understanding Sexual Exploitation, Abuse, and  Harassment,  Creating a Safe and  Respectful Workplace,  Sexual Harassment  Prevention Training,  Reporting Mechanisms and  Confidentiality,  Investigating and Responding to Complaints,  Support Services for Victims,  Promoting Bystander  Intervention,  Legal and Ethical  Considerations,  Engaging Leadership and  Management, | PIU staff, project workers, contractors  Traditional  Leaders Ward  Development  Committees, Local Councils, religious leaders, school managers, youth  leaders/groups, Women’s  groups/leaders | Before the  commencement of Civil Works of the project | Consultant | $5,000 |
| Labor influx and  Management  Procedure | Workforce Planning:  Recruitment and Selection:  Onboarding and Orientation: Training and Development: Performance Management  Communication and  Engagement:  Workforce Flexibility | Contractors OSHE  Officer | Before the  commencement of Civil Works of the Project | Consultant | $ 2,000 |
| Emergency prevention and preparedness | Risk Assessment and Hazard Identification.  Emergency Planning and  Preparedness. | PIU staff, project workers, contractors | Before the  commencement of Civil Works of the | Consultant | $5,000 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| and response arrangements to emergencies. | Training and Drills,  Emergency Communication,  Emergency Equipment and Resources  Collaborations and  Partnerships,  Incident Command System  (ICS),  Business Continuity Planning, Post-Emergency Evaluation  and Lessons Learned, Psychological Support, | Traditional  Leaders Ward  Development  Committees, Local Councils, religious leaders, school managers, youth  leaders/groups, Women’s  groups/leaders | project |  |  |
| Total | | | | | $ 48,000 |

### 9. CHAPTER NINE: CONCLUSION AND RECOMMENDATIONS

#### 9.1. Conclusion

The RESPITE project hopes to improve electricity in the country. There is no doubt this project comes with many social and economic benefits. However, the concern was how the project would be implemented in an environmentally friendly manner. Therefore, an ESIA was commissioned.

This ESIA study has been carried out according to statutory requirements for sustainable environment management in Sierra Leone. The World Bank ESS and industry best practices were also considered. The environmental studies identified possible project impacts and suggested cost-effective measures to mitigate such impacts. The project construction phase shall last for a short period and is expected to cause minimal effects of the loss of land, loss of vegetation, soil and water contamination, erosion, air pollution, noise, generation of solid waste, concerns related to the management of hazardous materials etc. Potential impacts of the proposed activity on air quality, noise, and water quality (and quantity) are defined as the adverse effects of changes in the baseline characteristics of these biophysical conditions on the health and welfare of humans and ecosystems. Significant impacts constitute major changes resulting in acute or chronic health conditions and major impairment of critical ecosystems. The proponent commits to adopting appropriate mitigation measures and sustainable best management practices where such impacts occur.

Based on biodiversity analysis of the data generated from the proposed project site, the following observations and conclusions can be made:

1. No threatened species of mammals, birds or butterflies were recorded. Identifying any of these species during the survey is one of the key aspects of the study. For most of the species listed, the type of habitats found in the survey areas cannot support them, because these species depend on closed forest environments, which do not occur in the survey areas, Also, the biogeographic range of some of these forest-dependent species does not extend to the sector of the country where the proposed site is located.
2. Applying the criteria used to identify Important Bird Areas (IBA) (Okoni-Williams et al., 2005), the project zone does not qualify as priorities for conservation based on its bird diversity. The IBA designation is accorded to sites that hold a reasonable number of species and/or individuals that satisfy agreed criteria that can be easily applied. These include but are not limited to the following: (a) the presence of species with global conservation concern; (b) species restricted to the Upper Guinea Forest; and (c) the regular support of 20,000 or more birds belonging to the migratory assemblage that visit the country. However, none of the proposed sites has the required criteria for IBA designation and so are not sites of significant conservation interest.
3. Generally, the biodiversity of the studied sites is low and does not include any fauna species of global conservation interest listed, so there is no critical justification for protecting the sites for the conservation of fauna over the development interest surrounding the supply of electricity to the prospective beneficiary communities. The same applies to the flora in Lungi study sites.
4. Despite the rather low diversity, there is a need to preserve areas of forest regrowth around the proposed solar site, if necessary, that would be necessary to ensure some level of biodiversity and cater for the ecological needs of some of the less adaptable species.

Generally, Lungi PV Solar Plant Subcomponent of RESPITE Project is feasible, indeed attractive, from the technical, economic and environmental and social viewpoints. The identified adverse environmental and social, health and safety impacts are all such that they are capable of control within acceptable limits, provided that the recommended mitigation measures are adopted.

Construction phase impacts will be mitigated by specific environmental and social protection clauses to be included in the construction contract documents and enforcing compliance with them during construction supervision. Monitoring of the contractor's works will be carried out by the supervising consultant, who will ensure that good civil/environmental engineering practices are followed.

Such a worthwhile scheme, which will bring net benefits to the Sierra Leone in general and the Lungi communities in particular should be implemented at the earliest possible date.

#### 9.2. Recommendations

Lungi PV Solar Plant is technically feasible and economically attractive. If the mitigation measures recommended in this ESIA report are adopted and a Resettlement Plan (RP) is prepared and implemented, there are no environmental and social grounds for not proceeding with implementation of the project in the form in which it is presently envisaged.

However, it is recommended for EDSA, implementing partners and contractor of the project to implement the following:

1. All appropriate environmental and social management measures detailed in this report and associated ESMP shall be implemented throughout the project's entire life.
2. A Resettlement Plan (RP) and /or Livelihood Restoration Plan (LRP) is required for the proposed project due to the following reasons:

* + ***Property ownership and title deed for the land allocated for solar PV, BESS Facilities site (***44.7583 Acres of land located in Lungi Port Loko District in the Northern Province) is presently transferred from the Koroma family, with the consent from the Paramount Chief of the Kaffu Bullom Chiefdom to Ministry of Energy (MoE) through Ministry of Lands, Housing and Country Planning in a willing-buyer willing-seller arrangement at a price voluntarily agreed to by both parties. All the necessary legal procedures and proper documentations are concluded, including evidence of compensation payment and conveyance letter dated 4th July 2023. No institutional/privately owned property is located within the designated and fenced boundary of the site. Thus, no socio-economic measure is required on return. Therefore, as per the requirements of ESS5, no RP is required for the stated plot of land.
  + A ***Resettlement Plan (RP)*** and/ or ***Livelihood Restoration Plan (LRP)*** is required for the transmission line construction within the RoW, including the inland swamp area used for farming. Assessment of the proposed transmission route indicates varying degrees of potential disturbance to about 40 economic trees and 5 business stalls in different locations along the route, with some areas showing minimal impact requiring RP to fully assess and provide mitigation measures to minimize disruption. There is a need for a comprehensive tree inventory to be completed in the course of RP development at the RESPITE Project implementation sites. The inventory should record all trees on the project site (economic or natural). The ToR developed for RP preparation has embedded tree inventory within its scope. The ESMP for contractor should also ensure that project design leads to minimal trees being cut for the project and also there is compensatory planting of the trees that are cut. Overall, the assessment for the 10km route does not indicate significant issues that will warrant the route to be alternated. There are no high-value structures deemed to be demolished.
  + Therefore, EDSA who is the implementing authority of the project shall prepare a RP/LRP prior to the commencement of project activities, especially for the transmission line construction works, as per the requirements of GoSL’s land expropriation laws and WB’s ESS 5 - Land Acquisition, Involuntary Resettlement and Restrictions on Land Use.

#### III. *Implementation of CDAP*

* **Providing access to electricity**: as already discussed in the previous sections of this ESIA, it is the priority request of the communities in Lungi study area. Therefore, EDSA is committed to electrify the Gbaneh Bana communities in the project site. As per Sierra Leone Electricity Act of 2011, Article 36 (2) (a) The Authority (EDSA) shall not extend supply to premises; (b) more than 200 metres from the nearest supply point. Thus, EDSA can only be able to provide the necessary accessories (provision of transformers, poles, conductors, etc.) and makes ready for the last mile connection. With the appropriate arrangement and technical support from EDSA, the communities will take the responsibility to electrify their houses or institutions accordingly. Based on the information gained from experts of EDSA, the estimated cost for the last mile connection, including the meter or instrument for recording the quantity of electricity supplied or consumed, for a single-phase transformer, is about $ 100.00 (equivalent to 2,300.00 New Leones). A budget of $112,294.56 is earmarked for the stated community development plan (subject to modification).
* **Rehabilitation of the existing access road: t**here is a dirt road stretching over 1 kilometer from the Gbaneh Bana junction that leads to the proposed PV and BESS site (covering about 1 km) will be rehabilitated as part of this project Community Development Plan (CDAP). The rehabilitation works will include ***improvements of the road surface quality, safety, and overall functionality.*** During the recent consultations, EDSA has clearly communicated to the communities and relevant stakeholders on the exact scope of works to be performed on the existing access road rehabilitation program. The GoSL in collaboration with relevant authorities, such as the Sierra Leone Roads Authority (SLRA), Sierra Leone Road Safety Authority (SLRSA), and EDSA will be involved in the successful execution of this road rehabilitation. These authorities possess the necessary expertise and jurisdiction to manage road infrastructure and road safety in Sierra Leone. A budget of $10,271.62 is earmarked for the stated community development plan (subject to modification during detailed technical planning of the road).
* **Support to Health Service in Lungi:** common to nationwide context, the health facilities in the project area lack adequate resources to serve their populations, with insufficient equipment and basic medical supplies. In Gbaneh Bana CHC, equipment, supplies and basic medical facilities are insufficient to meet the demand. The project plans to support the CHC with basic medical equipment, basic emergency medical supplies as part of the CDAP component with the aim for meeting emergency demands by community members and workers of the project. A budget of $20,000.00 will be allocated by the project as part of the SEA/SH Action Plan. There is also lack of essential items and resources that aid in the immediate response and support for survivors of SEA/SH and gender-based violence. Thus, the project will supply a comprehensive GBV response kit to Gbaneh Bana CHC to address immediate needs. The kit will be accompanied by awareness campaigns and training, with regular assessments to ensure responsiveness to evolving needs. These interventions will be provided by the project before the contractor mobilizes thereby guaranteeing adequate facilities both for the community and workers of the project (the budget for GBV related part of the CDAP is included in the SEA/SH Prevention and Response Action Plan, under preparation by the project-EDSA).

1. **Maintain Regular Stakeholders Engagement**: Maintaining ongoing and transparent discussions and consultations both with members of affected communities and their administrations, importantly with women/ vulnerable and disadvantaged groups is in the best interest of the project. Such platforms could and should be used to disclose information about the project, to create shared understanding and trust between parties involved in the process, consistent with the SEP developed for the project.
2. ***Project designs, specifications, and contract documents***: It is recommended to ensure project designs and specifications incorporate appropriate measures to minimize negative impacts and to enhance beneficial impacts. It is also recommended to ensure that the appropriate environmental protection and social wellbeing clauses are incorporated in the contract documents to allow control of actions by the contractor, which are potentially harmful to the environment, the community and construction workers, if not convened appropriately.

**REFERENCES**

* + Batinge, B., Musango, J. K., & Brent, A. C. (2019). Perpetuating energy poverty: Assessing roadmaps for universal energy access in unmet African electricity markets. Energy Research & Social Science, 55, 1-13.
  + Borrow, N. & R. Demey, 2014. Birds of Western Africa. 2nd edition. Christopher Helm, London. 592 pp
  + Birchall, C.J., Bleeker, P. & Cusani-Visconti, C. (1979). Land in Sierra Leone: A Reconnaissance Survey and Evaluation for Agriculture. Technical Report No. 1 AG: DP/SIL/73/002. UNDP/FAO 1979.
  + Brass, J. N., Harris, K. A., & MacLean, L. M. (2021). Does electricity demobilize citizens? Exploring access to the grid, political participation and democracy in Africa. Energy Research & Social Science, 81, 102256.
  + Byaro, M., & Mmbaga, N. F. (2022). What's new in the drivers of electricity access in sub-Saharan Africa. Scientific African, 18, e01414.
  + Christianity, L. Chapter 11 - Shifting cultivation and Tropical soils: Patterns, problems and possible improvements. In: Marten, G.D. (ed) (1986). Traditional Agriculture in Southeast Asia: A human ecological perspective. Westview Press, Boulder, Colorado.
  + Cole, N.H.A. (1968). The Vegetation of Sierra Leone. Njala University College Press, Sierra Leone.
  + Dalla Longa, F., & van der Zwaan, B. (2021). Heart of light: an assessment of enhanced electricity access in Africa. Renewable and Sustainable Energy Reviews, 136, 110399.
  + Gleave, M. B. (1996). The Length of the Fallow Period in Tropical Fallow Farming Systems: A Discussion with Evidence from Sierra Leone. The Geographical Journal Vol. 162, No. 1 pp. 14-24
  + GOPA International Energy Consultants October 2022 - Design Report for Newton and Lungi
  + GOSL, 2020. Sixth National Report to the Convention on Biological Diversity. Environmental Protection Agency, Sierra Leone. Commissioned by the United Nation Environment Program.
  + IUCN Red List (2022). Red List of Threatened Species 2022. IUCN Gland, Switzerland.
  + Kingdon, J. (1997). The Kingdon field guide to African mammals. Academic Press, San Diego.
  + Klop, E., Lindsell, J. and Siaka, A. (2008). The Biodiversity of Gola Forest, Sierra Leone. Royal Society for the Protection of Birds, Conservation society of Sierra Leone and Government of Sierra Leone.
  + Mensah, J. K. (2022). Electricity and informal settlements: Towards achieving SDG 7 in developing countries. Energy Research & Social Science, 93, 102844.
  + Nguea, S. M., Kaguendo, U. V. E., & Noumba, I. (2022). Are growth effects of foreign capital significant for increasing access to electricity in Africa? Energy Policy, 168, 113129.
  + Okoni-Williams, A.D., Thompson, H.S., Koroma, A.P and Wood, P. (2005). Important Bird Areas in Sierra Leone: Priorities for Biodiversity Conservation. Conservation Society and Government Forestry Divison, MAFFS.
  + Okoni-Williams, A.D. (2021). Analysis of the Spatio-temporal Dynamics of Soil Carbon and Nitrogen in a Tropical Bush-fallow Chronosequence. International Journal Science and Research Vol 10, Issue 8 pp 668-676. (Accepted July 2021. Published August 2021).
  + Pailman, W., & de Groot, J. (2022). Rethinking education for SDG 7: A framework for embedding gender and critical skills in energy access masters’ programmes in Africa. Energy Research & Social Science, 90, 102615.
  + Renner-Thomas, A. (2010). Land tenure in Sierra Leone: The law, dualism and the making of a land policy. Author House.
  + Statistics Sierra Leone. (2015). Sierra Leone Population and Housing Census Report, Freetown, Sierra Leone.
  + Statistics Sierra Leone (2018)- Sierra Leone Integrated Household Survey (SLIHS) Report, Freetown, Sierra Leone.
  + Statistics Sierra Leone (2019)- Sierra Leone Demographic and Health Survey Report, Report, Freetown, Sierra Leone.
  + Taylor, E.T. and Nakai, S.(2012). Prevalence of acute respiratory infections in women and children in Western Sierra Leone due to smoke from wood and charcoal stoves. International journal of environmental research and public health, 9(6), pp.2252-2265.
  + Turay, H. (2006). Land tenure and the legal aspects of land use in Sierra Leone: a background status report. prepared for the FAO, July, Freetown.
  + Weeks, S. B., & Bah, S. (2017). Sierra Leone 2015 Population and Housing Census: Thematic Report on Population Structure and Population Distribution (p. 43). Freetown, Sierra Leone: Statistics Sierra Leone.
  + Williams. (2006). *Land and Pro-Poor Change in Sierra Leone*
  + Zagury, G. J., Samson, R., & Deschênes, L. (2003). Occurrence of metals in soil and ground water near chromated copper arsenate–treated utility poles. *Journal of environmental quality*, *32*(2), 507-

514.

**ANNEXES**

### Annex I ToR for the Preparation of ESIA and ESMP



**GOVERNMENT OF SIERRA LEONE**



**ELECTRICITY DISTRIBUTION AND SUPPLY AUTHORITY**

**Ministry of Energy**

**REGIONAL EMERGENCY SOLAR POWER INTERVENTION (RESPITE) PROJECT**

**Terms of Reference**

**for the Preparation of Environmental and Social Impact Assessment (ESIA) and**

**Environmental and Social Management Plan (ESMP) for a Solar PV Facility in**

**Lungi, Port Loko District, Northern Sierra Leone**

1. **Background**

The Energy Distribution and Supply Authority (EDSA) is seeking the services of a consultancy firm (or team of consultants) to prepare an Environmental and Social Impact Assessment (ESIA) and an Environmental and Social Management Plan (ESMP) for the planned solar PV facility in Lungi in Port Loko District, Northern Region of Sierra Leone under the Regional Emergency Solar Power Intervention (RESPITE) project. The RESPITE Project is an emergency response by the Government of Sierra Leone (GoSL) to the impact of the Ukraine war and the rising oil prices, which are not only felt in government budgets but is also being felt in increased power outages. The war and resulting oil price rise is leading to massive fiscal impact for the country which largely depends on thermal-based generation.The war and its resulting oil price rise is leading to important fiscal impacts for the region given its continued dependence on oil-based generation. This proposed stand-alone regional IPF will finance the procurement and installation of approximately 106 MW (132 MWp) of solar PV and additional battery storage capacity across four countries in West Africa (Liberia, Sierra Leone, Chad and Togo), and 41 MW of hydro capacity in Liberia. It is expected that the proposed project will (i) reduce the impact of the high oil prices in those countries, and hence provide fiscal space for those countries to address the food crisis resulting from geopolitical developments in Ukraine; (ii) increase the supply of affordable and clean energy on the grid to alleviate current power supply crisis; and (iii) help countries to move away from expensive and polluting HFO and diesel generation, thereby reducing GHG emissions. Therefore, the Government of Sierra Leone with financing from World Bank (WB) will implement the RESPITE Project. The proposed project is aligned with the government sector strategy and builds on WB’s sustained engagement in the country’s energy sector.

The project development objective is to rapidly increase grid-connected renewable energy capacity and strengthen regional integration in the participating countries. The proposed activities, when completed, will enhance the generation capacity and capacity of the distribution network to take and distribute additional electricity from a 10MW solar PV generation plant at Lungi to load centers in Port Loko, Papel, Lungi airport, Lungi Lol.

The project in Sierra Leone aims to deliver two plants: expand the existing PV plant at Newton from 5 MWac to 35 MWac and a second PV plant in Lungi of 10 MWac. The grid connection of the Newtown site will be made through three configurations: 11 kV (Waterloo), 33 kV (line towards Jui) and to the existing 161 kV line. For the Lungi power plant, the connection will be through the 11 kV busbar of Lungi substation, 3.6 km away from the Lungi PV plant. A BESS of 15 MVa/15MWh and 6MVa/6MWh is being proposed for the new plants in Newton and Lungi respectively. Additionally, 7MVa/7MWh BESS will be added to the existing solar plant at Newton. The feasibility study has shown that both PV plants are technically sound including geotechnical and topographic surveys. The Newton PV plant is located in a site with a GHI of 1,799 kWh/m2 /year and the Lungi PV plant with 1865 kWh/m2 /year (source: SolarGIS). The estimated yield at P50 was 1468 kWh/kWp with a proposed capacity of 30MWac/39MWp and of 1525 kWh/kWp with a proposed capacity of 10MWac/13MWp.

1. **Project Description**

Component 1: Construction of Solar PV, BESS and Grid Connections (US$184 million equivalent IDA) will finance all costs associated with the Design, Supply and Installation (DSI) and O&M for the first three years of the solar PV power plants and any associated works for grid connection. The support to Sierra Leone is listed under Sub-components 1B and 3A of the project, as shown below:

• *Sub-Component 1B: Solar PV and Battery storage at two locations in Sierra Leone (US$63.5 million IDA equivalent)* will finance all costs associated with (i) the expansion of an existing 5MWac/ 6MWp power plant at Newton to 35 MWac with associated substation, adding storage to it and undertaking works for power evacuation, and O&M for three years, and (ii) the addition of about 10 MWac ground mounted solar PV with battery storage, undertaking works for power evacuation, and O&M for one to three years at Lungi and Newton. Feasibility studies have been completed for both sites. Support for O&M will include training and capacity building at the utility to ensure that the utility staff have the technical know-how to operate and maintain the power plant.

1. *Development of 39 MWp (30 MWac) with 15MWh Battery storage and addition of 7MWh battery storage to the existing 6MWp/4.9MWac at Newton (US$44 million):* A 6MWp solar power plant has been developed in the Newton area through a grant to GOSL from Abu Dhabi Fund for Development (ADFD). This component will finance the DSI and O&M for additional storage capacity for the existing plant and adding 39MWp (30MWac) of ground mounted solar PV. The proposed site is located at 8.322621°, -12.993666 with the government already having acquired 120 acres of land. The site will be linked to the proposed Waterloo substation through a 33kV line and further to the 161kV Bumbuna transmission line to Newton.

1. C*onstruction of 13 MWp (10 MWac) solar PV plant in Lungi Airport Area with 6MWh storage (US$19.5 million):* A 13 MWp (10 MWac) solar PV site is planned in the Lungi area that houses the Lungi International airport. The government has identified land (8.663171, 13.187704) for this purpose. The proposal is for a 13MWp (10MWac) fix tilt PV power plant to be connected to the existing MV switching station at Lungi through 11kV lines. The subcomponent will finance the DSI and O&M for the power plant and 5 MWh storage system as well as the construction of 11kV, 3.6 km long distribution line to the existing 11kV substation.

*Sub-Component 3A: Supply and installation of voltage regulation equipment at 161/11kV Substation of*

*Freetown to increase the evacuation capacity of the 161kV transmission line and Supply and installation of 33 kV and 11 kV distribution lines to optimize the integration of the Newton Solar Park (US$6 million)* This sub-component will finance the works associated with increasing the wheeling capacity of the existing 161 kV transmission line from 70 MW to 90 MW. The 161 kV line is around 205 km long which results in a high impedance that induces voltage drop along this line, especially during peak demand operations; this significantly impacts both the power transfer and voltage profiles in Freetown. The planned solar PV plant at Newton will evacuate part of its generation to the 161 kV transmission line and also use 33 kV sub-transmission line that is being built under WB financed Electricity Sector Utility Reform Project (P120304). This sub-component will cover the cost of design, procurement, and installation of devices for reactive power compensation (capacitor banks) and/or shunt reactors for voltage regulation support, and the 33kV and 11kV distribution lines needed to optimize the use of the solar plant. Increasing the 161kV line capacity will alleviate grid congestion and help in meeting the rapidly growing demand in Western Areas. This TOR relates to Sub-Component 1B (ii) on the Construction of 13 MWp (10 MWac) solar PV plant in Lungi Airport Area with 6MWh storage.

1. **Description of the project location**

Lungi is a [coastal](https://en.wikipedia.org/wiki/Coastal) town in [Port Loko District](https://en.wikipedia.org/wiki/Port_Loko_District) in the [Northern Province](https://en.wikipedia.org/wiki/Northern_Province,_Sierra_Leone) of [Sierra Leone.](https://en.wikipedia.org/wiki/Sierra_Leone) The town lies approximately 40 miles (64 km) north of the district [capital](https://en.wikipedia.org/wiki/Capital_city) [Port Loko](https://en.wikipedia.org/wiki/Port_Loko) and had a population of 4,185 in the 2004 census.[1]](https://en.wikipedia.org/wiki/Lungi,_Sierra_Leone#cite_note-1) It is best known for the [International Airport](https://en.wikipedia.org/wiki/Lungi_International_Airport) and host to a number of hotels and restaurants. The Sierra Leone River Estuary separates Lungi from the [capital](https://en.wikipedia.org/wiki/Capital_city) [Freetown.](https://en.wikipedia.org/wiki/Freetown) There are frequent commercial  [buses](https://en.wikipedia.org/wiki/Buses) and [ferry-](https://en.wikipedia.org/wiki/Ferry)service to Freetown and other parts of Sierra Leone from Lungi.

The Lungi site is located at Oku Town, Port-Loko District/North-West. It covers about 45 acres of agriculture land with little farming activity as well as small scale charcoal production. The site is covered with mostly mosaic vegetation and palm trees and is relatively flat. An aerial photograph of the proposed site is given below. The site is accessible via a small dirt road, used frequently by nearby communities, including school going children and people accessing the nearby health clinic.



Figure 1 – Map of Lungi Project Site, Sierra Leone

1. **The E&S Guiding Policy: The Environmental and Social Framework**

The Project will be guided by the World Bank's Environmental and Social Framework (ESF), which became operational on October 2018, and which sets out requirements for borrowers to identify and assess the environmental and social risks and impacts associated with projects supported by the World Bank.  By focusing on identifying and managing environmental and social risks, the framework aims to help borrowers reduce poverty and increase prosperity in a sustainable way for the benefit of the environment and people.

The standards will: (a) Help borrowers implement international best practices for environmental and social sustainability; (b) Assist borrowers in meeting their national and international environmental and social obligations; c) Strengthen non-discrimination, transparency, participation, accountability, governance and inclusion; and (d) Improve project sustainability outcomes through continued stakeholder engagement.

ESF provides methods and tools for the Borrower to carry out the environment and social assessment (ESA) of programs and projects. Project activities outlined in the introduction above will likely have environmental and social risks and impacts, and as required under the ESF, the preparation of E&S instruments will need to be prepared by the Borrower to guide the management of these risks and impacts and therefore, improve social and environmental sustainability, and inclusive development. The preparation of the ESIA for the Solar PV site at Lungi TOR is to align with the ESF and in specific the following eight Environmental and Social standards (ESSs):

* + **ESS 1:** Assessment and Management of Environmental and Social Risks and Impacts
  + **ESS2:** Labor and Working Conditions
  + **ESS3:** Resource Efficiency and Pollution Prevention and Management
  + **ESS4:** Community Health and Safety
  + **ESS5:** Land Acquisition, Restrictions on Land Use and Involuntary Resettlement
  + **ESS6:** Biodiversity Conservation and Sustainable Management of Living Natural Resources
  + **ESS8**: Cultural Heritage
  + **ESS10:** Stakeholder Engagement and Information Disclosure

Annex 3 contains relevant guidance and support materials to be used by the consultant(s).

In addition, the ESIA/ESMP will be guided by relevant national regulations and international conventions and protocols ratified or recognized by GoSL, which must be reviewed during the study.

1. **Objectives of the assignment**
2. .1 Overall objective

The overall objective of the assignment is to identify, evaluate and manage social and environmental impacts that may arise due to implementation and operation of the proposed project and to develop an Environmental and Social Impact Assessment (ESIA) and an Environmental and Social Management Plan (ESMP) for the Lungi site in line with the World Bank ESF and the World Bank EHS General Guidelines and Energy/Electricity-specific guidelines.

The EDSA and MOE have undertaken an initial Environmental and Social screening of the sites and established the need for a follow up ESIA and corresponding ESMPs based on the nature and scale of the activity and its potential environmental and social risks and impacts. Eight of the ten Environmental and Social Standards (ESS) of the World Bank ESF are considered relevant to the project. These are: ESS1 (Assessment and Management of Environmental and Social Risks and Impacts), ESS2 (Labor and Working Conditions), ESS3 (Resource Efficiency and Pollution Prevention and Management), ESS4 (Community Health and Safety), ESS5 (Land Acquisition, Restrictions on Land Use and Involuntary Resettlement), ESS6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources), ESS8 (Cultural Heritage), and ESS10 (Stakeholder Engagement and Information Disclosure). In addition, the risk rating for project induced SEA/SH risk in Sierra Leone was deemed to be Moderate as per the Bank assessment. As part of the social assessment to be included in the ESIA, appropriate mitigation measures relative to the risks will be described. The overall environmental and social risk rating is classified as **High** for the entire project, but **Substantial** for environmental and social risk for the Sierra Leone sub project.

As the intervention at Lungi is a greenfield project, a separate ESIA will be prepared. In doing so, the project will utilize the World Bank Group’s general and energy and electricity sector specific Environment, Health, and Safety Guidelines (EHSGs).

4.2 Specific Tasks

The Consultant shall prepare an Environmental and Social Impact Assessment (ESIA) and corresponding Environmental and Social Management Plan (ESMP) including a Resettlement Plan consistent with the relevant ESSs for infrastructure/works at the Lungi site, which shall include the solar plant, Battery Energy Storage System (BESS), and the construction of 11kV connection to the existing 11kV substation.

* + Prepare an ESIA for the planned intervention at Lungi along with an ESMP for the operation to ensure the socio-environmental sustainability of its different components. The ESIA / ESMP will set out the institutional, regulatory, and monitoring plan and implementation schedule and financial costs for the implementation of risk mitigation measures. The impact assessment will determine all the required management plans to be included in the ESMP but will need to include at least the OHS and community safety plan.
  + Prepare a SEA/SH Prevention and Response Action Plan
  + Develop a consultation/stakeholder engagement plan, including an analysis of interested and affected parties, detailing documentation requirements, and dissemination of information about the project. Support the implementing partners in carrying out meaningful consultation.

* + Description of the biophysical conditions of the project environment, such as baseline information of the project area with regards to climate, geology, hydrology and water quality, ambient noise, air quality, wind velocity and direction, soil suitability, roads, biological environment (fauna and flora) and impact on ecological corridors, vegetation (economic trees, cultural/medicinal trees).

Project description (project facility, equipment, solar panels, battery installation, inverters, charge controllers etc.)

Description of social context including but not limited to: disaggregated data on population of the project area; nearby schools and access roads used by children to go to these schools; literacy rates; languages spoken, poverty/socio-economic levels (gender disaggregated and age disaggregated); community decision making structures, access to electricity (gender disaggregated); access to information technology (mobile phones, computers, radios); access to internet; religious and ethnic groups in the project area; presence of conflicts (and around what topics if applicable); land tenure system; access to land for women; livelihoods (gender disaggregated), age breakdown; presence of persons with disabilities (including children, women), elderly, children, etc. in the project area; access to waste disposal, sanitation, water supply; access to health care and access roads used to access the nearby health clinic; general health data (including presence of communicable diseases); education attainment rates (gender disaggregated); gender equality and gender based violence; presence of cultural sites including sacred sites, burial locations, areas of cultural or spiritual significance near the project area; location of markets and places of worship; key methods the local population obtains information (gender disaggregated); among others. Note: some of this data can be gathered using primary sources such as informant interviews (social worker, local health workers, local school administrators/teachers, community consultations. Not all data must be gathered using secondary sources such as census since data can be very dated.

* + Description of the site including existing facilities.

* + Assessment of the socio-economic status of those directly and indirectly affected by the RESPITE activities

* + Review of relevant national legislations, policies and World Bank Environment Health and Safety Guidelines, WB ESF, international conventions and protocols for such projects. Conduct stakeholder consultation and summarize the views and concerns of the affected public and other stakeholders to inform project design and mitigation responses (reflect in a table in the ESIA, noting location, date and stakeholder group name). Include a column on the responses given by the project team. The summary must not include identifiable information of person speaking unless they are a public official or community leader. Pictures can be included in an annex, except for consultations with women. Women/girls only consultations must be facilitated by a women facilitator experienced in leading sensitive discussions such as those involving topics related to GBV.

* + Identification and description of environmental risks and impacts of project activities.

* + Identification and description of occupational health and safety risks/impacts and mitigation measures

* + Identification and description of Community Health and Safety risks, Waste Management both during construction and operation, with specific reference to handling and disposal of battery and electronic wastes, labor influx and employee working conditions GBV risks, impact on vulnerable groups and gender inequality associated with project interventions and Cumulative impacts from existing facilities adjacent to the project infrastructure at Newton.

* + Description of current neighborhood land use pattern that could be affected by RESPITE activities

* + Description of project alternatives

* + Describe labor management for construction activities and mitigation measures to ensure health and safety of worker community members.

* + Propose mitigation measures for the negative impacts

* + Determine adequate mitigation and monitoring measures for the RESPITE

* + Assessment of E&S risks and impacts of the project

* + Ensure that ESIA findings are incorporated into the project design and vice versa.

* + Conduct disclosure and consultation of PAPs on the scope of the ESIA study, and insight on the full assessment, mitigation and management of E&S risks and impacts is proportionate to the nature and severity of the risk/impact and this should factor into the assessment process.

* + Prepare an ESMP for the implementation of the proposed mitigation measures.

* + Define the institutional responsibilities and implementation arrangements for the implementation of the ESMP
  + Prepare monitoring plan including a specific description of monitoring measures (affiliated with the mitigation measures proposed in the mitigation plan) with the parameters to be measured, methods to be used, sampling locations, frequency of measurements, specific description of institutional arrangements, and the reporting procedures
  + Prepare implementation schedule for mitigation and monitoring measures proposed in the above plans and cost estimates and sources of funds for implementing the ESMP.
  + Prepare budget for implementation of the ESMP (in consultation with the PIU)

Note: corresponding technical and engineering studies will be conducted in parallel with ESIA, which in turn will be informed by preliminary design studies. The consultant must therefore coordinate their work with that of the design engineers. The draft and final report will be revised in consideration of the comments of the client and World Bank. The Consultant will assist the Client in carrying-out the public consultations and disclosure process.

**7. Scope of Work**

As part of this assignment, the consultant will:

1. Review the initial assessment/screening conducted by the PIU to identify and characterize project impacts;
2. Description of the project characteristics, for example, scale, activities, main processes, technology, size, capacity, and plan showing the boundary/footprint of the project including the site access road and transmission line to the national grid etc.
3. Describe project activities, assess alternatives and make necessary recommendations to the project team and design engineers on design modifications that could minimize E&S risks
4. Initiate consultations with PAPs, Consultant undertaking the ESIA/ ESMP, and other relevant stakeholders based on results of the initial assessment/screening
5. Conduct literature review and field investigation of the baseline environmental and social conditions and E&S risks
6. Prepare an environmental and social impact assessment
7. Assist EDSA to complete the relevant forms as per the requirements of SL EPA for the purpose of registration and permitting of the project
8. Propose mitigation measures for the negative risks and impacts and
9. Propose an Environmental and Social Management Plan (ESMP) which is materially consistent with the WB ESF policy, which recognizes EPA-SL Acts, guidelines and Procedures. The ESMP should be adaptable and would be incorporated into the bidding documents for the works contract to guide bidders to prepare the preliminary contractor’s ESMP with clear responsibilities for the implementation of identified aspects.

**8. Key Tasks**

At the minimum, the ESIA shall include a detailed identification and description of the following:

1. *Project Background:* An overview and detailed description of the project components and directly and indirectly affected areas and the rationale for the ESIA.
2. *Objectives of the ESIA:* Describe the main objectives of the ESIA with key environmental, social, economic and health conditions in areas potentially affected by the Project and highlight those that may be vulnerable to construction and operational aspects of the project;

*Methodology used in preparing the ESIA report:* Clearly explain the methodology used in the ESIA/ESMP.

1. *Description of the project, its Social and Biophysical environment and potential Impacts:* 
   1. Project Description and activities that may extend environmental, social and Health risks and impacts. In addition to the information on the Solar PV farms, the transformers and the 11 kV distribution line, the project description should also include detailed information on the Battery Energy Storage System (BESS) which will require cooling and fire protection. (This will include scale, activities, main processes, technology, size, capacity, and plan showing the boundary/footprint of the project including the site access road and transmission line to the national grid etc.)
   2. Description of Existing Environmental and Social Conditions; The Consultant will review, collect, evaluate and present baseline data on the relevant environmental, social, economic and physical cultural heritage characteristics within the project area taking into account the present land use and activities (This should include a review of available literature and studies on energy and electricity, the government’s policy, masterplan/plan, strategy etc.). Specifically, the environmental and social baseline conditions should include information on:
   3. Physical environment: geology/geomorphology, topography, sediments/soils, surface and ground water hydrology, land pollution, water quality, air quality and sources of air emissions, noise emissions, integration of water resource in the overall environment (e.g., water supply, sanitation, drainage, etc.), solid waste and sewage management and disposal.
   4. Meteorology: wind patterns, sunshine hours, monthly average temperatures, rainfall and runoff characteristics; extreme storm and precipitation events, climate and flood risk
   5. Biological environment: existing terrestrial and river flora and fauna including avifauna at the site; rare, threatened and endangered species; sensitive habitats, including wetlands/ swamps, parks or reserves in areas likely to be affected by the proposed works; species of commercial importance, ecosystems services, landscape and visual/aesthetics, etc.
   6. Social, economic impacts: Describe community structure (leadership and governance); inventory of community activities and production systems (e.g., access to energy and electricity, energy sourcing options (grid, off-grid, solar energy, hydro, transmission and distribution within or to the project environment, industry, farming, small businesses); traffic and transport, education, health, safety and security; level of income, public infrastructure and social services (goods and services); and a description of any direct, indirect and induced impacts on livelihoods; GBV (SEA-SH) baseline, labor and employment (including ILO’s position), Grievance Redress Mechanism etc.)
   7. Information on disadvantaged groups or persons for whom special provisions may have to be made, if affected, and in the context of developing mitigation measures
   8. Assess whether there will be any displacements as a result of the physical works
   9. Physical cultural property: Cultural heritage assets such as cultural, religious, historical or archaeological sites, including sacred sites, graveyards and burial places that might be affected during construction.
   10. Other data as may be required by the existing environmental protection laws, regulations and standards set by SL EPA
2. *Legal Framework:* Describe the policy,legal and institutional framework in Sierra Leone governing environmental and social impact issues. This section will include regulatory framework, national and international guidelines including World Bank ESF and the ESSs, as well as the WB EHS guidelines (including the sector specific health and safety guidelines relevant to the project), international conventions and regulations relating to the assessment

1. *Description of project alternatives*: Assess the alternatives to the project (technical, financial, economic, socio-cultural and low carbon aspects) and the project site and give a justification on the use of the proposed project site. The alternatives should include choice of sites, technology, equipment, routing, timing etc.

1. *Potential impacts and Benefits enhancement and mitigation measures*: This should describe the beneficial/positive and adverse impacts, identify room for improvement and where necessary identify appropriate mitigation measures to minimize and counter the adverse impacts, impacts on communities/PAPs and cumulative impact.

Environmental Impacts include:

* 1. Noise and vibration: Assess noise impacts at the nearest sensitive receptors, applying modeling based on projected emissions from expected sources, if needed. Identify areas where noise mitigation measures may be required to meet regulatory standards; identify the locations and design for noise mitigation measures and indicate the noise and vibration reduction levels against the standards applicable for the project (as per WB EHS

Guidelines and the national regulations)

* 1. Impact on natural Habitats: determine the location of natural habitats in the project area of influence, and assess the natural habitats in terms of their ecological and biological value; determine whether any of those natural habitats can be classified as critical as per the definition of the World Bank ESS 6 and IUCN. Identify impact of site clearance on local flora and fauna and propose mitigation measures to be implemented, including any compensatory measures and those of seasonal character, and articulate arrangements which contractor should have in place to ensure proper implementation of the mitigation plan.
  2. Impact on water resources: identify any impacts on the water resources in the project area and propose adequate mitigation measures and monitoring mechanisms. The ESIA should in particular, pay attention to the potential impacts on surface and ground water supply and quality for local/community use and ecosystem services, from use of water during construction and for regular cleaning of solar panels, at the operational stage. At the construction stage, potential for runoff and erosion of sediments into community water supply for domestic and agricultural use from exposed surfaces resulting from site clearance should be noted. This is particularly relevant to work done in the Rainy Season.
  3. Air pollution: identify impact on nearby residential areas, schools, health centers, communities and ecosystems (if any). This would include: (a) impact on neighborhoods along project routes and remote communities from increased traffic (primarily noise, dust, litter, odor, and vibrations), and (b) cumulative impacts due to other equipment and vehicles entering sites or plying routes adjacent to the sites.
  4. Impact on soil: Identify any impacts on soil, including those caused by excavation and erosion of exposed soils, accidental spillage of oils and chemicals; construction of onsite drainage to minimize potential for onsite flooding; assess results of studies undertaken by engineering consultant, and conclude on the feasibility and implications of the proposed works.
  5. Climate change: Identify any impacts and benefits on climate change resulting from the solar power generation installation. Assess the extent of loss of carbon sink that will result from vegetation clearing and site preparation.
  6. Inefficiency resulting from the sourcing of construction materials: ensure that potential suppliers possess all relevant licenses and permits, and that the purchased materials meet technical, safety and environmental requirements to be specified in Technical Specifications as part of the design.
  7. Identify the impacts of Battery Energy Storage System (BESS) which will require cooling and fire protection system, regular maintenance, removal, repair, storage and /or disposal of used batteries, etc.
  8. Construction, excavation, hazardous waste: Identify impacts of construction / maintenance of access roads used to transport solar panels and construction materials and labour and operational personnel to the site.

**Social impacts and risks shall include (see also section 4.2):**

1. Loss of land, assets and livelihoods, change in land use and settlement, social reaction/ tension in relation to land ownership, siting and change in land use, use of access road frequently used by school children and those going to the health center and markets;
2. Labor impacts including assessment of different type of workers and estimated number of labor force, setting up of labor camps or worker accommodation arrangement, risk of labor influx and the nature of potential impact on surrounding communities, assessment of existing labor management practices including child labor and risks that may be specific to female and other vulnerable workers such as persons with disabilities. The Consultant will prepare labor management plan to set out the systematic approach to the management of labor issues during construction;
3. Gender inequity in relation to women’s voices/rights, decision making in the project design, employment and economic benefits from the construction works, adverse impacts from the project on women and men. The Consultant shall develop a mainstreaming strategy that will ensure that the enhancement and protection of women, children and other vulnerable groups need to be identified and considered integral part of facility design.
4. Increase in exposure of young girls and women and children to SEA/SH risks and recommend measures to prevent or mitigate the risks. In undertaking this task, the Consultant shall invite the views of NGOs and local community organizations with physical presence in the selected project areas (e.g. women and child advocates, social workers, health teams) to inform project communities about SEA/SH risks, as a part of the stakeholder consultations; understand groups that are most vulnerable to harm and how they currently deal with SEA/SH incidences; inquire about existing channels of reporting SEA/SH complaints and identify if these channels follow a survivor-centered approach (e.g. respect for survivors’ choices and confidentiality). The Consultant shall develop a SEA/SH Prevention and Response Action Plan as an annex to the ESIA with consideration which include GBV service providers and a clear referral pathway, GBV complaints mechanism, sample SEA/SH Code of Conduct (CoC) for potential contractor and workers, an Accountability Framework that outlines how the PIU/contractor will handle allegations, including those related to investigation (in alignment with national processes) and sanctions for potential perpetrators, awareness raising / training strategy etc.

The potential impacts must relate to the project cycle which includes the following:

* + Design and preconstruction - determination of project site and its size, land acquisition, resettlement of people in the project area, compensation and housing for displaced people, etc.
  + Project construction works - land clearing, earth moving, blasting works (where applicable), HIV/AIDS and communicable diseases preventive planning, access roads, waste disposal and management systems, drainage systems, dust, loss of scenic value of landscape, threat to cultural and historical sites or artefacts.
  + Project operation - generation and removal of waste, emission of pollutants from vehicles, access routes, interaction between migrant workers and local community, accidents, communicable diseases (including STI/STDs, COVID 19 prevalence, and other communicable diseases in the project area), traffic management, etc.
  + Project decommissioning- restoring productive use of the land used for Solar PV and campsite, reconstruction of damaged environment, ensuring occupational and community safety.

1. *Environmental Management and Monitoring Program:* The environmental and social management plan should describe the range of environmental issues associated with the project and outline corresponding management strategies to be adopted to prevent, minimize or mitigate potential adverse environmental effects. Describe environmental management, and monitoring plan. The monitoring plan should assign roles and responsibility for the monitoring and supervision of safeguards implementation, the institutional framework and timelines for monitoring. The role of third-party monitoring, if required, and EPA-SL in monitoring and supervision should be discussed.
2. *Public consultations and disclosure plan:* Consistent with the World Bank’s policy on consultation and disclosure, describe a strategy for consultation with, and participation of PAPs, communities and stakeholders with interests in the proposed project and its potential impacts. This section should also describe the methods used throughout the consultations and disclosure and major findings of the consultations.
3. *Environmental mitigation, management, monitoring and training costs:*

The Consultant shall identify project benefits and significant negative impacts, direct, indirect and cumulative impacts, and immediate and long-term impacts related to the design/preconstruction, construction phase of the proposed works as well as the operational and decommissioning phase, once the works are finalized. For the task, the Consultant will review the environmental and social aspects presented in the background technical documents and will generate an updated environmental and social impacts assessment, specifically related to all infrastructure investments in line with the proposed detailed design.

* 1. Impacts during mobilization/preconstruction phase. May involve the deployment of required equipment and vehicles, transportation of construction materials to the site, site clearance, preparations and site access roads, base camps.
  2. Impacts during construction phase may focus on: impacts caused by clearance / disturbance of the land on the terrestrial and aquatic ecosystem; impacts of possible contamination of surface and groundwater by use of fuels, construction materials, and transport activity; soil contamination; waste management; biodiversity management, traffic management, emergency preparedness, noise and air emissions; workers health and safety etc.
  3. Impacts during the operation phase may include impact of discharges; accidental oil and chemical spills; traffic activity; air emissions; run-off from open storages; transport of goods, sanitation and solid waste management and impacts at the decommissioning phase; impact of solar glare on aircraft operations.
  4. Impacts on public and private structures around the project area; including impacts on the running of daily business, jobs, agricultural and fishing; flow and exchange of goods and services that may cause direct, indirect and induced impacts on the livelihoods of those living around the project area. Should the facility fall within land procured by the government for future development, to the extent possible, anticipate risk on adjacent structures and vice-versa, and make recommendations to manage these risks.
  5. Impacts on physical cultural heritage, religious and burial sites for which mitigation measures need to be developed.

The Consultant shall propose mitigation measures and the associated costs for each of the impacts identified above that will represent the content/summary of an Environmental and Social Mitigation Plan for the overall project during its construction as well as the operation phases. The Mitigation Plan is part of the overall project Environmental and Social Management Plan. Costs for implementing the environmental mitigation measures, management, monitoring and training should be described in detail in this section. Mitigation measures involving technologies should not entail excessive costs.

1. *ESMP implementation responsibilities:* Indicate the responsibilitiesassigned to various agencies. These responsibilities should cover (I) role of the PIU Environmental/OHS, social and GBV specialists/consultants (i) role of the Contractor and delivery of the Contractors’ ESMP; (ii) role of the supervising engineer (iii) coordination between agencies and jurisdictions involved in ESIA implementation; and (iv) capacity building measures that are necessary to strengthen the capacities of project officials to manage overall safeguards issues related to the project including COVID 19 prevention and transmission guidelines in line with WB and WHO guidelines, principles and directives, and the national policies.
2. *Implementation Schedule:* an implementation schedule covering all ESMP activities from preparation, implementation, and monitoring and evaluation indicating the target dates for delivery of activities and showing phasing and coordination with overall project implementation plans. The schedule should indicate how the ESMP relates to the implementation of the overall works.
3. *Costs and budget:* provide detailed (itemized) cost estimates for all ESMP activities. The budget should include the implementation of the proposed ESMP. This section will also include sources of funds, arrangements for timely flow of funds, and fiduciary considerations that are consistent with the Sierra Leone’s financial management and World Bank fiduciary requirements.

In the case that the ESIA assessed that there are resettlement impacts, then the consultant shall determine the scope of the resettlement and prepare a ToR for the preparation of a Resettlement Plan (RP), proportionate to the resettlement impact. This ToR for RP will need to be approved by the PIU and World Bank. The actual preparation of the RP is NOT included in this consultancy. To enable an early start on the RP preparation, the TOR must be prepared as soon as the need for a RP is established and before the ESIA is finalized.

**9. Outline of the ESIA/ESMP**

A tentative outline of an ESIA is included in Annex 1 and a tentative outline of an ESMP is included in Annex 2.

**10. Reporting and Deliverable**

The consultant shall report to the Project Coordinator for ESLEAP/ PIU, but would work with staff of EDSA’s ESMU, on day-to-day basis. The ESMU is led by a Senior Environmental and Social Management specialist who is assisted by an experienced Supervision Engineer and a team of Planning Engineers of EDSA who would provide technical guidance on the Project and the Distribution Network. The PIU will review all reports submitted by the Consultant, and shall share the reports with the Bank Safeguards team for review when they deem them ready for such review and of of acceptable standard. The consultant shall address all comments raised by the PIU and the World Bank.

The Consultant is expected to submit the following deliverables:

1. Inception report describing the procedures (detailed work plan, study timeline, milestones, deliverables), and timetable for completion of the ESIA preparation process.;
2. Report summarizing the preliminary results of the screening and consultation process with PAPs and other stakeholders; and
3. Draft ESIA report (including annexes of SEA/SH action plan and Biodiversity action plan (as needed)) .
4. After completion of the review of the draft ESIA (by PIU and WB), including consultations with PAPs and with communities on the main finding of the ESIA, a final ESIA will be disclosed by the project. During the review process, the Consultant is expected to make the necessary changes to the ESIA and actively participate in the disclosure and the consultation process.
5. If the ESIA determined that a Resettlement Plan is required, then the Consultant shall prepare a ToR for the preparation of a RP, proportionate to the resettlement impact. The actual preparation of the RP is NOT included in this consultancy. To enable an early start on the RP preparation, the TOR must be prepared as soon as the need for a RP is established and before the ESIA is finalized.

**11. TIMETABLE AND DELIVERABLES**

The consultancy is expected to last for Six (6) months to complete. The Consultant is expected to submit to the Project Coordinator the following:

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Deliverables** | **Timeline** | **Percentage of payment** |
| 1 | Inception report describing the procedures (detailed work plan, methodology, study timeline, milestones, deliverables), and timetable for completion of the ESIA preparation process  Approved Inception Report | Two (2) weeks after contract signing); | 40% |
| 2 | 3-page summary of the preliminary results of the screening and consultation process with PAPs and other stakeholders. | Two (2) weeks after contract signing |  |
| 3 | Draft ESIA Reports – Submission of Draft ESIA report.  Review of Draft ESIA (2 weeks) | Eight (8) weeks after contract signing).  Ten (10) weeks after contract signing |  |
| 4 | If the ESIA determined that a  Resettlement Plan is required, then the Consultant shall prepare a ToR for the preparation of a RP, proportionate to the resettlement impact | Eight (8) weeks after contract signing. |  |
| 5 | Final Draft ESIA (including annexes for  SEA/SH Prevention and Response Action | Twelve (12) weeks  after contract signing |  |
|  | Plan and Biodiversity Action Plan (as needed)) |  |  |
| 6 | Reviewing of Final Draft by the client and the World bank (two weeks after receiving comments) – Approved Final  Draft | Fourteen (14) weeks after contract signing | 40% |
| 7 | After completion of the review of the final draft ESIA, including consultations with PAPs and communities on the main finding of the ESIA, the final ESIA will be prepared by the consultant upon satisfactory incorporation of comments by the client and World Bank. . During the review process, the Consultant is expected to make the necessary changes to the ESIA/ESMP and organize the public disclosure and consultation process. | Eighteen (18) weeks after contract signing and after all the comments provided by the client and World Bank have been resolved. | 20% |

### Formats for Delivery and Data Management

* All key deliverables shall be provided in editable digital form to the client. The Final Report shall be provided within 14 weeks after receipt of comments from the Client and the World Bank.
* Final reports, and drafts thereof, shall be submitted in Word format. Copies of the ESIA shall be submitted, a final clean version and one version in track change, showing change and how comments were addressed.
* The consultant will attend regular project meetings with the client to monitor project progress and present and discuss deliverables.
* All reports shall be written in English

1. **Qualification and Experience of the Consultancy firm**

The firm/consultants shall utilize highly qualified experts for the study. The team shall comprise at least the experts listed in the table below. Either the Environmental or Social Specialist must take on the task of being the Team Leader. The Team Leader (TL) must have led or played a major role in at least three assignments for the preparation of ESIA and ESMP for renewable power projects and/or transmission lines. The TL must have proven experience with World Bank Safeguards Policies and requirements with demonstrated experience in preparing acceptable ESIAs in accordance with the World Bank ESF or safeguards policies. Demonstrable experience in preparing ESIA studies in the energy sector in the West African sub region and proficiency in local languages is an added advantage.

In addition to the positions listed below, the Consultant should provide additional resources and expertise as necessary to execute the TOR.

|  |  |  |
| --- | --- | --- |
| **POSITION** |  | **MINIMUM QUALIFICATION REQUIRED** |
| Environmental  Specialist | • | The consultant must have a minimum masters’ degree in natural resources management, environmental studies, management, policy, and environmental engineering or a related discipline. |
|  | • | A minimum of 10 years of post-qualification professional experience in thematic areas related to environmental and social management issues with grounding in environmental assessments. |
|  | • | Proven experience and familiarity in African region |
|  | • | Proven knowledge in sustainable development financing and environmental and social risk management. |
|  | • | Excellent knowledge, skills and experience in preparing Environmental and Social Audits of development projects, designing frameworks and systems associated with Environmental and Social Impact Assessments (ESIAs) and Environmental and Social Management Plans (ESMPs), monitoring, evaluation and compliance assessment pertaining to large civil infrastructure projects, especially hydro power projects. |
|  | • | Working experience of the new World Bank Environmental and Social  Framework (ESF) is required |
|  | • | Excellent knowledge, skills and experience in multi-criteria assessments, stakeholder engagement and consultation, community participation; analytical skills to assess institutional capacity and to design / review practical arrangements for implementing complex projects, particularly in Africa. |
|  | • | Proficiency in the usage of computers and office software packages (word processing, spreadsheet etc.) |
|  | • | Possess excellent technical and analytical skills: |
|  | • | Able to communicate effectively and fluently in oral and written English language |
| Social Specialist | • | A minimum of 10 years of post-qualification professional experience in thematic areas related to social risk management issues with a grounding in social assessments and monitoring. |
|  | • | Minimum of a Master’s degree in Social Sciences. |
|  | • | Proven experience and familiarity in African region |
|  | • | Proven knowledge in sustainable development financing social risk management. |

|  |  |
| --- | --- |
|  | * Excellent knowledge, skills and experience in designing frameworks and systems associated with Environmental and Social Audits, the social aspects of development projects, monitoring, evaluation and compliance assessment. * Working experience of the new World Bank Environmental and Social Framework is required. * Excellent knowledge, skills and experience in multi-criteria assessments, stakeholder engagement and consultation, community participation; analytical skills to assess institutional capacity and to design / review practical arrangements for implementing complex projects, particularly in Africa. * Proficiency in the usage of computers and office software packages (word processing, spreadsheet etc.) * Possess excellent technical and analytical skills: * Able to communicate effectively and fluently in both oral and written English language |
| GBV specialist | * A minimum of 8 years of post-qualification professional experience in thematic areas related to GBV * The GBV specialist must have a degree/experience in psychology, social work, gender studies, GBV studies or related fields. * Be familiar with the World Bank approach to SEA/SH and the Good Practice Note on SEA/SH * The GBV specialist must have experience developing and implementing SEA/SH Action Plans, GBV mapping of services, and relevant GBV experience. * Proven experience and familiarity in African region * Proficiency in the usage of computers and office software packages (word processing, spreadsheet etc.) * Possess excellent technical and analytical skills: * Able to communicate effectively and fluently in both oral and written English language |
| Occupational health and safety specialist | * A minimum of 8 years of post-qualification professional experience in thematic areas related to Occupational Health and Safety (OHS). * Minimum of a Master’s degree. * Proven experience and familiarity in African region * Excellent knowledge, skills and experience in designing OHS plans * Working experience of the new World Bank Environmental and Social Framework is required. * Proficiency in the usage of computers and office software packages (word processing, spreadsheet etc.) * Possess excellent technical and analytical skills:   Able to communicate effectively and fluently in both oral and written English language |

1. **Inputs to be provided by the PIU/EDSA**

The client shall make available to the Consultant the following facilities and relevant documentation:

* The client will facilitate the exchange of ideas and materials between the ESIA consultants and design engineer and the PIU’s Environmental and Social Specialists
* Assist with the arrangement of stakeholder meetings and consultations as per the SEP
* Submission of the report and relevant documents to SL Environmental Protection Agency for approval and issuance of the necessary permit shall be the responsibility of the PIU, with the active participation of the Consultant.
* Any other facility needed for the timely implementation of the assignment
* All approved documentation under this project including the Project Appraisal Document (PAD), the E&S Risk Brief ( prepared by the World Bank), the Stakeholder Engagement Plan

(SEP), the Environmental and Social Commitment Plan (ESCP)

* Feasibility Studies and any other documents related to the Project, such as design reports, inhouse preliminary environmental and social assessment prepared by the PIU, environmental and social information collected by the PIU.

### Annex 1: Tentative outline of the ESIA report

At the minimum, the ESIA shall include detail identification and description of the following:

*(a) Executive Summary*

• Concisely discuss significant findings and recommended actions.

1. *Legal and Institutional Framework* 
   * Analyze the legal and institutional framework for the project, within which the environmental and social assessment is carried out.
   * Compare the Borrower’s existing environmental and social framework and the ESSs and identify the gaps between them.
   * Identify and assess the environmental and social requirements of any co-financiers and international agencies.
2. *Project Description* 
   * Concisely describe the proposed project and its geographic, environmental, social, and temporal context, including access roads, power supply, water supply, housing, and raw material and product storage facilities, as well as the project’s primary suppliers.
   * Through consideration of the details of the project, indicate the need for any plan to meet the requirements of national law and the ESF.
   * Include maps of sufficient detail, showing the project site and the area that may be affected by the project’s direct, indirect, and cumulative impacts.
3. *Baseline Data (see above section 4.2)* 
   * Set out in detail the baseline data that are relevant to decisions about project location, design, operation, or mitigation measures. This should include a discussion of the accuracy, reliability, and sources of the data.
   * Identify and estimate the extent and quality of available data, key data gaps, and uncertainties associated with predictions.
   * Based on current information, assess the scope of the area to be studied and describe relevant physical, biological, and socioeconomic conditions, including any changes anticipated before the project commences.
   * Identify current and proposed development activities within the project area but not directly connected to the project.
4. *Environmental and Social Risks and Impacts* 
   * Describe all relevant environmental and social risks and impacts of the project. This will include the environmental and social risks and impacts specifically identified in the ESF and other environmental and social risks and impacts arising as a consequence of the specific nature and context of the project. In this regard, discuss the repair, storage, recycle, disposal of solar panels and batteries.
5. *Mitigation Measures* 
   * Identify mitigation measures and significant residual negative impacts that cannot be mitigated and, to the extent possible, assess the acceptability of those residual negative impacts.
   * Identify differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable.
   * Assess the feasibility of mitigating the environmental and social impacts; the capital and recurrent costs of proposed mitigation measures, and their suitability under local conditions; and the institutional, training, and monitoring requirements for the proposed mitigation measures.
   * Specify issues that do not require further attention, providing the basis for this determination.
6. *Analysis of Alternatives* 
   * Systematically compare feasible alternatives to the proposed project site, technology, design, and operation—including the “without project” situation—in terms of their potential environmental and social impacts.
   * Assess the alternatives’ feasibility of mitigating the environmental and social impacts; the capital and recurrent costs of alternative mitigation measures, and their suitability under local conditions; and the institutional, training, and monitoring requirements for the alternative mitigation measures.
   * For each of the alternatives, quantify the environmental and social impacts to the extent possible, and attach economic values where feasible.
7. *Design Measures* 
   * Describe the basis for selecting the particular project design proposed and specify the applicable EHSGs or if the ESHGs are determined to be inapplicable, justify recommended emission levels and approaches to pollution prevention and abatement that are consistent with GIIP.
8. *Key Measures and Actions for reporting on Environmental and Social Commitment Plan (ESCP)*

*Compliance*

* + Summarize key measures and actions and the timeframe required for the project to meet the requirements of the ESSs. This will be used in reporting on compliance with the (ESCP).

1. *Appendices* 
   * List of the individuals or organizations that prepared or contributed to the environmental and social assessment.
   * References—setting out the written materials both published and unpublished, that have been used.
   * Record of meetings, consultations and surveys with stakeholders, including those with affected people and other interested parties. The record specifies the means of such stakeholder engagement that were used to obtain the views of affected people and other interested parties.
   * Tables presenting the relevant data referred to or summarized in the main text.
   * List of associated reports and plans.

### Annex 2: Basic Outline of the Environmental and Social Management Plan (ESMP)

The Consultant will develop an ESMP as part of the ESIA Main Report for the construction and operation of the proposed Project. The ESMP will be based on the findings of the ESIA and will incorporate specific measures or actions as may be required by the Bank and SL EPA to meet the Environmental and Social Standards, as well as the national requirements. The ESMP will cover the construction and operation phase of the project and will include set of mitigation, monitoring and institutional measures to be undertaken during implementation and operation of the project to eliminate, offset or reduce adverse environmental and social risks to acceptable levels. The ESMP shall include the measures and actions needed to implement these measures. The Consultant will:

1. identify the set of responses to potentially adverse impacts;
2. determine requirements for ensuring that the proposed responses are implemented effectively and in a timely manner; and
3. describe the means for meeting those requirements.

The ESMP shall be prepared as a stand-alone document to be adapted by the Contractor(s) in the preparation of the Contractor’s ESMP (C-ESMP). This ESMP should be concise enough to be incorporated into the contract between GoSL and the Contractor. The content of the ESMP will include the following:

1. *Mitigation* 
   * Identify measures and actions in accordance with the mitigation hierarchy that reduce potentially adverse environmental and social impacts to acceptable levels.

* + Include compensatory measures, if applicable, such as:

i. identify and summarize all anticipated adverse environmental and social impacts (including those involving involuntary resettlement, labor and working conditions,

SEA/SH, stakeholder engagement and grievance resolution, etc.); ii. describe—with technical details—each mitigation measure, including the type of impact to which it relates and the conditions under which it is required (e.g. continuously or only in the event of contingencies), together with designs, equipment descriptions, and operating procedures, as appropriate;

iii. estimate any potential environmental and social impacts of these measures; and iv. describe any other mitigation plans required for the project (e.g., for involuntary resettlement, indigenous peoples, or cultural heritage).

1. *Monitoring* 
   * Identify monitoring objectives and specify the type of monitoring, with linkages to the impacts assessed in the environmental and social assessment and the mitigation measures described in the ESMP.[[5]](#footnote-5)

* + The monitoring section of the ESMP shall specifically provide: (a) description and technical details of monitoring measures, including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate) and definition of thresholds that will signal the need for corrective actions; and (b) monitoring and reporting procedures to: (i) ensure early detection of conditions that necessitate specific mitigation measure(s) and (ii) furnish information on the progress and results of mitigation. The ESMP should consider the use of portable, hand held monitoring meters for noise, air pollution (dust, TSP, etc.), water pollution (TSS, BOD, DO, COD, pH, etc.) for day to day monitoring to ensure Contractors’ compliance with mitigation measures and to respond to Stakeholders’ concerns / complaints.

1. *Capacity Development and Training* 
   * To support timely and effective implementation and monitoring of environmental and social project components and mitigation measures, the Consultant shall draw on the environmental and social role, capacity and capability of responsible parties on site or at the Client, agency and Ministry level to implement the project.

•

* + Specifically, the ESMP shall provide description of institutional arrangements, identifying the party or parties responsible for carrying out the mitigation and monitoring measures for construction and operation supervision, enforcement, monitoring of implementation, financing, reporting, and staff training.

* + To strengthen environmental and social management capability within the Client and the agencies responsible for implementing the project, the ESMP, shall recommend establishment or expansion of social and environmental groups, training of staff and any additional measures that may be necessary to support implementation of mitigation and monitoring measures and other recommendations pertaining to environmental and social assessment.

1. *Implementation Schedule and Cost Estimates* 
   * For all three aspects (mitigation, monitoring, and capacity development) the ESMP should provide: (a) an implementation schedule for measures that must be carried out as part of the project, showing phasing and coordination with overall project implementation plans;

and (b) the estimate of capital and recurrent costs and sources of funds for implementing the ESMP. These figures should be integrated into the total project cost tables.

* + The ESMP will also provide an outline of how environmental and social issues will be managed during the decommissioning phase of the project.

1. *Integration of ESMP with the Project*

The Borrower’s decision to proceed with a project, and the Bank’s decision to support it, are predicated in part on the expectation that the ESMP (either stand alone or as incorporated into the ESCP) will be executed effectively. Consequently, each of the measures and actions to be implemented will be clearly specified, including the individual mitigation and monitoring measures and actions and the institutional responsibilities relating to each, and the costs of so doing will be integrated into the project’s overall planning, design, budget and implementation.

### Annex 3: Relevant guidance and support materials to be used by the consultant(s)

* **The Environmental and Social Framework (ESF)**can be viewed at the following link:  [https://thedocs.worldbank.org/en/doc/837721522762050108-](https://thedocs.worldbank.org/en/doc/837721522762050108-0290022018/original/ESFFramework.pdf)

[0290022018/original/ESFFramework.pdf](https://thedocs.worldbank.org/en/doc/837721522762050108-0290022018/original/ESFFramework.pdf)

* **Guidance notes for Borrowers**to assist in the development of the ESMF for each relevant standard. The Guidance Notes help explain the standards in detail and what the requirements are.  [https://www.worldbank.org/en/projects-](https://www.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-framework-resources%22%20/l%20%22guidancenotes)

[operations/environmental-and-social-framework/brief/environmental-and-socialframework-resources#guidancenotes](https://www.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-framework-resources%22%20/l%20%22guidancenotes)

* **The guidelines for Environment, Health and Safety**can be consulted at the following link:[https://www.ifc.org/wps/wcm/connect/Topics\_Ext\_Content/IFC\_External\_Corporat e\_Site/Sustainability-At-IFC/Policies-Standards/EHS-Guidelines/](https://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Policies-Standards/EHS-Guidelines/)

* **ESF good practice for road safety for Bank operations:**  [https://thedocs.worldbank.org/en/doc/648681570135612401-](https://thedocs.worldbank.org/en/doc/648681570135612401-0290022019/original/GoodPracticeNoteRoadSafety.pdf)

[0290022019/original/GoodPracticeNoteRoadSafety.pdf](https://thedocs.worldbank.org/en/doc/648681570135612401-0290022019/original/GoodPracticeNoteRoadSafety.pdf)

* **Good Practice Note Addressing Sexual Exploitation and Abuse and Sexual**

**Harassment in the Financing of Investment Projects involving Major Civil (relevant for construction activities)**

**Works**[https://thedocs.worldbank.org/en/doc/6f3d9ddc6010c4221315dd1282958e41-](https://thedocs.worldbank.org/en/doc/6f3d9ddc6010c4221315dd1282958e41-0290032022/original/SEA-SH-Civil-Works-GPN-Third-Edition-Final-October-12-2022.pdf)

[0290032022/original/SEA-SH-Civil-Works-GPN-Third-Edition-Final-October-122022.pdf](https://thedocs.worldbank.org/en/doc/6f3d9ddc6010c4221315dd1282958e41-0290032022/original/SEA-SH-Civil-Works-GPN-Third-Edition-Final-October-12-2022.pdf)

* **Good Practice Note for Non-discrimination and**

**Disability:**[*http://pubdocs.worldbank.org/en/366051548972401439/ESF-Good-practice-notedisability-french.pdf*](https://translate.google.com/translate?hl=en&prev=_t&sl=fr&tl=en&u=http://pubdocs.worldbank.org/en/366051548972401439/ESF-Good-practice-note-disability-french.pdf)

* **Good Practice Note: Non-Discrimination Sexual Orientation and Gender Identity**

**(SOGI)** [https://thedocs.worldbank.org/en/doc/590671570796800429-](https://thedocs.worldbank.org/en/doc/590671570796800429-0290022020/original/GoodPracticeNoteSOGI.pdf)

[0290022020/original/GoodPracticeNoteSOGI.pdf](https://thedocs.worldbank.org/en/doc/590671570796800429-0290022020/original/GoodPracticeNoteSOGI.pdf)

* **Assessing and Managing the Risks of Adverse Impacts on Communities from ProjectRelated Labor Influx**

|  |  |
| --- | --- |
| [https://thedocs.worldbank.org/en/doc/fc074f5b6cc1621dc65675bf83c9d0b8-](https://thedocs.worldbank.org/en/doc/fc074f5b6cc1621dc65675bf83c9d0b8-0290032021/original/ESF-Labor-Influx-Good-Practice-Note.pdf) | |
| [0290032021/original/ESF-Labor-Influx-Good-Practice-Note.pdf](https://thedocs.worldbank.org/en/doc/fc074f5b6cc1621dc65675bf83c9d0b8-0290032021/original/ESF-Labor-Influx-Good-Practice-Note.pdf) |  |

* **Good Practice Note for**

**Gender**[*http://pubdocs.worldbank.org/en/158041571230608289/Good-Practice-Note-Gender.pdf*](https://translate.google.com/translate?hl=en&prev=_t&sl=fr&tl=en&u=http://pubdocs.worldbank.org/en/158041571230608289/Good-Practice-Note-Gender.pdf)

•

* **Technical Note: Public Consultations and Stakeholder Engagement in WB-supported operations when there are constraints (i.e. COVID-19) on conducting public meetings**

|  |  |
| --- | --- |
| [https://worldbankgroup.sharepoint.com/sites/wbunits/opcs/Knowledge%20Base/Public](https://worldbankgroup.sharepoint.com/sites/wbunits/opcs/Knowledge%20Base/Public%20Consultations%20in%20WB%20Operations.pdf) | |
| [%20Consultations%20in%20WB%20Operations.pdf](https://worldbankgroup.sharepoint.com/sites/wbunits/opcs/Knowledge%20Base/Public%20Consultations%20in%20WB%20Operations.pdf) |  |

* **Good Practice Note: Assessing and Managing the Risks and Impacts of the Use of Security Personnel.**

|  |  |
| --- | --- |
| [https://documents1.worldbank.org/curated/en/692931540325377520/Environment-and-](https://documents1.worldbank.org/curated/en/692931540325377520/Environment-and-Social-Framework-ESF-Good-Practice-Note-on-Security-Personnel-English.pdf) | |
| [Social-Fra](https://documents1.worldbank.org/curated/en/692931540325377520/Environment-and-Social-Framework-ESF-Good-Practice-Note-on-Security-Personnel-English.pdf) | [mework-ESF-Good-Practice-Note-on-Security-Personnel-English.pdf](https://documents1.worldbank.org/curated/en/692931540325377520/Environment-and-Social-Framework-ESF-Good-Practice-Note-on-Security-Personnel-English.pdf) |

### Annex II Methodology for the Assessment of Biophysical and Social Attributes

|  |  |
| --- | --- |
| **Item** **Method** | |
| Water quality | Seven samples including surface and groundwater samples were collected from swamp areas and community groundwater well in and around the project site for analysis in November 2022 and May 2023. Measurements for physical parameters (pH, conductivity, turbidity, temperature, salinity), and data were done *in situ*, with the aid of a water quality probe (MD610 and SD 70). For chemical and bacteriological determinations, samples were preserved at 6 degrees Celsius, and analyzed in the laboratory within 3 hours. ***Annex IV*** details sample collection, transportation, handling and analysis. The results are further presented in ***Table 5.2***. |
| Soil quality | Soil samples from the solar PV and BESS site were analysed for agricultural suitability (N, P, K, carbon, pH, organic matters). They were collected in May 2023 at 3 locations within the PV and BESS site. Samples are sent to a laboratory to determine the soil type and soil properties within the proposed site. ***Table 5.1*** presents the results. |
| Noise emissions | In November 2022 and May 2023, noise levels and air quality were simultaneously measured at five locations. Noise levels were measured simultaneously with air quality at the same locations.  LAeq levels were measured.  A Multifunctional Sound Level Meter (SLM) - SL-5868P was used to measure dB levels. See ***table 5.3*** for noise values. |
| Air quality | AQM-09 Air Quality Monitoring System was used to measure the following parameters: SO2, NO2, O3, PM2.5., PM10. The Results are presented in ***Table 5.4*** |
| Biodiversity | Field observation of vegetation, mammals, reptiles and  amphibians, and macroinvertebrates on plateaus and swap areas in and around the project site. The study spanned seven days and took place in both November 2022 and May 2023.  • Vegetation: The survey for vegetation was consistent with a rapid assessment, which mainly involves determining vegetation types and distribution and their botanic composition. This was done by walking along defined transects (mainly bush paths used by local people) and observing in and around specific locations running through the main study sites and reference points. Observations were made 5m on either side of the transect midline. The broad vegetation categories encountered in the project area were classified based on the biogeography representation of |

|  |  |
| --- | --- |
| **Item** **Method** | |
|  | the country and/or sub-region (Cole, 1988). The recorded plant species were checked for conservation status by referring to the IUCN Red List (2021) and by considering their regional distribution, where necessary. Annex V presents plant species recorded.    • Fauna: Data on mammals were obtained mainly through actual surveys, including visual evidence, faecal droppings, and footprints.    - Herpeto-fauna assessment  Reptiles and amphibians were sampled at locations specified by the project, including the swap areas around the PV and BESS site, and Suctarr along the transmission route. The methodology included a Visual Encounter Survey (VES) through which logs were turned over, cracks and burrows observed, night patrol was conducted, opportunistic encounter and capture of some species for proper observation and identification, and listening to calls of amphibians. The idea of collecting specimens was avoided in order to prevent killing the species; instead, photographs of confusing species were taken for further identification. ***See tables 5.8 & 5.9*** for the list of amphibians and reptiles recorded.       1. Mammals   The survey was done to provide a rapid assessment of the fauna, particularly those that occupy or visit habitats that overlap with areas to be traversed by the transmission line. Data on mammals were obtained mainly through interviews with local people and hunters and in few cases, through visual evidence, such as faecal droppings, footprints and nesting sites. The data is presented based on mere occurrence and status in the visited areas, not abundance. Local respondents were also asked to indicate whether the species come within areas alongside the proposed transmission route or in distant areas. A field guide to mammals of Africa (Kingdon, 1997) was used to properly identify species whose occurrences were indicated by respondents and those encountered during the survey. The conservation status of the mammal species was verified by referring to the IUCN Red List (2019). ***Table 5.10*** presents list of mammals recorded.     1. Birds |

|  |  |  |
| --- | --- | --- |
| **Item** | **Method** | |
|  |  | The avifauna diversity was assessed mainly by walking through a transect perpendicular and/or parallel to the proposed transmission route along the main road, sometimes covering up to 300 m along the defined paths. At the PV and BESS site, two transects were chosen, at least 100m from each other across the entire stretch of the site. The importance of focusing on transect surveys is the fact that it makes it possible to traverse various sub-habitats (such as streams, moist zones and fallows) within a particular zone, and thus the probability of encountering a good representative of the species that occur in the area. Point surveys were employed for keen and focused observation at specific locations along transects whenever the opportunity arose. Keen observations were made whenever a swamp area was encountered. There is no swamp area within the PV and BESS site, but some sections of the transmission line (around Suctarr village) traverse streams and swamps on its western flank. These watery areas support the foraging and reproductive activities of some migratory birds. Recording and play-back techniques of bird calls were implemented to attract and identify shy and uncommon species whenever necessary. A field guide (Borrow and Demey, 2008) was used to verify species identification in the course of the survey. See ***Annex VI*** for birds recorded. |
| **Socio-economic**  **Baseline** | • The study simultaneously employed mixed data collection methods that entailed qualitative and quantitative methods. Secondary data was gathered through a desk review of several sources, including Port Loko District Council,  Statistics Sierra Leone, World Bank, WHO, and other sources. Primary data was mainly collected through a household survey and personal interviews in the project area using a structured questionnaire. The household survey questionnaire was designed and coded into an Open Data Kit (ODK) collect software for subsequent data collection.  **Ethical Considerations:** Prior to the survey, informed consent was sought from all respondents. The informed consent highlighted the purpose of the study, the risks and benefits of participating in the survey and careful observance of the confidentiality of data collected. In addition, strict adherence to international best practices was observed during the entire study. This study collected data in various ways, including tablets, written forms, and session notes. The survey data was synced daily to a central online server accessed by authorized personnel. | |

|  |  |  |
| --- | --- | --- |
| **Item** | | **Method** |
|  |  | **Data Collection:** Socio-economic information about the communities was collected through household interviews, community records, and Key Informants Interviews (KIIs) conducted from November 2022 to May 2023. The structured household questionnaire was loaded in the open data kit (ODK) on smartphones for actual data collection (see ***Annex IV*** for sample questionnaire). The ODK was programmed to self-validate and authenticate to minimise human errors in data capture. 529 questionnaires were administered (see ***Table 5.13*** for disaggregated data). The collected data were synced to the project ODK server daily.  **Data Management and Analysis**: All the quantitative data at the ODK collect central server was merged into a single excel file. The data was then transferred to Statistical Package for Social Sciences (SPSS) platform. Further cleaning and logical checks were performed for consistency in the data set before analysis. The quantitative data was analysed using SPSS version 20. |
|  | • | Key informant interviews and focus group discussions with local community authorities, headmen women, and chiefs |
|  | • | Separate focus group discussions were held for women and vulnerable households. The outcome of the discussion is described in the section on Stakeholder Consultations. (Chapter 4)    Cultural and heritage survey: consulted with the communities impacted by the project to learn about any potential existing heritage, cultural, and archaeologically significant sites and resources  Field inspection of heritage/relic in the project site |

**Annex III Field Photos**



Drone survey



Noise and Air Quality Monitoring



Stakeholder Consultation Gbaneh Bana-Lungi



Insitu water Quality monitoring



Stakeholder consultation – Lungi town

### Annex IV Water sampling collection, transportation, handling and Analysis

The following objectives were set for the water quality monitoring and assessment:

* To determine the physical, chemical, and bacteriological parameters of the sampling

points

* To analyze the results obtained from the water quality testing.
* To determine whether the water meets the WHO drinking water quality guidelines.

The table below shows the list of equipment used for the testing of the water samples. **List of water quality equipment used for the water quality testing**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Name of equipment | Manufacturer | Type of equipment used | Description |
| 1 | MD610 | Lovibond | Chemical parameters | Photometer. Can test more than  100 physicochemical parameters |
| 2 | SD70 | Lovibond | Physical parameters | Handheld meter. Use to test for  EC, temperature, and pH |
| 3 | SD150 and SD  400 Oxi | Lovibond | Physical parameters | Handheld meter. Use to test for  DO, ORP and temperature |
| 4 | WAGTECH  Bacteriological  Kit | WAGTECH | Bacteriological parameters | Bacteriological testing kit. Use for the testing of faecal and nonfaecal parameters |

#### Sample collection, field, and laboratory testing

The in-situ or field assessment involved testing physical parameters such as Dissolved Oxygen (DO), temperature, Electrical Conductivity (EC), and pH using SD70, SD150, and 400 probes, as depicted in the table above. This process entailed straightforwardly inserting the probe directly into the water sources or, when not readily accessible, into sampling containers. The resulting measurements were then obtained from the meter display.

Samples were collected for chemical and bacteriological analysis using high-density polyethylene bottles which were rinsed three times with the sampled water and tightly capped. The samples were preserved in a cool box and immediately transported to the laboratory for analysis. The

MD610 photometer was used for the testing of chemical parameters following the prescribed manufacturer’s procedures. The MD610 manual can be downloaded from the link below. [http://lovibond.eu/downloads/instructions/md600,md610/ins\_md610\_gb\_lovi.pdf.](http://lovibond.eu/downloads/instructions/md600,md610/ins_md610_gb_lovi.pdf)

#### Water Quality Testing for Faecal and Non-Faecal Coliforms

The WAGTECH bacteriological testing kit was used to test for faecal and non-faecal coliforms. A 100ml of the water sample is collected and filtered, the filtered paper was then placed in a petri dish soaked with the MLSB media. The Petri dishes were then incubated for 18 Hrs at 44 0C. After the completion of the incubation period, colonies for faecal and non-faecal bacteria were counted to obtain the result for each sampled station.

### Annex V Soil Sample Analysis

|  |  |
| --- | --- |
| **Parameter** | **Instrumentation and Methodology** |
| Determination  of Soil Colour | Soil colour was determined on dry soil using the Munsell Color Chart. Basically, a small quantity of soil sample was taken and matched against the Munsell Colour Chart (Munsell Color Book – x-rite) for hue and Chroma determination. |
| Determination of Gravel  Concentration  (%) | One hundred grams of soil sample that has not been sieved was weighed. Then the sample was sieved through the >2.0 mm screen. The gravel (held on the sieve), was weighed and the weight in grams was used to calculate the percentage concentration of the gravel. |
| Determination of Moisture Content (%) | The Infrared Moisture (Infrared Moisture Balance – Ac: 0.1 mg) meter was used to determine the moisture content of the samples. A hundred grammes quantity of the sample was placed on a sample plate, then the temperature was adjusted to 150oC. The percentage moisture content was later read through the observation point and the value was recorded. All samples were replicated in triplicates. |
| Determination of pH | Sample pH (1:1) in water and potassium chloride were determined following the methods described by Anonymous, 1994b and Moore and Loeppert, 1987, respectively. Ten grans of air-dried (2.0mm sieved) sample was weight into a 25 ml beaker and 10mL of water was added. The mixture was thoroughly stirred for 5 seconds with a glass rod. The sample–water suspension was allowed to stand for 30 min and the pH was read using a pH meter (RS 5500 – Acc: 0.01). Sample pH was measured at 20 to 25°C stirring the sample–water mixture with glass rod whilst the measurement was taken. The pH was immediately read after 30 to 60 second to the nearest 0.1 pH unit. |
| Determination of Electrical  Conductivity | The EC was determined Ten Grams of air-dried (2.0mm sieved) soil was weight into a cup and 10 mL of 0.01N KCl was measured into the cup into the cup and mixed thoroughly for 5 seconds with a glass rod. The KClwater mixture was then allowed to stand for 20 min. The EC measurement at 20 to 25°C was performed and the EC was immediately taken after 15 to 30 seconds using an EC meter (Rs 3520 Acc: 0.01). |
| Determination  of Texture | The Hydrometer Method described by Benton-Jones (2001) was employed for the textural class determination. Briefly, 50 g of air-dried samples were treated with Sodium hexametaphosphate- and allowed to stand over night to enhance particle dispersion. The samples were later transferred into 1000 ml measuring cylinders and made to volume with distilled water. Readings were taken after 20 seconds and 2 hours after inserting the hydrometer (Specific Gravity Hydrometer – Acc: 0.1). Values obtained were used to calculate the percentages of sand, silt and clay in soil samples. With the use of the textural triangle, the textural class of each soil sample |
| **Parameter** | **Instrumentation and Methodology** |
|  | was determined. For Phytobac 4, samples were only passed through the 2.0 mm sieve and determined by feel method. |
| Determination of Total  Nitrogen | Into a Kjeldahl flask 1.0 g of soil sample was placed and 10 ml distilled water added. This was followed by the addition of 0.7 g of copper sulphate, 1.5 g of K2SO4 and 30 mL of conc. H2SO4. The mixture was heated gently at 150oC until frothing stopped and at 300oC until a clear colour is seen. The flask was removed and allowed to cool with 50 mL of deionized water. Then 30 mL of 10M NaOH, 0.2 g Devada's alloy and 25 mL of 0.05M H2SO4 alloy were added to the distilling flask. The mixture was distilled for about 30 minutes and titrated with 0.1 M NaOH. The digestion process was performed using the Kjeldhal distillation unit (Kjeldhal Distillation Unit - UDK 129) |
| Determination of Total  Phosphorus | Two grams of soil sample was weighed into a 125 ml conical flask as described by Bray and Kurtz, (1945). Then 14 ml of the extracting solution was added to each soil in the 125 ml conical flask and allowed to filtrate. Then 3ml of the filtrate sample was put into a test-tube and thereafter 3ml of mixed solution was added and allowed to stand for about 30 minutes. The Phosphorus concentration was determined by spectrophotometry using a spectrophotometer (Jenway 6300 Spectrophotometer – Ac; 0.001 ppm)). |
| Determination of Available  Potassium and  Calcium | Available K was determined as described by Benton-Jones (2001). Five grams of air-dried (2-mm) soil was weighed into a 50 mL extraction vessel. Then, 25 mL of Extraction Reagent and shaken for 5 min at 150 rpm on a reciprocating shaker. The mixture was immediately filtered and collected for elemental determination using a flame photometer (Microprocessor Flame Photometer - Ac: 0.1 ppm/meq) |
| Determination  of Total Carbon | Briefly 0.5 g of air-dried (2 mm sieved) soil samples were placed into 500 mL conical flask. Potassium dichromate and sulphuric acid were added to digest the organic matter in the samples. Then, 50 mL of deionized water was added and allowed to cool before titrating with ferrous ammonium sulphate. |

**Annex VI SLEWRC Mini-Grid Regulations, 2018 and 2019**

.Specific guidelines on lithium solar battery storage, transportation and disposal (SLEWRC Mini-Grid Regulations, 2018)

|  |  |  |  |
| --- | --- | --- | --- |
| **Type of Equipment** | **Phase in the Project** | **Recommended link to**  **Environmental**  **Protection** | **Health and Safety** |
| Lithium Battery | Installation &  Operations |  | * Do not discharge completely and do not overcharge (risk of explosion). * Keep away from solar radiation. * Batteries must be disposed at a suitable waste management facility based on International Standards after end of lifetime |
| Solar PV | Operation |  | * Wear safety gear. * Must be a safe working environment. * A comprehensive occupational safety program, including training and site orientation. * Competent persons to effectively respond to emergency events. * Keep a record of all occupational injuries and illnesses and divulge these records to SLEWRC or body on demand for examination and analysis. * Should have adequate insurance policy to cover facilities, employees and third parties. |
| Decommissioning &  Disposal | * For CdTe modules: Hazardous Waste must be collected and brought to a recycling centre.      * Consult manufacturer’s guidelines or where necessary |  |

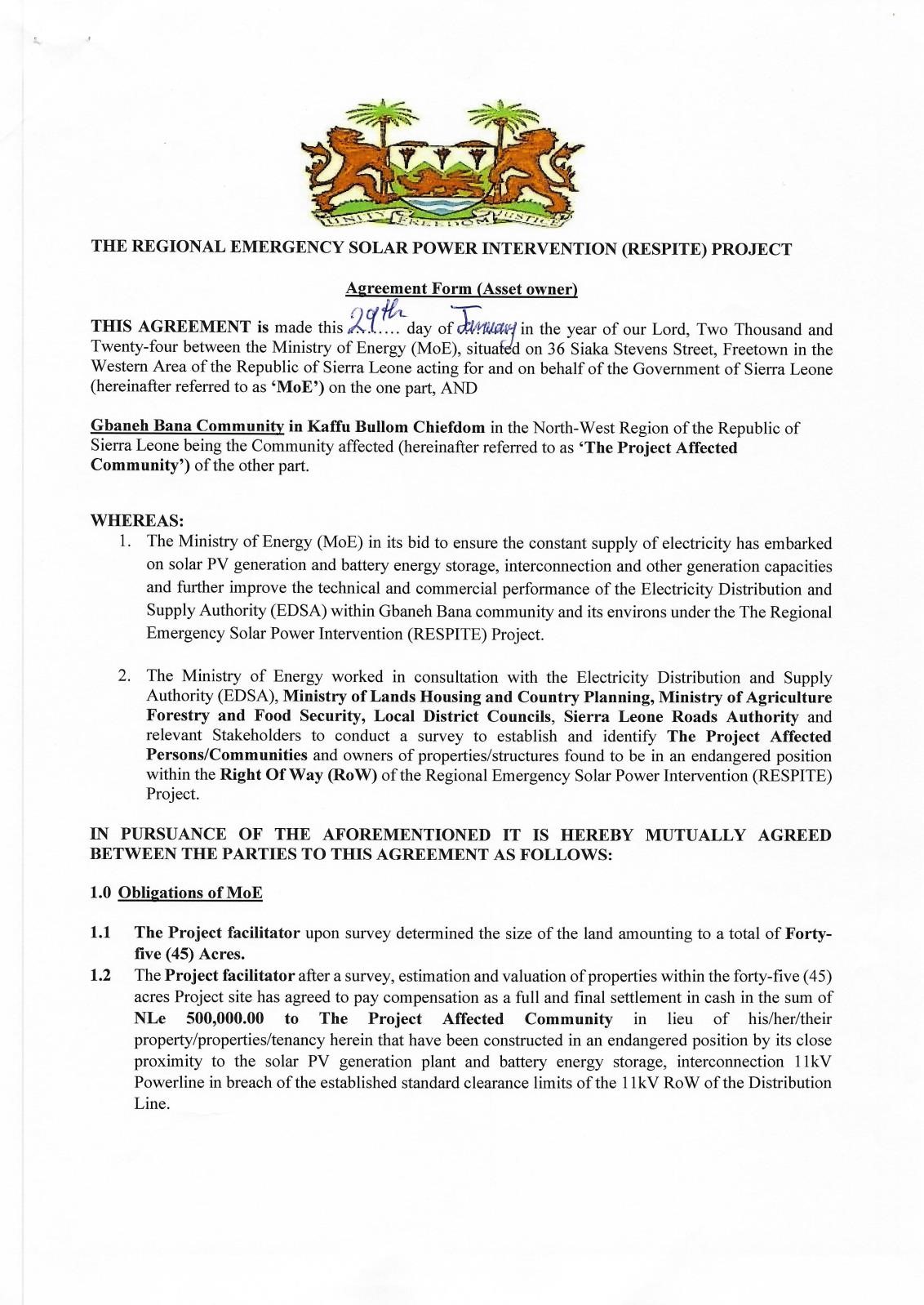
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | the manufacturer | |  |
| Inverters, charge controller and other electronic equipment  Inverters, charge controller and other electronic equipment | Installation |  | | ✓ Must only be installed by professional electricians. ✓ |
| Operation |  | | * Must be a safe working environment. * A comprehensive occupational safety program,  including training and site orientation. * Competent persons to effectively respond to  emergency events. * Keep a record of all occupational injuries and illnesses  and divulge these records to SLEWRC or  body on demand for examination and analysis. * Should have adequate insurance policy to cover  facilities, employees and third parties. |
| Decommissioning &  Disposal | Must be disposed in an environmentally friendly way. Waste must be collected and brought to a recycling centre. | |  |
| Distribution Box  Conductors  Transformers | Transport & Storage |  | | Due to the weight of equipment, use appropriate lifting and installation equipment (e.g. crane). |
| Installation | * Select a site where the risk of flooding is low. * Use fire proved material. | | * Installation only by an electrician * Wear all applicable safety gear like safety shoes, safety  gloves Comply with the SLEWRC Distribution Code. |
| Operation |  | | * Must be a safe working environment. * Wear appropriate safety gear * Must only be operated by trained electricians. * Comply with the SLEWRC Distribution Code. |
|  |  |  |  | * A comprehensive occupational safety program, including  training and site orientation. * Competent persons to effectively respond to  emergency events. * Keep a record of all occupational injuries and illnesses and  divulge these records to SLEWRC or body on demand for  examination and analysis. * Should have adequate insurance policy to cover facilities,  employees and third parties. |
| Decommissioning &  Disposal | ✓  ✓  ✓ | The foundations must be  removed and the place recover its original status. Transformer may contain hazardous and polluting material which has to be  brought to a collection point where it can be treated. | Due to the weight of equipment, use appropriate lifting and installation equipment (e.g. crane). |

|  |  |  |  |
| --- | --- | --- | --- |
| TYPE OF  EQUIPMENT | PHASE IN THE  PROJECT | RECOMMENDED LINK TO  ENVIRONMENTAL PROTECTION | HEALTH AND SAFETY |

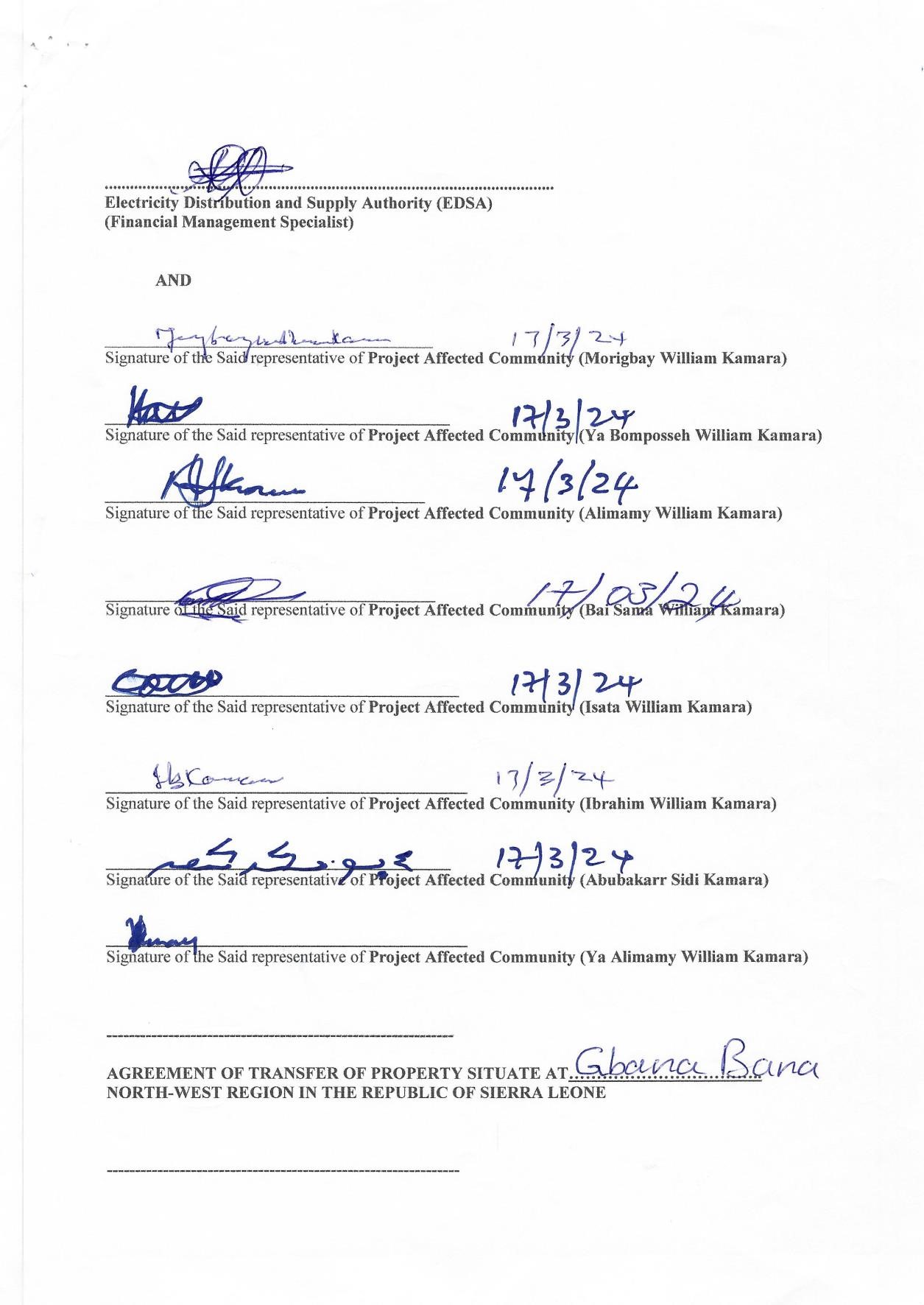
Specific requirements regarding the different types of equipment that are components in mini- grids:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Battery VRLA | Transport  & Storage |  |  | • Wear protection gear: shoes, helmet, goggles and gloves. |
| Installation |  |  | • Must only be installed by professional electricians. |
| Operation | • • •  • | Keep battery cells clean and clean with dry cloth.  Do not overcharge the batteries to avoid explosive hydrogen production.  Must be a safe working environment.  A comprehensive occupational safety program, including training and site orientation. | |
|  |  | • | Competent persons to effectively respond to emergency events. | |
|  |  | • | Keep a record of all occupational injuries and illnesses and divulge these records to SLEWRC or body on demand for examination and analysis. | |
|  |  | • | Should have adequate insurance policy to cover facilities, employees and third parties. | |

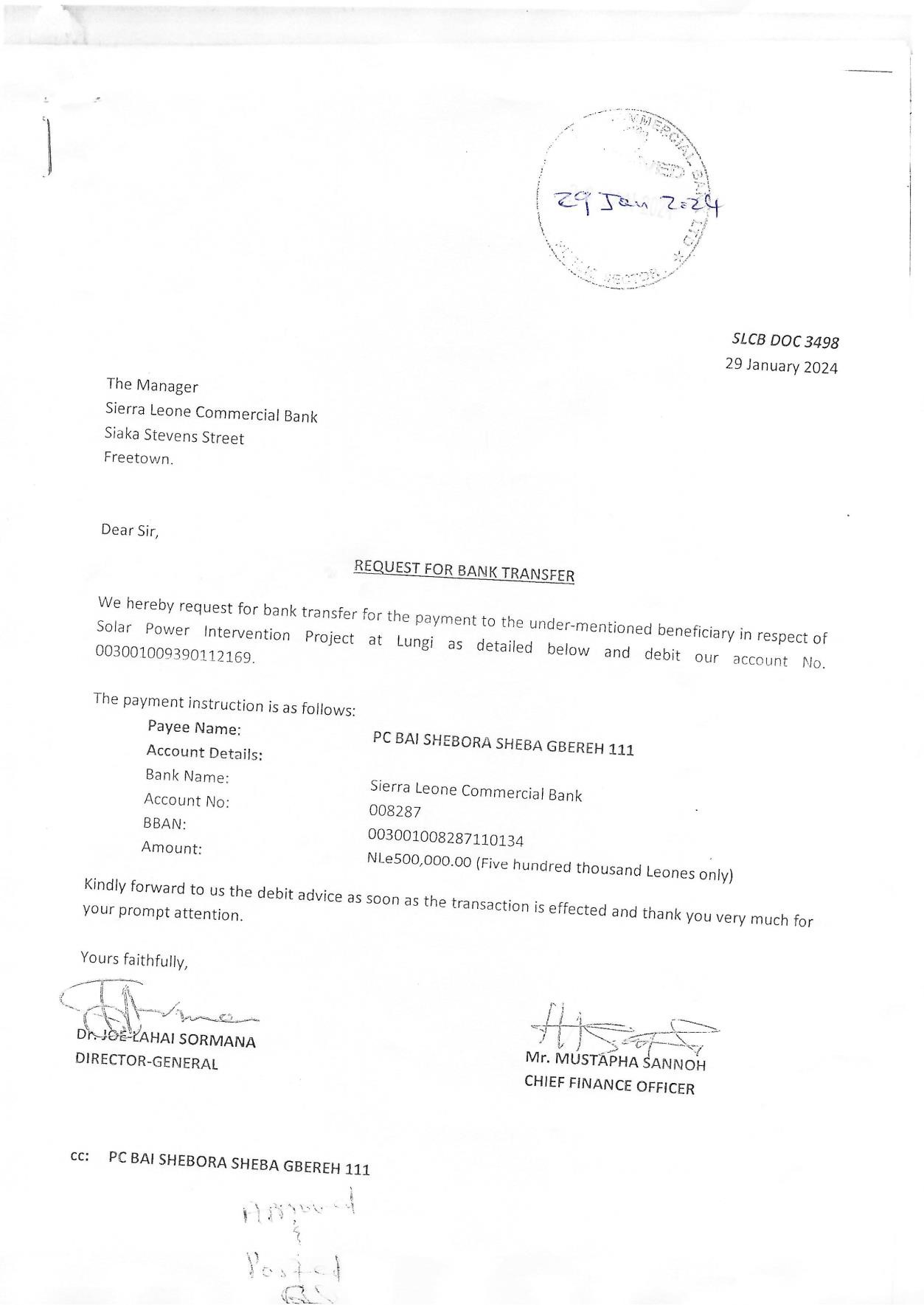
**Annex VII-A- Lungi Land Sale Agreement**



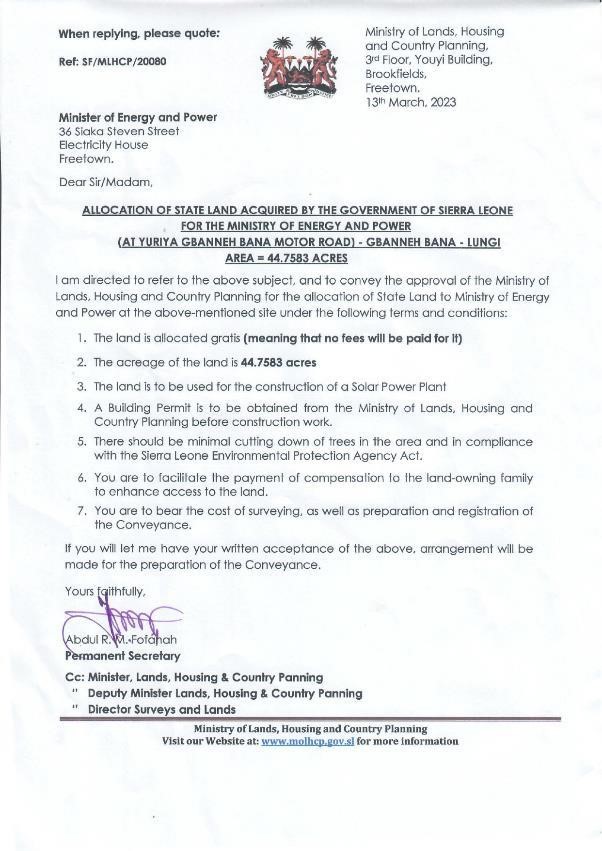




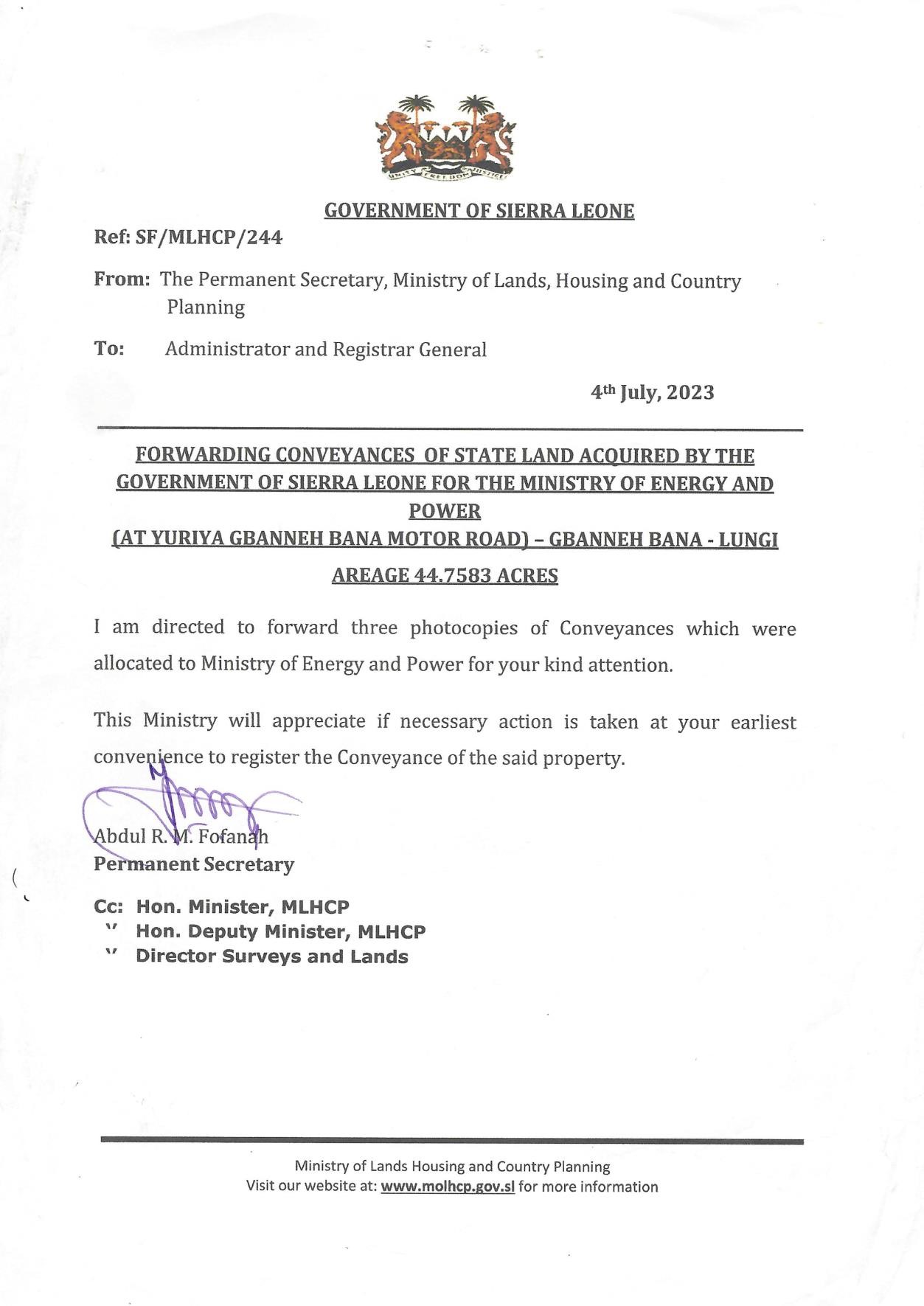
**Annex VII-B- Transfer of Fund for Land Acquired for Lungi Solar PV and BESS site.**

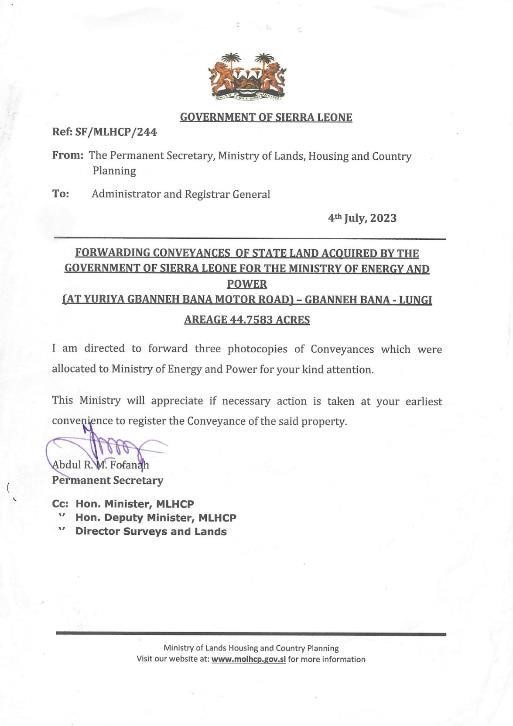


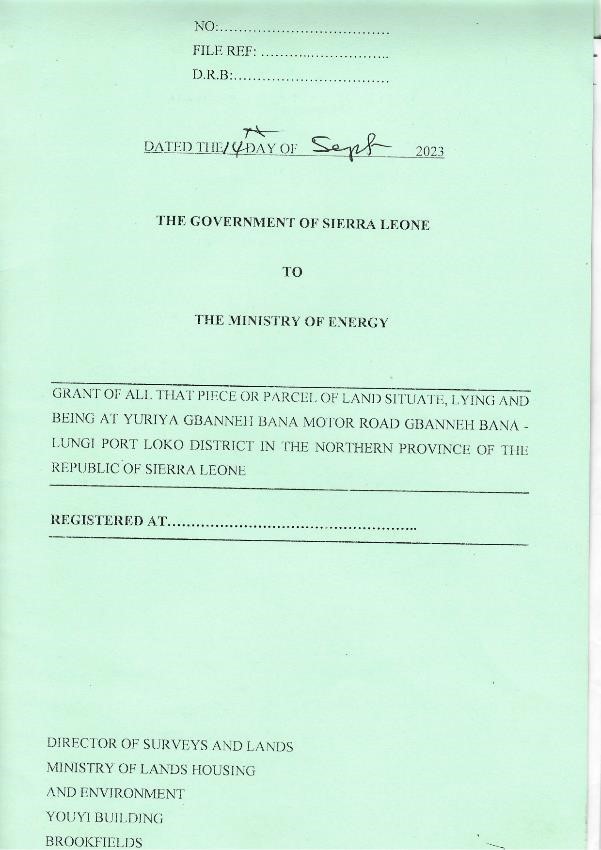
**Annex VII-C- Land Offer**

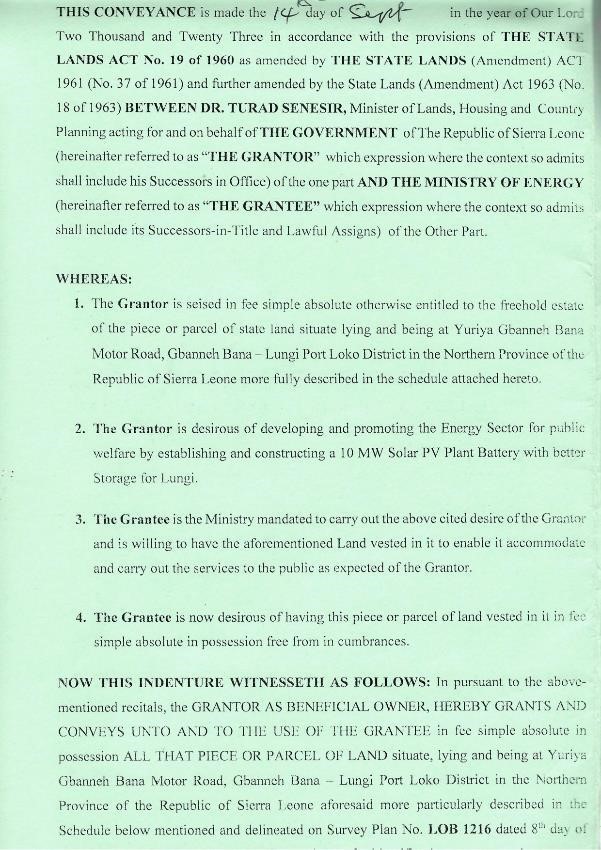


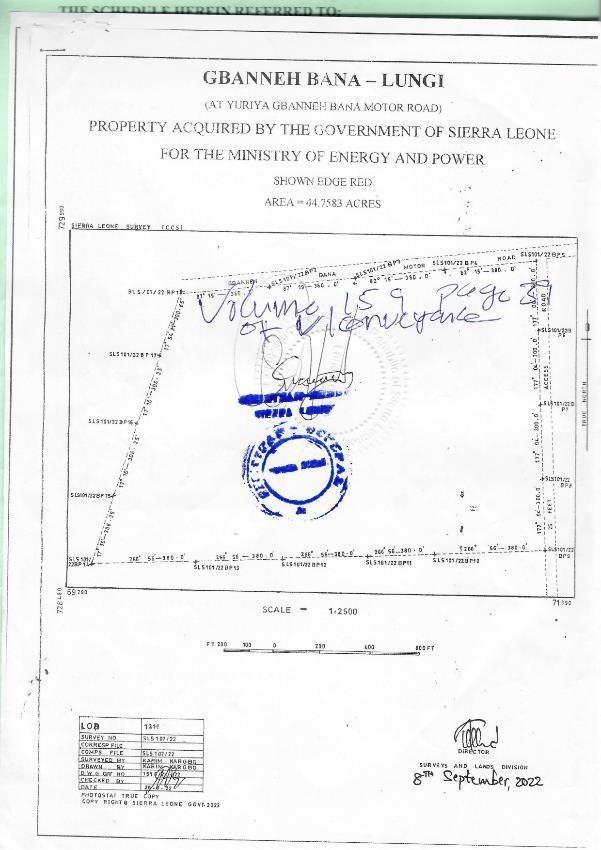
**Annex VIII Lungi Conveyance**

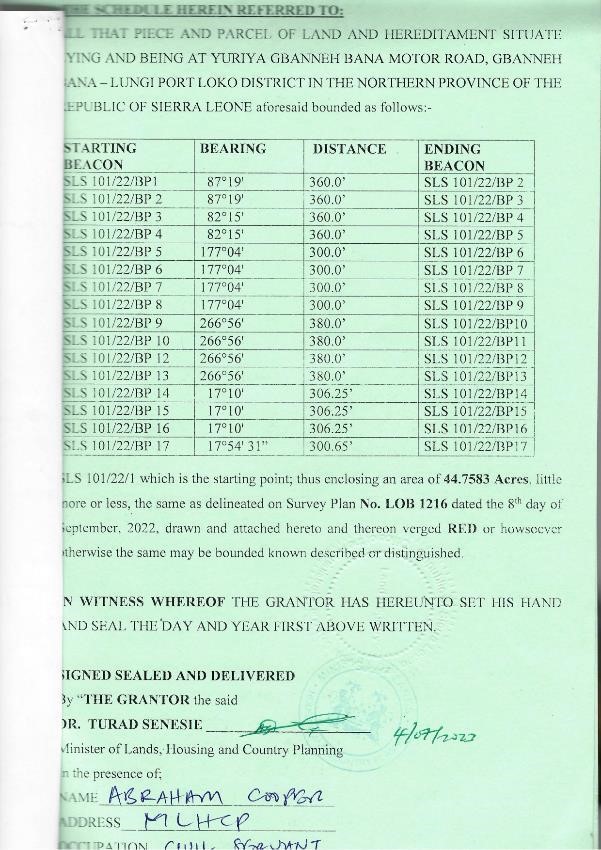


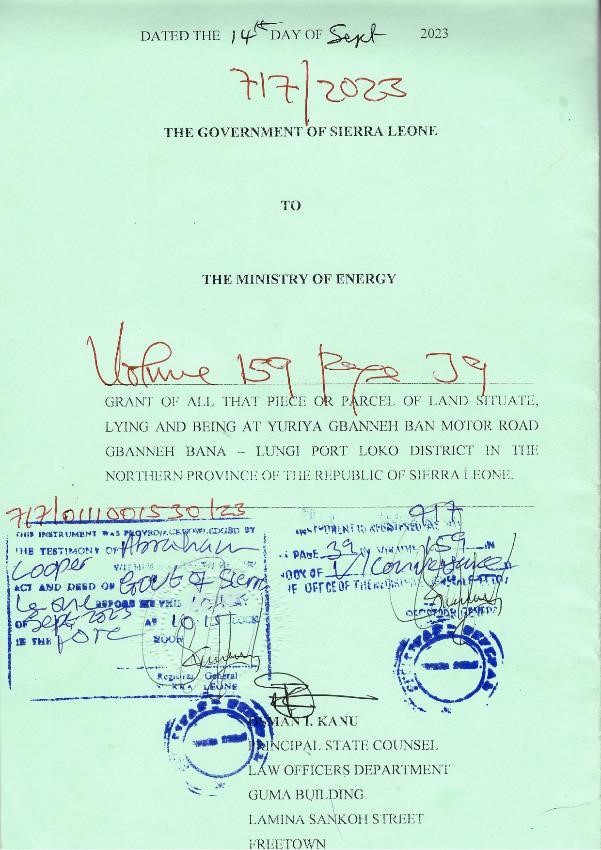












### Annex XI Summary of meeting discussions

|  |  |  |
| --- | --- | --- |
| **Category** |  | **Summary of Concerns and Comments** |
| **Knowledge,**  **Perception**  **Challenges** | **and** | In meetings, which gathered stakeholders and representatives from the various communities, the ESIA consultant introduced the project, and the EIA process, including its relevance to residents who had prior knowledge about the project. |
| All the participants said they feel very good about such a project since it will improve their quality of life. They welcome the project and are willing to support it to success. |
| **Livelihoods** |  | The main livelihood sources of residents across communities in the project area are farming and trading mostly women. |
| Respondents noted that they could only think that the project would positively affect their livelihood. They, however, noted and appealed that if the project affects their income and livelihood actives, income and other disturbances, an appropriate mechanism should be put in place by the project proponent to mitigate and resolve the same |
| **Felt needs community** | **in the** | Felt needs in the various communities in the project area are noted as follows as presented by stakeholders;  Electricity  Health facilities  Schools, including skills training centres  Community/multipurpose centres |
| **GBV issues** |  | A community stakeholder in Gbaneh Bana community in Lungi raised concerns about the lack of measures to protect women and girls during the project implementation phase, adding that it has always been the case, even during the civil war in Sierra Leone. He said the women and girls in his community had been sexually exploited and abused over the years, with little or no efforts to hold the perpetrators to account. He said they were genuinely worried. |

327 **Annex XII Plant Species Recorded During the Surveys**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **BOTANICAL NAME** | **FAMILY** | **IUCN STATUS** | **LIFE**  **FORM** | **USES** |
| Acacia mangium | Fabaceae |  | Tree | T/W |
| *Acacia pennata* | Fabaceae |  | Liana | M |
| *Afzelia Africana* | Fabaceae | VU | Tree | T |
| *Ageratum conyzoides* | Asteraceae |  | Herb | M |
| *Albizia adianthifolia* | Fabaceae |  | Tree | W |
| *Albizia zygia* | Fabaceae |  | Tree | W |
| *Alchonea cordifolia* | Euphorbiaceae |  | Shrub | M |
| *Anacardium occidentale* | Anacardiaceae |  | Tree | F/M |
| *Andropogon gabonensis* | Poaceae |  | Grass | U |
| *Anisophyllea laurina* | Rhizophoraceae |  | Tree | F/M |
| *Anthocleista nobilis* | Gentianaceae |  | Tree | U |
| *Arachis hypogaea* | Fabaceae |  | Herb | F |
| *Aspilia Africana* | Asteraceae |  | Herb |  |
| *Asystasia gangetica* | Acanthaceae |  | Herb |  |
| *Axonopus compressus* | Poaceae |  | Herb | U/M |
| *Bambusa vulgaris* | Poaceae |  | Grass | U |
| *Borreria verticillate* | Rubiaceae |  | Herb | M |
| *Calapogonium mucunoides* | Fabaceae |  | Herb | U |
| *Carica papaya* | Caricaceae |  | Tree | F/M |
| *Cassia spp* | Fabaceae |  | Tree | W/M |
| *Cassia tora* | Fabaceae |  | Shrub | M |
| *Ceiba pentandra* | Bombacaceae |  | Tree | T/M |
| *Celosia argentea* | Amaranthaceae |  | Herb | F |
| *Chromolaena odarata* | Asteraceae |  | Herb | M |
| *Citrus Spp* | Rutaceae |  | Tree | F |
| *Clappertonia ficifolia* | Tiliaceae |  | Shrub | U |
| *Cocos nucifera* | Arecaceae |  | Palm | F/M |
| *Combretum grandiflorum* | Combretaceae |  | Liana | M |
| *Croton hirtus* | Euphorbiaceae |  | Herb | M |
| *Cyperus erythorhizos* | Cyperaceae |  | Grass |  |
| *Desmodium adscendens* | Fabaceae |  | Shrub |  |
| *Dichrostachys glomerata* | Fabaceae |  | Shrub | M |
| *Dioscorea Spp* | Dioscoreaceae |  | Liana | F |
| *Dissotis rotundifolia* | Melastomataceae |  | Herb |  |
| *Elaeis guineensis* | Arecaceae |  | Palm | F |
| *Eleusine indica* | Poaceae |  | Grass |  |
| *Ficus capensis* | Moraceae |  | Tree | M |
| *Ficus exaspirata* | Moraceae |  | Tree | M |
| *Gmelina arborea* | Laminaceae |  | Tree | T |
| *Geophila obvalfata* | Rubiaceae |  | Liana | M |
| *Hallea stipulosa* | Rubiaceae | VU | Tree | T/U |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **BOTANICAL NAME** | **FAMILY** | **IUCN STATUS** | **LIFE**  **FORM** | **USES** |
| *Hibiscus esculentus* | Malvaceae |  | Herb | F |
| *Hibiscus sterculiifolius* | Malvaceae |  | Shrub | U |
| *Imperata cylindrica* | Poaceae |  | Grass | U |
| *Ipomoea batatas* | Convolvulaceae |  | Liana | F/M |
| *Kyllinga pumila* | Cyperaceae |  | Grass |  |
| *Merremia umbellata* | Convolvulaceae |  | Herb |  |
| *Manihot Spp* | Euphorbiaceae |  | Shrub | F/M |
| *Mangifera indica* | Anacardiaceae |  | Tree | F/M |
| *Mimosa pudica* | Fabaceae |  | Herb | M |
| *Lycopersicum esculentum* | Solanaceae |  | Herb | F |
| *Craterispermum laurinum* | *Rubiaceae* |  | Shrub | M |
| *Musa sapientum* | Musaceae |  | Shrub | F |
| *Myrianthus arboreus* | Moraceae |  | Tree | W |
| *Nauclea latifolia* | Rubiaceae |  | Shrub | M |
| *Uvaria chamae* | Annonceae |  | Shrub | F/M |
| *Newbouldia laevis* | Bignoniaceae |  | Shrub | M |
| *Cleistopholis patens* | Annonaceae |  | Tree | M |
| *Oryza sativa* | Poacceae |  | Grass | F |
| *Panicum dinklygii* | Poaceae |  | Grass |  |
| *Panicum maximum* | Poaceae |  | Grass | U |
| *Parkia biglobosa* | Fabaceae |  | Tree | F |
| *Pennisetum macrourum* | Poaceae |  | Grass | U |
| *Pennisetum purpureum* | Poaceae |  | Grass | U |
| *Phyllocosmus africanus* | Ixonanthaceae |  | Tree | W |
| *Phyllanthus discoideus* | Euphorbiaceae |  | Tree | W |
| *Psychotra rufipes* | Rubiaceae |  | Shrub | M |
| *Salacia senegalensis* | Gelastraceae |  | Shrub | F/M |
| *Sorindeia juglandifolia* | Anacardiaceae |  | Shrub | F |
| *Synedrella nodifloria* | Asteraceae |  | Herb | M |
| *Tarenna nitidula* | Rubiaceae |  | Tree |  |
| *Trema guineensis* | Ulmaceae |  | Shrub |  |
| *Osbeckia tubalosa* | Melastomaceae |  | Herb |  |
| *Pteridium* sp | Dennstaedtiaceae |  | Fern |  |
| *Raphia palmae* | Arecaceae |  | Palm | U |
| *Scleria barteri* | Cyperaceae |  | Grass | M |
| *Sida rhombifolia* | Malvaceae |  | Herb | M |
| *Morinda geminata* | Rubiaceae |  | Tree | M |
| *Erythrina senegalensis* | Fabaceae |  | Tree | M |
| *Dialium guinennse* | Fabaceae |  | Tree | F/M |
| *Cucumis sativa* | Cucurbitaceae |  | Liana | F |
| *Solenostemon Spp* | Lamiaceae |  | Herb | M |
| *Spondias mombin* | Anacardiaceae |  | Tree | F/M |
| **BOTANICAL NAME** | **FAMILY** | **IUCN STATUS** | **LIFE**  **FORM** | **USES** |
| *Sporobulus jacquemontii* | Poaceae |  | Grass | U |
| *Capsicum annuum* | Solanaceae |  | Herb | F/M |
| *Bombax buonopozense* | Bombacaceae |  | Tree | U |
| *Tectona grandis* | Verbenaceae |  | Tree | T |
| *Olyra latifolia* | Poaceae |  | Grass |  |
| *Mussaenda afzelii* | Rubiaceae |  | Shrub |  |
| *Terminalia cattappa* | Combretaceae |  | Tree | W/F |
| *Tridax pucumbens* | Asteraceae |  | Herb |  |

**Annex XIII List of Birds Recorded**

|  |  |  |  |
| --- | --- | --- | --- |
| **Scientific names** | **English names** | **Status** | **Biome** |
| *ARDEIDAE* |  |  |  |
| *Bubulus Ibis* | Cattle Egret | R |  |
| *Microcarbo africanus* | Long-Tailed Cormorant | R |  |
| *Dendrocygna viduata* | White - Faced Whistling Duck | R |  |
| *Actophilomis africanus* | African Jacana | R |  |
| *ACCIPITRIDAE* |  |  |  |
| *Gypohierax angolensis* | Palm-nut Vulture | R |  |
| *Polyboroides typus* | African Harrier Hawk | R |  |
| *Kaupifalco monogrammicus* | Lizard Buzzard | R |  |
| *Accipiter erythropus* | Red-thighed Sparrowhawk | R |  |
| *Lophaetus occiptalis* | Long-Crested Eagle | R |  |
| *PHASIANIDAE* |  |  |  |
| *Francolinus bicalcaratus* | Double-spurred Francolin | R |  |
| *RALLIDAE* |  |  |  |
| *Sarothrura pulchra* | White-spotted Flufftail | R | GC |
| *COLUMBIDAE* |  |  |  |
| *Turtur afer* | Blue-spotted Wood Dove | R |  |
| *Streptopelia vinacea* | Vinaceous Dove | R |  |
| *Streptopelia semitorquata* | Red-eyed Dove | R |  |
| *MUSOPHAGIDAE* |  |  |  |
| *Crinifer piscator* | Western Grey Plantain-eater | R |  |
| *CUCULIDAE* |  |  |  |
| *Chrysococcyx klaas* | Klaas's Cuckoo | AM |  |
| *Chrysococcyx caprius* | Didric Cuckoo | AM |  |
| *Centropus senegalensis* | Senegal Coucal | R |  |
| *APODIDAE* |  |  |  |
| *Apus affinis* | Little Swift | R |  |
| *Rhaphidura sabini* | Sabine's Spinetail | R |  |
| *ALCEDINIDAE* |  |  |  |
| *Halcyon malimbica* | Blue-breasted Kingfisher | R |  |
| *Halcyon senegalensis* | Woodland Kingfisher | R |  |
| *Halcyon leucocephala* | Grey-Headed Kingfisher | R |  |
| *MEROPIDAE* |  |  |  |
| *Merops albicollis* | White-throated Bee-eater | R |  |
| *Merops pusillus* | Little Bee-eater | R |  |
| *CORACIIDAE* |  |  |  |
| *Eurystomus glaucurus* | Broad-billed Roller | R |  |
| *Tockus fasciatus* | African Pied Hornbill | R | GC |
| *CAPITONIDAE* |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Scientific names** | **English names** | **Status** | **Biome** |
| *Pogoniulus scolopaceus* | Speckled Tinkerbird | R | GC |
| *PICIDAE* |  |  |  |
| *Picus canus* | Grey Woodpecker | R |  |
| *HIRUNDINIDAE* |  |  |  |
| *Psalidoprocne nitens* | Square-tailed Saw-wing | R | GC |
| *Psalidoprocne obscura* | Fanti Saw-wing | R | GC |
| *Hirundo lucida* | Red-chested Swallow | R |  |
| *Petrochelidon preussi* | Preeuss's Cliff Swallow | R |  |
| *Hirundo rustica* | Barn Swallow | PM |  |
| *MOTACILLIDAE* |  |  |  |
| *Anthus leucophrys* | Plain - Backed Pipit | R |  |
| *PYCNONOTIDAE* |  |  |  |
| *Andropadus virens* | Little Greenbul | R |  |
| *Chlorocichla simplex* | Simple Leaflove | R | GC |
| *Thescelocichla leucopleura* | Swamp Palm Bulbul | R | GC |
| *Pycnonotus barbatus* | Common Bulbul | R |  |
| *TURDIDAE* |  |  |  |
| *SYLVIIDAE* |  |  |  |
| *Melocichla mentalis* | African Moustached Warbler | R |  |
| *Cisticola erythrops* | Red-faced Cisticola | R |  |
| *Cisticola lateralis* | Whistling Cisticola | R |  |
| *Cisticola brachypterus* | Short Wing Cisticloa | R |  |
| *Prinia subflava* | Tawny-flanked Prinia | R |  |
| *Camaroptera brachyura* | Grey-backed Camaroptera | R |  |
| *Eremomela pusilla* | Senegal Eremomela | R | SG |
| *Sylvietta virens* | Green Crombec | R | GC |
| *Sylvietta denti* | Lemon-bellied Crombec | R | GC |
| *Hypergerus atriceps* | Oriole Warbler | R | SG |
| *MUSCICAPIDAE* |  |  |  |
| *Melaenornis edolioides* | Northern Black Flycatcher | R |  |
| *MONARCHIDAE* |  |  |  |
| *PLATYSTEIRIDAE* |  |  |  |
| *Platysteira cyanea* | Common Wattle-eye | R |  |
| *NECTARINIIDAE* |  |  |  |
| *Hedydipna collaris* | Collared Sunbird | R |  |
| *Cinnyris venustus* | Variable Sunbird | R |  |
| *Cinnyris coccinigastrus* | Splended Sunbird | R | GC |
| *Zosteropessenegalenses* | Yellow White-eye | R |  |
| *LANIIDAE* |  |  |  |
| *Lanius collaris* | Common Fiscal | R |  |
| *MALACONOTIDAE* |  |  |  |
| **Scientific names** | **English names** | **Status** | **Biome** |
| *Tchagra senegalus* | Black-crowned Tchagra | R |  |
| *Dryoscopus gambensis* | Northern Puffback | R |  |
| *DICRURIDAE* |  |  |  |
| *Dicrurus adsimilis* | Fork Tailed Drongo | R |  |
| *CORVIDAE* |  |  |  |
| *Corvus albus* | Pied Crow | R |  |
| *STURNIDAE* |  |  |  |
| *Cinnyricinclus leucogaster* | Violet-backed Starling | AM |  |
| *Ploceus nigerrimus* | Vieillot's Black Weaver | R | GC |
| *Ploceus cucullatus* | Village Weaver | R |  |
| *Quelea erythrops* | Red-headed Quelea | R |  |
| *Euplectes hordeaceus* | Black-winged Bishop | R |  |
| *Euplectes macroura* | Yellow-mantled Widowbird | R |  |
| *ESTRILDIDAE* |  |  |  |
| *Lagonsticta senegala* | Red-billed Firefinsch | R |  |
| *Estrilda melpoda* | Orange-cheeked Waxbill | R |  |
| *Spermestes cucullatus* | Bronze Mannikin | R |  |
| *Spermestes bicolor* | Black-and-white Mannikin | R |  |
| *VIDUIDAE* |  |  |  |
| *Vidua macroura* | Pin-tailed Whydah | R |  |
| *FRINGILLIDAE* |  |  |  |
| *Serinus mozambicus* | Yellow-fronted Canary | R |  |

GC – Guinea-Congo; UGF – Upper Guine Forest; SG Sudan-Guinea; AM – Afrotropical migrants;

PM – Paelaearctic migrant

**Annex XIV List of butterflies recorded during the survey**

|  |  |  |
| --- | --- | --- |
| **Species Name** | **Comm. Name** | **Family** |
| *Precis octavia* | The Gandy Commodore | Nymphalidae |
| *Precis pelarga* | The Common Commondore | Nymphalidae |
| *Precis sinuata* | Wide -Banded Commondore | Nymphalidae |
| *Junonia oenone* | The Dark Blue Pansy | Nymphalidae |
| *Junonia terea* | The Soldier Pansy | Nymphalidae |
| *Junonia stygia* | The Brown Pansy | Nymphalidae |
| *Euryphura chalcis* | The Common commander | Nymphalidae |
| *Neptis nemetes* | The Nemetes Sailer | Nymphalidae |
| *Neptis serena* | The River Sailer | Nymphalidae |
| *Neptis nicoteles* | the Clubbed Sailer | Nymphalidae |
| *Neptis trigonophora* | The Regular Club-Sailer | Nymphalidae |
| *Neptis serena* | The Serena sailer | Nymphalidae |
| *Pseudoneptis bugandensis* | The Blue Sergeant Sailer | Nymphalidae |
| *Aterica gelene* | Forest Glade Nymph | Nymphalidae |
| *Amauris niavius* | The Friar | Nymphalidae |
| *Amauris damocles* | Small Monk | Nymphalidae |
| *Hamanumida dadaelus* | Guinea Fowl | Nymphalidae |
| *Phalanta phalantha* | The Common Leopard Fritillary | Nymphalidae |
| *Hypolimnas salmacis* | The Blue Diadem | Nymphalidae |
| *Hypolimnas misippus* | The Danald Eggfly | Nymphalidae |
| *Danaus chrysippus* | The Plain Tiger | Nymphalidae |
| *Ariadne enotrea* | The African Castor | Nymphalidae |
| *Eurytela hiarbas* | The Pied Piper | Nymphalidae |
| *Palla decius* | White banded-palla | Nymphalidae |
| *Athene definita* | Common indigo ciliate blue | Nymphalidae |
| *Gnophodes chelys* | The Lobed Evening Brown | Nymphalidae |
| *Melantis leda* | The Common evening Brown | Nymphalidae |
| *Bicyclus xeneax* | The Stately Bush Brown | Nymphalidae |
| *Bicyclus procera* | The Cinnamon Bush Brown | Nymphalidae |
| *Bicyclus milyas* | The Lesser Bush Brown | Nymphalidae |
| *Bicyclus vulgaris* | The vulgar Bush brown | Nymphalidae |
| *Bicyclus saftza* | Common Savannah bush Brown | Nymphalidae |
| *Byblia itithyia* | The Joker | Nymphalidae |
| *Byblia anvatara* | The African Joker | Nymphalidae |
| *Pseudacraea eurytus* | The Common False Acraea | Nymphalidae |
| *Euriphene leonis* | The Sierra Leone Nymph | Nymphalidae |
| *Acraea circeis* | The Whie Acraea | Nymphalidae |
| *Acraea parrhasia* | the Yellow-Veined Acraea | Nymphalidae |

|  |  |  |
| --- | --- | --- |
| **Species Name** | **Comm. Name** | **Family** |
| *Acraea pharsalus* | The pharsalus Acraea | Nymphalidae |
| *Acraea egina* | The Elegant Acraea | Nymphalidae |
| *Acraea quirina* | The Common Glassy Acraea | Nymphalidae |
| *Acraea vestalis* | The Smoky Bematistes | Nymphalidae |
| *Acraea epaea* | The Common Bematistes | Nymphalidae |
| *Elymniopsis bammakoo* | African palmfly | Nymphalidae |
| *Melantis leda* | Common evening brown | Nymphalidae |
| *Gnophodes chelys* | Dusky evening brown | Nymphalidae |
| *Charaxes boueti* | Bamboo charaxes | Nymphalidae |
| *Charaxes jasius* | Two-tailed pasha | Nymphalidae |
| *Charaxes protoclea* | Flame-bordered emperor | Nymphalidae |
| *Pseudacraea semire* | Green false Acraea | Nymphalidae |
| *Catuna crithea* | Common pathfinder | Nymphalidae |
| *Bebearia arcadius* | The arcadian | Nymphalidae |
| *Euphaedra medon* | Widespread forester | Nymphalidae |
| *Euphaedra themis* | Common themis butterfly | Nymphalidae |
| *Euphaedra harpalyce* | Common blue-banded forester | Nymphalidae |
| *Catopsilia florella* | African Emigrant | Pieridae |
| *Eurema senegalensis* | Forest Grass Yellow | Pieridae |
| *Eurema hecabe* | Common Grass Yellow | Pieridae |
| *Eurema brigitta* | Small Grass Yellow | Pieridae |
| *Eurema regularis* | Desjardins Grass Yellow | Pieridae |
| *Nepheronia argai* | Large Vagrant | Pieridae |
| *Nepheronia pharis* | Round-Winged Vagrant | Pieridae |
| *Colotis antevippe* | The Large Orange Tip | Pieridae |
| *Colotis euippe* | Round-Winged Orange Tip | Pieridae |
| *Colotis amata* | Small Salmon Arab | Pieridae |
| *Belonios calypso* | Calypso Caper White | Pieridae |
| *Leptosia alcesta* | African Spirit | Pieridae |
| *Mylothris rhodope* | Common Dotted Border | Pieridae |
| *Mylothris chloris* | Common dotted border | Pieridae |
| *Eretis melania* | The Common Elf | Hesperiidae |
| *Abantis bismarcki* | Bismarck"s Paradise | Hesperiidae |
| *Kedestes protensa* | The Western African Ranger | Hesperiidae |
| *Coliades forestan* |  | Hesperiidae |
| *Eagris denuba* | The cream flat | Hesperiidae |
| *Leona melonii* | The melou’s recluse | Hesperiidae |
| *Caenides dacena* | White-Fringed Recluse | Hesperiidae |
| *Coeliades pisistratus* | Two Pip Policeman | Hesperiidae |
| *Papilio nireus* | Narrw-Bnded Green Swallowtail | Papilionidae |
| **Species Name** | **Comm. Name** | **Family** |
| *Graphium leonidas* | Veined Swallowtail | Papilionidae |
| *Papilio dadanus* | Flying handkerchief | Papilionidae |
| *Graphium angolanus* | Angola white lady | Papilionidae |
| *Papilio demodocus* | Citrus butterfly | Papilionidae |
| *Graphium policenes* | Common Striped Swordtail | Papilionidae |
| *Iolaus eurisus* | Royal Sapphire | Lycaenidae |
| *Iolaus moyambina* | Sierra Leone fine Sapphire | Lycaenidae |

**Annex XV Ecological Composition of Study Site**



#### Annex XVI Minutes of Meeting on Land Acquisition (Lungi)

**Government of Sierra Leone**

**Ministry of Energy**



|  |  |  |  |
| --- | --- | --- | --- |
| **Project**  **Title** | **P179267** – REGIONAL EMERGENCY SOLAR POWER  INTERVENTION (RESPITE)  PROJECT | **Meeting Number** | MOM/230516 |
| **Meeting**  **Purpose** | Community consultation on Land acquisition for the RESPITE Project. | | |
| **Meeting**  **Location** | The Premise of the Hon. Paramount Chief Bai Shebora Sheba Gbaneh III, Lungi | **Meeting Date**  **& Time** | 16th May 2023  01:30 Hrs – 02:40 Hrs |

|  |  |  |  |
| --- | --- | --- | --- |
| **Notes prepared by** | Senesie FULLAH | **Distribution**  **Date** | 18th May 2023 |

|  |  |  |
| --- | --- | --- |
| **Present**  **(See annex**  **II)** | 1. P.C. Bai Shebora Sheba  Gbaneh III | Paramount Chief |
| 2. Pa Komrabai Kamara | Chiefdom Speaker |
| 3. Pa Alimamy Smart Kamara | Section Chief |
| 4. Amadu Sesay | Community Rep. |
| 5. Chief Pa Santigie Sesay | Town Chief |
| 6. Osman Kamara | Community Rep. |
| 7. Peter Y. Kamara | Town headman (Gbaneh Bana) |
| 8. Chief Pa Adekalie Q.S Kamara | Town Chief (Gbaneh Bana) |
|  | 9. Mohamed M. Suma | Youth Leader (Gbaneh Bana) |
|  | 10. Mohamed Islam Kamara | Land owner (Gbana Bana) |
|  | 11. Pa Adekalie Conteh | Chief (Gbaneh Bana) |
|  | 12. Fatmata Osayoung | Community Rep (Gbaneh Bana) |
|  | 13. Alusine Kamara | Chiefdom Rep |
|  | 14. Salliu Kamara | EDSA Station Manager Lungi |
|  | 15. Chernoh S. Jalloh | Director of Technical Services (DTS) – EDSA |
|  | 16. John S. Moanah | MOHAPEWA Ltd Rep. (ESIA Consultant) |
|  | 17. Santigie A. Bangura | Electrical Engineer – EDSA –EDSA/PIT |
|  | 18. Augusta Berewa | Social Safeguards & Gender Specialist (SSGS) –  EDSA/PIT |
|  | 19. Senesie Fullah | Senior Environmental Management  Specialist(SEMS) – EDSA/PIT |

|  |  |  |
| --- | --- | --- |
| **NO.** | **DISCUSSION POINTS** | **Resolutions / Action Points/Additional comments** |
|  | **AGENDA OF THE MEETING**  Agenda was as follows:     1. Individual Silent Prayer 2. Introduction 3. Declaration of purpose 4. Consultation with the Community Stakeholders on Land acquisition 5. AOB | * Individual prayers was embarked on by every participants present * The introduction of the EDSA Team was done by the SEMS * Self-introduction was done by the   Community members |
| **1** | **Declaration of Purpose**  The declaration of purpose was done the Director of Technical Services (Mr. Chernor S. Jalloh). He highlighted the Objective of the Consultation;   * To ensure stakeholders are well informed about potential Project benefits. * To ensure that appropriate Project information on environmental and social risks and impacts is clearly communicated to stakeholders in project locations. * To ensure that land cost is well | The Community Stakeholders positively welcome the EDSA Team and expressed their willingness for the successful implementation of the RESPITE  Project. |

|  |  |  |  |
| --- | --- | --- | --- |
|  | communicated and negotiated with land owners appropriately.  ▪ To establish a productive relationship between EDSA, MoE, and stakeholders in the Lungi community. | |  |
| **2** | **CONSULTATION & NEGOTIATION FOR THE COST**  The participation process of stakeholders was simple and transparent, before and during the conduct of the consultation meeting the following methods were employed:   * Direct contact with stakeholders by the EDSA PIT Safeguards team through phone calls requesting stakeholder participation in the consultations/engagement meeting for Lungi on land acquisition and offer. * Face-to-face discussions with stakeholders on land-related issues followed by questions and answers. * Close engagement with land owners for negotiation of cost for proposed project land site at Gbaneh Bana Village (Lungi) | | Various concerns & questions were raised by the Lungi community Stakeholders;   * Project start date and employment opportunities for residents of Lungi. * Employment of locals to be considered as priority * Question on whether the Land is going to be used on lease bases or not?   The EDSA Team responded by;   * Ensuring the Lungi community that the Project will commence sooner preliminary & Safeguards issues/concerns are in place accordance with the Project Environmental & Social Commitment Plan (ESCP) * Highlighting the relevance and benefits of the Project to residents of Lungi community and its surroundings. * That there is project Labor Management Plan which will address relevant recruitment issues including the Local workforce   Presentation of Site/survey Plan (45acres) to the Lungi community Stakeholders through the Paramount Chief   * That the Project Site/land is will be acquired on freehold bases & not lease for the Project activities.     The Community Stakeholders expressed willingness for what was discussed and accepted the negotiated fees of ***“Five Hundred Million Leones” (Le 500, 000,000 – old leones) for the 45 acres Land.*** |
|  |  | | ***Which is about $28,304.56 (exchange rate to be1usd = 17,665SLL;18/5/23)***. |
| **3** | **AOB**  ✓  ✓  ✓  ✓ | Employment opportunities for the  Community members  Equal opportunities in the recruit  process to be considered  Project timing  The Process of transferring the ownership of the Land to the Ministry of Energy (MoE) | * The EDSA Team assured the Community   Stakeholders that the Community members will be recruited by the Project in accordance with Labour Management Plan, except the skills that are not available in the Community.   * Equal opportunities will be given to every member including women, & the Vulnerable groups in terms of recruitment. * The Project will commence as plan by the Project Schedule. * The Land is transferred to MoE through the Conveyance process involving the Port Loko District Council. |

|  |  |
| --- | --- |
| **4** | **Action points**  The following actions were agreed on by the Lungi Community Stakeholders, & EDSA Team |
| **A** | Payment of ***“Five Hundred Million Leones” (Le 500, 000,000 – old leones) for the 45 acres Land to the Land owning Family.*** |
| **B** | To acquire Conveyance & to be signed by the Senior District Officer of Port Loko District Council |
| **C** | Recruitment of Local workforce during implementation of the Project |
| **D** | Continuous Stakeholders engagement |

|  |  |
| --- | --- |
|  |  |
| ***Photo 1:EDSA Team negotiating land cost with Landowners in a consultation meeting in***  ***Lungi*** | ***Photo 2: Cross Section of Land Owners for RESPITE project site in close consultation among themselves*** |
|  |  |
| ***Photo 3: EDSA Team engaging stakeholders on land acquisition for RESPITE project proposed land site in Lungi in which the Survey Site plan was presented by the SEMS to the Stakeholders*** | ***Photo 4: EDSA Director of Technical Services outlining project benefits to stakeholders in a consultation meeting in Lungi*** |

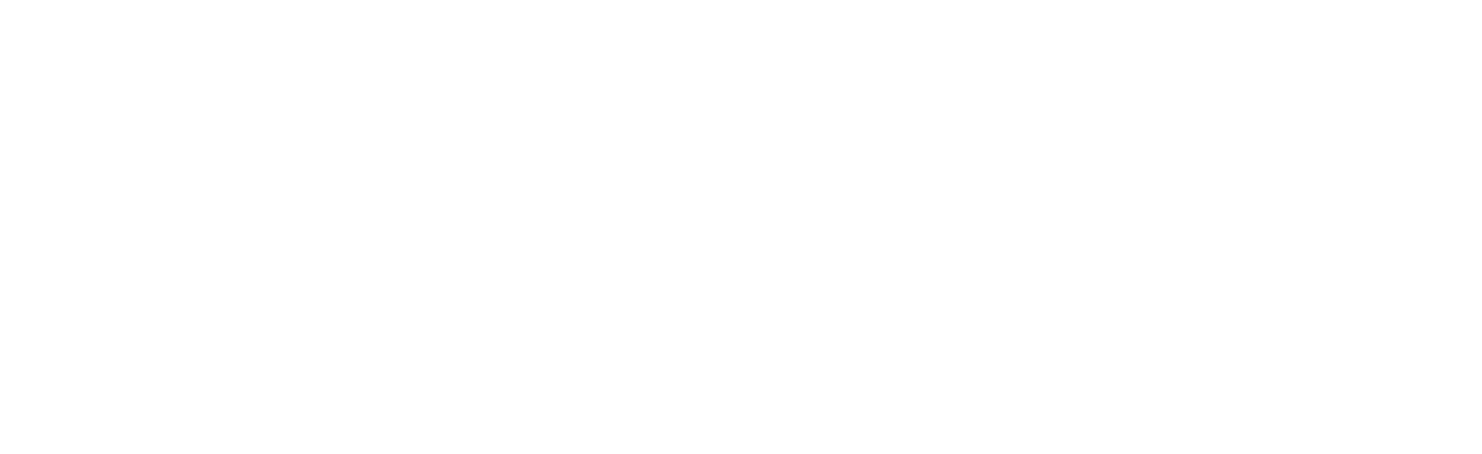
#### Annex XVII Incident Report Forms

The following report form is to be completed by the responsible PIU within 24 hours in the case of an incident: **Part B of ESIRT- To be completed by Borrower within 24 hours**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **B1: Incident Details** | | | | |
|  | | | | |
| **Date of Incident:** | | **Time:** | **Date Reported to PIU:** | **Date Reported to WB:** |
|  | |  |
| **Reported to PIU by:** | | **Reported to WB by:** | **Notification Type**: Email/’phone call/media notice/other | |
|  | |  |  | |
| **Full Name of Main Contractor:** | | | **Full Name of Subcontractor:** | |
|  | | |  | |
| **B2**: **Type of incident (please check all that apply)** | | | | |
|  | | | | |
| Fatality ☐ Lost Time Injury ☐ Displacement Without Due Process ☐ Child Labor ☐ Acts of Violence/Protest ☐ Disease | | | | |
| Outbreaks ☐ Forced Labor ☐ Unexpected impacts on heritage resources ☐ Unexpected impacts on biodiversity resources ☐ | | | | |
| Environmental pollution incident ☐ Dam failure ☐ Other ☐ | | | | |
|  | | | | |
| **B3: Description/Narrative of Incident** | | | | |
|  | | | | |
| *For example:*   * *I. What is the incident?* * *II. What were the conditions or circumstances under which the incident occurred (if known)?* * *III. Are the basic facts of the incident clear and uncontested, or are there conflicting versions? What are those versions?* * *IV. Is the incident still ongoing or is it contained?* * *V. Have any relevant authorities been informed?* | | | | |
|
| **B4: Actions taken to contain the incident** | | | | |
|  | | | | |
|  | | | | |
| **Short Description** | **of** | **Responsible Party** | **Expected Date** | **Status** |
| **Action** |  |  |  |
|
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| **For incidents involving a contractor:** Have the works been suspended under Contract GCC8.9? Yes ☐**;** No ☐**;** Name of | | | | |
| Contractor: | | | | |
|
| **B5: What support has been provided to affected people** | | | | |
|  | | | | |
|  | | | | |

|  |  |  |
| --- | --- | --- |
| **C1: Corrective actions from the investigation to be implemented (To be fully described in Corrective Action**  **Plan)** | | |
| **Short Description of Action (SEA/SH e*xamples*)** | **Responsible**  **Party** | **Expected Date** |
| *Referral of victim to holistic care services* |  |  |
| *Disciplinary actions, including sanctions, to be applied following misconduct investigation.* |  |  |
| *Measures to prevent similar instances from happening in the future.* |  |  |
| *Measures to address gaps in procedural manuals or implementation of procedures that contributed.* |  |  |
| *Measures to change/modify program practices to prevent recurrence* |  |  |
| *Where additional training might be needed* |  |  |

**To be completed by Borrower (following investigation)**



*Please*

*replace*

*text*

*in*

*italics*

*with*

*findings,*

*noting*

*for*

*example:*

*where*

*and*

*when*

*the*

*incident*

*took*

*place*

*who*

*was*

*involved,*

*and*

*how*

*many*

*people/households*

*were*

*affected*

*what*

*happened*

*and*

*what*

*conditions*

*and*

*actions*

*influenced*

*the*

*incident*

*what*

*were*

*the*

*expected*

*working*

*procedures*

*and*

*were*

*they*

*followed*

*did*

*the*

*organization*

*or*

*arrangement*

*of*

*the*

*work*

*influence*

*the*

*incident*

*were*

*there*

*adequate*

*training/competent*

*persons*

*for*

*the*

*job,*

*and*

*was*

*necessary*

*and*

*suitable*

*equipment*

*available*

*what*

*were*

*the*

*underlying*

*causes;*

*where*

*there*

*any*

*absent*

*risk*

*control*

*measures*

*or*

*any*

*system*

*failures*



**C1:**

**Investigation**

**Findings**

|  |  |  |
| --- | --- | --- |
| **C2: Corrective Actions from the investigation to be implemented (to be fully described in Corrective Action Plan)** | | |
| **Action** | **Responsible Party** | **Expected Date** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Annex XVIII Socio-Economic Household Survey**

SOCIO-ECONOMIC HOUSEHOLD SURVEY

Environmental Impact Assessment forRegional Emergency Solar Power Intervention (RESPITE) **- (Individual Interview)**

***Name of Community: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Community Type 1. Rural 2. Urban Constituency: \_\_\_\_\_\_\_\_\_\_\_\_***

***Ward: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date of survey: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***Name of interviewer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Name of supervisor: \_\_\_\_\_\_\_\_\_\_\_\_\_***

***Questionnaire ID-Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

**The enumerator explains to the respondent the purpose of the survey and assurance of confidentiality of information provided**

**SECTION A – HOUSEHOLD HEAD & HOUSEHOLD DEMOGRAPHIC CHARACTERISTICS**

|  |  |  |
| --- | --- | --- |
| 1 | Who are you in this household? | ¨ 1 = Household Head  ¨ 2 = Spouse of Household Head  ¨ 3 = Son/daughter of household head  ¨ 4 = Brother/sister of household  ¨ 5 =mother/father of household head  ¨ 6 =other(s) specify |
| 2 | Household head’s gender | ¨ 1 = Male ¨ 2 = Female |
| 3 | Household head’s age | ¨ 1 = 19 to 29 years ¨ 2 = 30 to 39 years  ¨ 3 = 40 to 49 years ¨ 4 = 50 to 59 years  ¨ 5 = 60 to 69 years ¨ 6 = 70 & above |
| 4 | Marital status of household head? | ¨ 1 = Single ¨ 2 = Married  ¨ 3 = Divorced/Separated ¨ 4 = Widowed |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | |  | |
| 5 | If **male-headed**-household, how many wives has the household head got? | | ¨ 1 = one ¨ 2 = two ¨ 3 = three ¨ 4 = four | |
| 6 | How many households are living in this dwelling unit? | | ¨ 1 = One household ¨ 2 = Two households  ¨ 3 = Three households  ¨ 3 = More than three households | |
| 7 | Can the HH read and write in any language? | | 1-No 2-Yes | |
| 8 | If yes, which language? | | …………………………………….. | |
| 9 | What is the educational level of the household head? | | ¨ 1 =never went to school  ¨ 2 = Primary school level ¨ 3= JSS Level  ¨ 4 = SSS Level ¨ 5 = Tertiary level  ¨ 6 = Vocational school ¨ 7 = Arabic education | |
| 10 | To which ethnic group does the household head belong? | | ¨ 1 = Temne ¨ 2 = Kono ¨ 3 = Mende  ¨ 4 = Limba ¨ 5 = Fula ¨ 6 = Loko  ¨ 7 = Madingo ¨ 8 = Kissi ¨ 9 = Krio  ¨ 10 = Sherbro ¨ 9 = Foreign National (Specify) :  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  ¨ 9 = Other, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| 11 | what is the predominant language spoken by household? | | …………………………………….. | |
| 12 | What is the religion of your household head? | | ¨ 1 = Christian ¨ 2 = Muslim | |
| 13 | Was the household head born in the project area? | | ¨ 1 = Yes (if yes go to **Q14**)  ¨ 2 = No | |
| 14 | If NO, how long has the household head been resident in the area? | | ¨ 1 = 1 to 10 years ¨ 2 = 11 to 20 years  ¨ 3 = 21 to 30 years ¨ 4 = 31 to 40 years  ¨ 5 = 41 to 50 years | |
| 15 | If NO, where was the household head born? | | ¨ 1 = other part of the Western Rural/North-West | |
|  |  |  | | ¨ 2 = The western area ¨ 3 = Northern region  ¨ 4 = Eastern region  ¨ 5= Southern region  ¨ 6 = Other country, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| 16 | If NO, what was the main reason for household head settling in this area? | ¨ 1 = Accommodation ¨ 2 = Marriage  ¨ 3 = Employment ¨ 4 = Trading  ¨ 5 = Fishing ¨6 = Other, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | |
| 17 | Household size  (Total number of household members by sex) | 1. Male 2. Female | | | |
| 18 | Number of Adults  (Total number of adult household members by sex) | 1. Male 2. Female | | | |
| 19 | Number of children  (Total number of children in HH by sex) | 1. Male 2. Female | | | |
| 20 | Do you have any disabled persons in your household | ¨ 1 = Yes ¨ 2 = No | | | |
| 21 | If yes, could you please share what their disability it is? |  | | | |

**SECTION B – LAND, DWELLING RELATED INDICATORS AND OTHER ASSET OWNERSHIP**

|  |  |  |
| --- | --- | --- |
| 22 | Do you own land in this community? | ¨ 1 = Yes ¨ 2 = No |
| 23 | What is the tenancy status? | ¨1= Owned  ¨2= Rented  ¨6= Free |
| 24 | How many rooms does your household occupy? |  |
| 25 | What is the major construction material of the roof? | ¨1= Thatch, Straw  ¨2= Wood, Planks  ¨3= Corrugated metal/aluminium sheet ¨4=  Asbestos  ¨5= Bamboo  ¨6= Concrete(cement)  ¨7= Other |
| 26 | What is the major construction material of the exterior wall? | ¨1= Thatch, Straw  ¨2= Mud and poles  ¨3= Timber/wood  ¨4= Corrugated metal/aluminium sheet  ¨5= Burnt bricks with mud  ¨6= Burnt bricks with cement  ¨7= Cement blocks  ¨8= Stone  ¨9= Other |
| 27 | What is the major material of the floor? | ¨1= Mud/soil/earth  ¨2= Cement  ¨3= Tiles  ¨4= Wood  ¨5= Other |

SECTION C – ECONOMIC ACTIVITIES, INCOME, AND EXPENDITURE

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 28 | What is the current employment status of HH? | 1-Self-employed in agriculture 2- Self-employed in non-farm enterprise/Trading   1. Casual worker /unprotected, unskilled wage worker 2. Regular/ protected salaried worker (private) 3. Public servant 4. Student 5. House Help 6. Unemployed, looking for a job 7. Unwilling to work or retired 8. Not able to work (handicapped) |
| 29 | What is the average monthly income from HH’s current employment? |  |
| 30 | How much does HH make from other income sources monthly? |  |

Section D – PERCEPTION OF PROPOSED PROJECT

**(The field worker now explains to the respondent about the** Regional Emergency Solar Power Intervention (RESPITE)

|  |  |  |  |
| --- | --- | --- | --- |
| **Project Perceptions & Expectations** | |  | |
| 31 | Have you ever heard about Regional Emergency Solar Power Intervention (RESPITE)? | ¨ 1 = Yes  ¨ 2 = No | |
| 32 | If yes, how do you feel about the proposed Regional Emergency Solar Power Intervention (RESPITE)? | ¨ 1 = Good ¨ 2 = Bad ¨ 3 = Indifferent | |
| 33 | What positive impacts do you envisage from the proposed Regional Emergency Solar Power Intervention (RESPITE) on your livelihood? | 3. 4.  5. | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 34 | What negative impacts do you envisage from the proposed Regional Emergency Solar Power Intervention (RESPITE)on your livelihood? | 1. 2.  3. | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 35 | What measures should be put in place to address the negative impacts? | 1.  2. | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  |  | 3. | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**SECTION E: EDUCATION**

|  |  |  |
| --- | --- | --- |
| 36 | Are there any child(ren) of primary school-going age (6 to 13 yrs) in the household | ¨ 1 = Yes ¨ 2 = No |
| 37 | If yes, Do all children between the ages of 6 to 13 years that are supposed to be in primary school in your household attend school? | ¨ 1 = Yes ¨ 2 = No (if No, go to **Que.41**) |
| 38 | If YES, name of primary school? | Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 39 | Location of primary school | Location: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 40 | Distance of primary school? | Distance: \_\_\_\_\_\_\_\_\_\_\_ miles |
| 41 | If NO, how many children between the ages of 6 to 13 years do not attend primary school? | ¨ 1 = Boy(s): \_\_\_\_\_\_\_\_\_\_\_  ¨ 2 = Girl(s): \_\_\_\_\_\_\_\_\_\_\_ |
| 42 | If NO, what is/are the reason(s) that the children between the ages of 6 to 13 years not attending primary school? | ¨ 1 = No primary school in community/school is too far away  ¨ 2 = Cost of schooling not affordable  ¨ 3 = Early pregnancy  ¨ 4 = Unwanted pregnancy  ¨ 5= To assist household with business and/or farming activities  ¨ 6 = Other(s), specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 43 | Does your household pay school fees for primary education? | ¨ 1 = Yes ¨ 2 = No (If No go to **Que. 45**) |
| 44 | How easy or difficult do you find it to raise the fees? | ¨ 1 = With ease ¨ 2 = With some constraint  ¨ 3 = Very difficult and sometimes cannot afford |
| 45 | Do your household have secondary school-going pupil(s) that had dropped out  of school | ¨ 1 = Yes ¨ 2 = No |
| 46 | If yes, what is/are the reason(s) that supposed secondary school pupils not attending school? | ¨ 1 = No secondary school in community/school is too far away  ¨2 = Cost of schooling not affordable  ¨ 3 = Early pregnancy  ¨ 4 = Unwanted pregnancy  ¨5 = commercial bike riding  ¨ 6= To assist the household with business activities ¨ 7 = marriage  ¨ 6 = Other(s), specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 47 | Where do children in your household access secondary education? | Name:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 48 | Location of secondary school | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 49 | Distance of secondary school | \_\_\_\_\_\_\_\_\_\_\_ miles |

**SECTION F- HEALTH INDICATORS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| 50 | In the last **two weeks** has any member of your household | **CHOOSE ALL THAT APPLY** | | |
| Malaria |  |  |
| Diarrhoea/dysentery |  |
| Skin diseases/rash |  |
| Cold, cough and/or flu |  |
| Vomiting/stomach problems |  |
| Typhoid |  |
| Sucking blood (leach) |  |
| Worm infection |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | fallen sick from the following diseases | Tuberculosis | 1= Yes  2= No |  |
| Eye irritation |  |
| River blindness |  |
| Anaemia |  |
| Any other illness,  Specify……… |  |  |
| 51 | Generally, what do you think is the main cause of each of the following diseases | **Disease** | **Cause of Disease** | |
| Malaria |  | |
| Diarrhoea/dysentery |  | |
| Skin diseases/rash |  | |
| Cold, cough and/or flu |  | |
| Vomiting/stomach problems |  | |
| Typhoid |  | |
| Sucking blood (leach) |  | |
| Worm infection |  | |
| Tuberculosis |  | |
| Eye irritation |  | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | River blindness | |  |
| Anaemia | |  |
| Any other illness,  Specify……… | |  |
| 52 | In case of (serious) sickness, where does your household go for treatment?  **(Please state only one - the most frequently used source of treatment)** | | ¨ 1 = Hospital (Government)  ¨ 2= Hospital (Private)  ¨ 2 = Community health centre (Government)  ¨ 3 = Traditional doctor/healer  ¨ 4 = Drug peddler  ¨ 5 = Pharmacy  ¨ 6 = Other(s), specify: | |
| 53 | Location | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| 54 | Distance of health facility | | \_\_\_\_\_\_\_\_\_ miles | |
| 55 | How many meals do you and your household take in a day? | | …................................... | |
| 56 | Have you heard of the sickness HIV/AIDS? | | ¨ 1 = Yes ¨ 2 = No | |
| 57 | If Yes, from whom or what did you first hear about it? | | ¨ 1 = Health worker  ¨ 2 = Media (TV, radio, newspaper)  ¨ 3= Family member or friend  ¨ 4= School | |
| 58 | Based on what you know, state the way(s) by which people can get infected by HIV/AIDs,) | | 4. ……………………………………………… ……………… | |

|  |  |  |
| --- | --- | --- |
|  |  | 1. ………………………………………………   ……………..   1. ……………………………………………… 2. ……………………………………………… |
| 59 | Would you buy cooked food from someone infected with HIV/AIDS Virus? | ¨ 1 = Yes ¨ 2 = No |
| 60 | Would you allow a teacher infected with HIV/AIDS Virus to teach your child? | ¨ 1 = Yes ¨ 2 = No |
| 61 | Have you and/or any member of your household members been tested for HIV/AIDS | ¨ 1 = Yes  ¨ 2 = No, reason(s) \_............................. |
| 62 | Have you heard of Corona Virus (COVID 19)? | ¨ 1 = Yes ¨ 2 = No |
| 63 | If yes, where did you hear about it? | ¨1= Health worker  ¨2= Media (TV, radio, newspaper) ¨3= Family member or friend school  ¨4= Other (specify) |
| 64 | Based on what you know, state the way(s) by which people can get infected by COVID 19 | ¨ 1 = Yes ¨ 2 = No |
| 65 | Have you and/or any member of your household members been tested for COVID 19? | ¨ 1 = Yes ¨ 2 = No |
| 66 | Has any member of your Household been tested positive for COVID-19? | ¨ 1 = Yes ¨ 2 = No |
| 67 | To your knowledge, has anyone in the community been infected of COVID-19? | ¨ 1 = Yes ¨ 2 = No |

**SECTION G: POTABLE WATER AND SANITATION**

|  |  |  |
| --- | --- | --- |
| 68 | What is the main source of drinking water for your household? | ¨1 = Pipe borne water  ¨2 = Open Well ¨3 = River/stream/lake  pond/spring/dugout/irrigation canal  ¨4 = Hand pump well  ¨5 = Rain water  ¨6 = Borehole |
| 69 | Is the water source within your compound or neighbouring compound? | ¨ 1 = Yes ¨ 2 = No |
| 70 | what is the average distance between your house and water source? | \_\_\_\_\_\_\_\_ minutes (walking) |
| 71 | How does your household usually dispose of household waste? | **CHOOSE ALL THAT APPLY** |
| ¨1 = Burn/bury  ¨2 = Throw in the bush  ¨3 = Throw in the sea/stream  ¨4 = Used to make compost  ¨5 = Waste company (clean salone, masada)  ¨6 = public/community dump site |
| 72 | What type of toilet facility does your household have and do make use of? | ¨1. Flush ¨ 2 = Stream/river ¨ 3 = Bush  ¨ 3 = Bucket ¨ 4 = Traditional pit latrine  ¨ 5 = Ventilated pit latrine ¨ 6 = Others (specify):  \_\_\_\_\_\_\_\_\_\_\_ |

**SECTION H: ENERGY**

**Energy**

73

What is/are the main source of energy for

lighting in your household?

¨

1=

EDSA

¨

2=

Electricity from generator

¨

Electricity from communal Solar

3=

¨

Electricity from private Solar

4=

¨

Flash light (Chinese Light

)

5=

¨

Candle

6=

74

How money is spent on household electricity

monthly?

75

What is/are the main source(s) of energy for

cooking in your household

¨

1

. Wood

¨

= Charcoal

2

¨

= Kerosene

3

¨

4

Gas

Other, specify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. The proponent must obtain a license to sink a borehole, and the contractor responsible for the drilling must also be licensed by the agency.

   [↑](#footnote-ref-1)
2. The purpose of the MOU is to establish a collaborative framework between Electricity Distribution and Supply Authority (EDSA) and KRISS ENTERPRISE (KE) for the Collection, Recycling, and Safe Disposal of used and expired Solar Batteries from designated RESPITE project sites specifically Lungi and Newton, for a period of fifteen years (after the battery life cycle of operation).

   [↑](#footnote-ref-2)
3. Annex 5: Climate and Hazard Considerations of the PAD:

   [https://documents1.worldbank.org/curated/en/099655012092213765/pdf/BOSIB0982688f909f0b3870c1ea29 a534dd.pdf](https://documents1.worldbank.org/curated/en/099655012092213765/pdf/BOSIB0982688f909f0b3870c1ea29a534dd.pdf)  [↑](#footnote-ref-3)
4. This includes the cost of equipment and the training of PIU staff [↑](#footnote-ref-4)
5. Monitoring during project implementation provides information about key environmental and social impacts of the project and the effectiveness of mitigation measures. Such information enables the Borrower and the Bank to evaluate the success of mitigation as part of project supervision, and allows corrective action to be taken when needed. [↑](#footnote-ref-5)