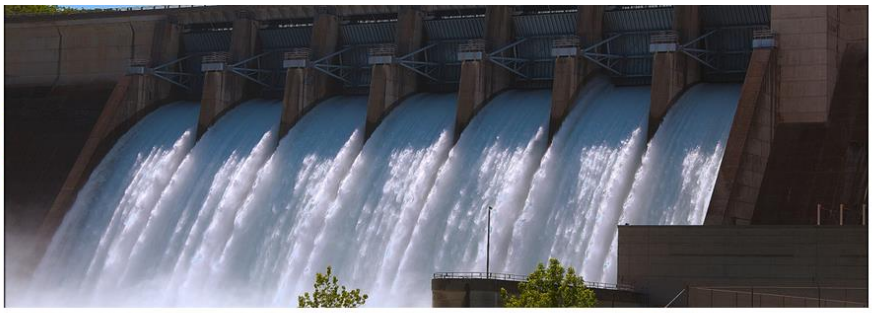
PWALUGU MULTIPURPOSE DAM PROJECT

50MW SOLAR HYBRID PROJECT IN THE WEST MAMPRUSI MUNICIPAL OF THE NORTH EAST REGION, GHANA




ENVIRONMENTAL IMPACT ASSESSMENT: SCOPING REPORT

VOLTA RIVER AUTHORITY

NOVEMBER 2020

CORPORATE ENVIRONMENTAL POLICY STATEMENT

The Volta River Authority (herein referred to as "the Authority") is a public power utility and supplies electricity to industries and mining companies as well as distribution companies in Ghana. The Authority commits to ensuring continuous improvement of environmental performance that minimizes potential impacts of all its operations on the environment in accordance with the principles of sustainable development and complying with national and international environmental protection regulations.

In respect of the above, VRA will:

1. Make environmental considerations a priority in all business planning and decision-making and comply with relevant national and international environmental protection regulations.
2. Take reasonable steps to mitigate the impact of its actions with regard to the development, operation and management of its assets.

VRA will thus pursue the following specific objectives:

a. Develop and implement Environmental Management Systems for all its business units to:

   i. Assess environmental impact of processes, operations and products.
   ii. Focus on pollution prevention and waste reduction.
   iii. Ensure compliance with national/international environmental protection regulations.
   iv. Set annual environmental targets to ensure continuous improvements.
   v. Monitor and report on environmental performance as required to the appropriate stakeholders.

b. Ensure minimum environmental impact of VRA's projects and take adequate steps to mitigate any such anticipated adverse impacts as far as is practicable.
c. Promote environmental awareness and individual sense of responsibility among its employees through print material for distribution, safety meetings, and the corporate website which will continue to be updated, and provide adequate empowerment and training for personnel to perform environmental jobs satisfactorily.
d. Support research efforts on materials, products, processes and pollution reduction techniques that are directly related to its operations.
e. Contribute to the development of public policy and programmes that enhance environmental awareness and protection.
f. Promote open communication on environmental issues.
g. Undertake projects and programmes in collaboration with relevant agencies to preserve the Volta Lake resource, and reasonably restore/mitigate ecological imbalance caused by the creation of the lake.
h. Undertake projects and programmes to mitigate the impact on the livelihood of individuals and communities displaced or affected by VRA's developmental projects.

VRA shall design evaluation procedures for all processes that fall under this policy to ensure that these processes comply. Deficiencies, in the policy or in the evaluation procedure, shall be addressed as required. Each employee of VRA is charged to exercise his or her responsibility on behalf of VRA to assure that the intentions of this Policy Statement are diligently carried out.

Approved by: Emmanuel Antwi-Darkwa — Date: 18-6-2019
CHIEF EXECUTIVE

VOLTA RIVER AUTHORITY

REPORT DETAILS

Title	Environmental Scoping Report for the Pwalugu Multi-Purpose Dam Project - 50MW Solar Hybrid Project in the West Mamprusi Municipal of the North East Region, Ghana
Project Description	This Scoping Report forms part of a series of reports and information sources that are being provided during the EIA Process for the proposed project. This scoping exercise has been undertaken to help provide an indication of the ecological, social and economic impacts that may arise following the establishment of the solar hybrid power facility, based on which the terms of reference for the study, including the spatial and temporal boundaries for the EIA, has been defined for approval by the EPA.
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Date	November 2020

DOCUMENT CONTROL SHEET

REPORT TITLE:	Environmental Scoping Report for the Pwalugu Multi-Purpose Dam Project - 50MW Solar Hybrid Project in the West Mamprusi Municipal of the North East Region, Ghana		
DATE:	November 2020		
REPORT STATUS:	Final Copy		
PROPONENT:	Volta River Authority		
INTERNAL DOCUMENT DISTRIBUTION			
Type	**Institution**	**Recipient Name**	**Location**
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NOTE:

Hard Copies are held and distributed by the Environment & Sustainable Development Department of VRA. Electronic copies of this report are issued in portable document format and posted on the Corporate website of the Volta River Authority at www.vra.com.

ACRONYMS AND ABBREVIATIONS

AC	-	Alternating Current
AIDS	-	Acquired Immunodeficiency Syndrome
AMSL	-	Above Mean Sea Level
AoI	-	Area of Influence
ASTM	-	American Society for Testing and Materials.
BPA	-	Bui Power Authority
CFMP	-	Carbon Footprint Management Programme
DC	-	Direct Current
DCE	-	District Chief Executives
DCP	-	Decommissioning and Site Closure Plan
DISCos	-	Power distribution companies
EC	-	Energy Commission
ECG	-	Electricity Company of Ghana
EEMC	-	Environ Engineering & Management Consult
EHS	-	Environmental, Health & Safety
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
EP	-	Environmental Permit
EPA	-	Environmental Protection Agency
EPC	-	Engineering, Procurement, and Construction
ESS	-	Environmental and Social Standards
ETU	-	Electricity Transmission Utility
FSD	-	Forest Services Division
GENCos	-	Power Generation Companies
GES	-	Ghana Education Service
GHG	-	Greenhouse Gas
GNGC	-	Ghana National Gas Company
GNPC	-	Ghana National Petroleum Corporation
GoG	-	Government of Ghana
GRIDCo	-	Ghana Grid Company
GRM	-	Grievance Redress Mechanism
GS	-	Ghana Standards
GSA	-	Ghana Standards Authority
H&S	-	Health & Safety
HIV	-	Human Immunodeficiency Virus
HPP	-	Hydroelectric Power Plant
I&APs	-	Interested & Affected Persons
ICT	-	Information, Communication & Technology
IEC	-	International Electrotechnical Commission
IFC	-	International Finance Corporation
ILO	-	International Labour Organisation
IPCC	-	Intergovernmental Panel on Climate Change
IPPs	-	Independent Power Producers
ISO	-	International Organisation for Standardization
JHS	-	Junior High School
LARP	-	Land Acquisition & Resettlement Plan
LEAP	-	Livelihood Empowerment Against Poverty

LI	-	Legislative Instrument
MCE	-	Municipal Chief Executives
MoEn	-	Ministry of Energy
MW	-	Mega Watt
NED	-	Northern Electricity Department
NEDCo		Northern Electricity Distribution Company
NES	-	National Electrification Scheme
NGO	-	Non-Governmental Organisation
NITS	-	National Interconnected Transmission System
O&M	-	Operational and Maintenance
OHS	-	Occupational Health and Safety
OHSAS	-	Occupational Health and Safety Assessment Series (
OPD	-	Outpatient Department
OPGW	-	Optical Ground Wire
OVCs	-	Orphan Vulnerable Children
PAPs	-	Project-affected Persons
PMDP	-	Pwalugu Multipurpose Dam Project
PNDC	-	Provisional National Defence Council
PS	-	Performance Standard
PURC	-	Public Utility Regulatory Commission
PV	-	Photovoltaic
RAP	-	Resettlement Action Plan
RDTs	-	Rapid Diagnostic Tests
RE	-	Renewable Energy
REMP	-	Renewable Energy Master Plan
RoW	-	Right-of-Way
SDGs	-	Sustainable Development Goals
SEP	-	Stakeholder Engagement Plan
ToR	-	Terms of Reference
UK	-	United Kingdom
VRA	-	Volta River Authority
WBG	-	World Bank Group
WPP	-	Wind Power Project

EXECUTIVE SUMMARY

INTRODUCTION

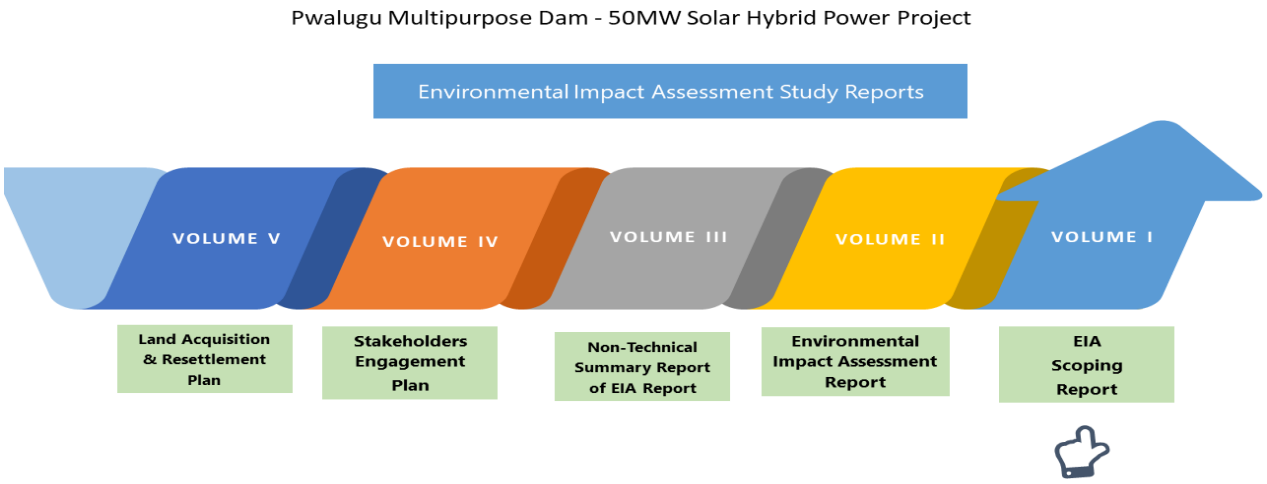
The Volta River Authority (VRA) proposes to construct and operate a 50MW solar hybrid power plant on a 1.40 Km^2 of land at Kurugu in the West Mamprusi Municipal in the North East Region of Ghana. Project development is to meet the power system demands of the associated 59.6MW Hydroelectric Power Plant (HPP) component of the Pwalugu Multipurpose Dam Project (PMDP). The power generated will be connected to the expanded substation of Pwalugu Hydropower Station for combined operation, featuring hydro-photovoltaic hybrid demonstration effect. The project, titled the "**Pwalugu Multi-Purpose Dam Project – 50MW Solar Hybrid Project**" (hereinafter referred as the "Project"), will be at an estimated cost of around US$55.3 Million and construction will be by Power China International Group Limited.

Specific objectives of the project are:

- To keep water volume balance during the daytime without affecting power generation benefits of the hydropower station.
- To utilize solar as an additional source of generation to supply the increasing domestic and export demand.
- To align VRA's generation capacity development with Ghana's Renewable Energy Master Plan (2019) that seeks 10% of all electricity generation to come from renewable sources.

Under the provisions of the Ghana Environmental Assessment Regulations, 1999 (LI 1652), power generation and transmission projects of this nature are categorized under environmentally critical projects for which an Environmental Permit is required from the Environmental Protection Agency (EPA). Based on project registration, the EPA in October 2020 directed VRA to undertake a scoping exercise to generate the relevant terms of reference to guide a satisfactory EIA Study as well as serve Scoping Notice to facilitate stakeholder involvement. The scoping exercise has culminated in the production of this Scoping Report for submission and review by the EPA.

Even though this Scoping Report is a standalone document, it is to form part of the suite of documents that are being prepared as part of the environmental assessment process of the project to ensure adherence to international best practice and represents Volume I of the expected five (5) reports as shown below. It is therefore important that the implementation of the outcome of the Environmental Assessment is linked to the requirements of all these documentations.



DESCRIPTION OF EXISTING POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

Key national policy and legislation, with their relevant standards, guidelines and codes applicable to the envisaged project relates to that of the following:

- Assessment and Management of Environmental and Social Risks and Impacts
- Labour & Working Conditions
- Resource Use Efficiency & Pollution Protection
- Community Health, Safety and Security
- Land Acquisition & Involuntary Resettlement
- Cultural Heritage
- Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Financial Intermediaries
- Climate Change
- Gender & Vulnerability

This categorisation has been done in order to align with that of World Bank Group Environmental And Social Safeguards Standards (ESS), August 2016 and includes cross cutting issues such as Climate Change and Gender & Vulnerability, as required by Ghana EPA. Within this context, the list of national legal instruments as compared to the requirements of the ESS has been provided and how the project intends to comply with these legal instruments shall be discussed in the Main EIA Report.

PROJECT DESCRIPTION & CONSIDERATION OF ALTERNATIVES

The solar site at Kurugu is about 25.5km from the Walewale Township and about 13km off the Walewale-Bolgatanga N10 Highway at Wulugu. This 13km road from Wurugu to the project site which passes through Kulunga, Kparkpiri, Kpatusi and finally to Kurugu is an untarred feeder road and poor in nature. The project site has a Rating of Solar Energy Resource Stability (RW) of 0.755, and this is considered to have a "**Very Stable**" solar energy resource making Kurugu a suitable site for the development of the solar hybrid plant, and thus the rationale for selecting the site. The design

installed capacity of the project is 50MW (AC), and the total land occupation area of the power station layout area is 0.52 Km^2, representing 37% of the land area to be acquired to allow for future expansion. A 7km 34.5Kv sub-transmission line is to be developed to connect the PV plant directly to the Hydropower Plant Substation for mutualization of the electrical components and easy operation of both plants.

A description of the project activities from preconstruction, construction, operation and maintenance and decommissioning phases are summarised as below.

Phase	Activities
Pre-Constructional Phase (Ongoing)	▪ Solar radiation and yield study, electrical grid studies, etc. ▪ Stakeholder Engagements ▪ Identification of Land Area & Site ▪ Site Surveys ▪ Feasibility Studies involving ▪ Land Acquisition & Compensation ▪ Acquisition of permits and licensing ▪ Design and finalization with EPC Contractor
Constructional Phase (1-Year Period)	▪ Stakeholder Engagements ▪ Monitoring and evaluation of land acquisition and compensation actions. ▪ Contractor mobilization, including engagement of labour ▪ Strengthening of access roads. ▪ Site Preparation ▪ Construction of site office and internal roads. ▪ Construction of temporary storage facilities. ▪ Transportation of construction materials. ▪ Mobilising and operating construction equipment, machinery and DG's ▪ Transportation of solar modules and ancillary facilities ▪ Foundation excavation, piling and construction for solar mounts, ▪ Electrical cable laying and installation of PV module and Transformer. ▪ Construction of sub-station and office buildings ▪ Installation of inverter and transformers ▪ Foundation laying for ground mounted structures. ▪ Excavation foundation and erection of transmission line towers ▪ Stringing of transmission lines.
Operational & Maintenance Phase (25-Year Period)	▪ Stakeholder Engagements ▪ Periodic cleaning of PV modules. ▪ Control of vegetation viz. weeds, bushes etc. within the site and those immediately surrounding it. ▪ Routine inspection of all PV modules and associated structures viz. cables, transformers, inverters, mounting structures etc. ▪ Operation and maintenance of ancillary facilities such as power substation. ▪ Inspection and maintenance of transmission lines; and ▪ Inspection and maintenance of internal site pathways/access roads.

Phase	Activities
Decommission Phase (1 Year Period)	▪ Stakeholder Engagements ▪ Removal of PV Module ▪ Removal of ground mounted structures, ancillary facilities

The Environmental Assessment process as required under LI 1652 of 1999 mandates the provision of an outline of the main alternatives considered and the main reasons for the preferred choice. Subsequently, the alternatives to be considered in this study are as follows:

a. 'No Action' Alternative
b. Alternatives for the Generation of Electricity from a Non-Renewable Resource
c. Site Location Alternative
d. PV Technology Alternatives
e. PV Module Technology Selection
f. Transmission Line Selection

This will be expanded based on review comments on this Scoping Report from the Ghana EPA. Following this, a full description of the process followed to select the proposed preferred activity, considering environmental, social and economic variables will be provided in the Main EIA Report.

DESCRIPTION OF EXISTING ENVIRONMENT

The Kurugu village is about 1km North of the site with the Kpatuse village being about 0.5km South of the site. The proposed solar site of Kurugu is rural and serene and experiences virtually no public transportation. Thus, traffic load from vehicles on that road network is very low. There is a feeder road from Wulugu to the Solar Hybrid project site. Within the project site itself, are various routes that are utilised by the local communities on a daily basis for their movements and the acquisition of the land will require a diversion of these routes. Land use at the site was identified as being mainly for farming purposes. The site has flat terrains and bounded at all ends by farmlands and uncultivated savannah vegetation, with the exception of the easting end which is an untarred feeder road, which provides access to the site.

The site is currently for agricultural use, with current agricultural practises including mixed farming of crops such as maize, millet, soya bean, groundnut, okro, Bambara beans and tomatoes. Economic trees such as Shea and Dawadawa are also common. Livestock like cattle, goats and sheep were abundant in the area. There is a new 34.5kV line from Wulugu to Kulugu which is still under construction and runs along the road on the side of the site. There are some settlements (hamlets) of Fulani herdsmen within the area of interest, but are located outside the project site. Most of the developments within the project enclave are traditional mud houses designed for occupation by households. Compound subsistence farming is the pattern of farming in the area.

The baseline noise was observed to be exceptionally tranquil and rural and comprised mainly of natural noise form sources such as insects, birds, and wind in the trees and foliage. For this EIA, measurement of noise and air quality on the project site is being established for monitoring purposes and the results will be provided in the Main EIA Report. Climatic data covering years 2010-2019

has been obtained from the nearest national synoptic weather station at Navrongo, Weather station: 654010 (DGLN) located at Latitude: 10.9 | Longitude: -1.1 | Altitude: 201 and this will be provided in the Main EIA Report for climatological analyses, to provide a clearer picture of the climatic conditions in the project area.

From the field survey, there are no visible sources of surface water on the PV site. The site has an elevations of 235 - 255m, with flat terrains and is generally lateritic gravel with fused laterite. The soil type in some areas is however loamy. The Municipal is mainly drained by the White Volta and its tributaries, the Sissili and the Kulpawn rivers. Hydrological simulations of various flood scenarios carried out as part of the EIA shows that Kurugu is not flooded even under a 1-in-1,000 year flood. In addition, interviews during the fieldwork also suggests that Kurugu does not suffer from flooding. This is because elevation of Kurugu is over 200 metres above mean sea level (amsl) compared to the elevation of the river bank of about 140m amsl. Hand-dug wells have been found to be the most preferred option of sources of water for the community members

The natural vegetation of the district is classified as Guinea Savannah Woodland, and is generally composed of short trees of varying sizes and density, growing over a dispersed cover of perennial grasses and shrubs and this is typical of the project area. The savanna is an 'arrested climax' vegetation due to regular fires which create the open cover and a relatively small number of species all of which are relatively fire resistant. The fauna of the project area has been extensively affected by alteration and fragmentation of habitat resulting from especially fire, human settlements, and agricultural activities. An initial faunal survey carried out showed insects such as grasshopper and butterflies as common to the area. Birds such as Vulture, Cattle Egret, Harrier Hawk were common. Reptiles identified included the agama lizard and snakes. In addition, rabbits, squirrels, bush guinea fowls, monkeys are animals that are commonly hunted by the locals. The Gambaga Scarp West Forest reserve (Block 2) is the closest Environmentally sensitive area within the vicinity of the project area. It is, however, envisaged that the project will have no impact on the forest reserve.

The Municipality is headed by a Municipal Chief Executive (MCE), in the person of Honourable Arimyao Somo Luc as at September 2020, who serves as a representative of the President and is responsible for executive decisions and approvals to guide the daily administration of the Municipality. There are four main paramountcy in the Municipality all answerable to the King of Mamprugu, the Nayiri. These include the Wulugu Traditional Area (headquarters at Kpasenkpe), Soo Traditional Area (headquarters at Janga), Wungu Traditional Area (headquarters at Wungu) and Kurugu Traditional Area (headquarters at Kurugu), under which the project area is. There are also a number of divisional chief under these major chiefs.

The population of West Mamprusi District, according to the 2010 Population and Housing Census, is 121,117. Using the 2.2% estimated annual growth in population, the projected population of the District as at beginning of 2020 was 153,361, with a dominant male population of 50.8%. The predominant ethnic group is the Mole Dagbani (Mamprusis and Dagombas). The main language spoken is Mampruli, however, for the project area, the Talenli language is also spoken. The dominant religious groups are Islam. According to the Chief of Kurugu, land in the area is owned

by the Chief and it was the responsibility of the Chief to provide land to subjects for farming purposes. When this is done, the land will now be owned by the individual families whose control rest in the family head as the sole custodian.

Based on desktop research as well as a field investigation undertaken by the EIA Team, no archaeological material was found and recorded. However, a shrine (Kpatusi) is located at the project site and a sacred grove covering an area of about 4,400 square meters is located about 100m beyond the Northern end of the project site. The sacred grove near the project site is called "Kpasurugu" and sacrifices are offered twice of thrice a year depending on the instructions of the soothsayer.

The major economic activities in the district are basically primary activities and these include;

- Agriculture - basically at the peasant level
- Trading in foodstuff such as maize, beans, rice and other grains,
- Sand winning mostly for construction work in the district
- Quarrying
- Fishing along the White Volta
- Sheanut processing
- Petty trading such as provision stores

Women play a prominent role in agriculture in the Municipality yet they face persistent economic and social constraints. Majority of women in the district are comfortable with providing input related to production decisions. They however have less control over the use of household income. Access to land by women in the traditional framework subtly deprived women because of the patrilineal system of inheritance and the role assigned to women by the society.

STAKEHOLDER ENGAGEMENTS

The engagements process for the EIA study for the PMDP commenced in 2014 by Mott MacDonald (UK) / EEMC (Ghana). During the period, 42 individual meetings with a range of governmental, NGO and local community members were organised. Six public consultation meetings were held in Bolgatanga, Zebilla, Garu, Walewale, Gambaga, and Tamale. The main issues of interest during those stakeholder engagements and how they are to be addressed were provided in the Draft EIA Report, 2015 for the hydropower component of the PMDP that was submitted to the EPA.

A pre-site entry stakeholder engagements was performed in June 2020 and this afforded VRA the opportunity to introduce to these communities, the EIA consultants, Power China and the various surveyor firms who would demarcate the boundaries of the reservoir. It must be noted that these engagements also discussed issues regarding the need for the solar hybrid project. Thus, the West Mamprusi Municipal as well as the communities of Kurugu and Kpatusi have been consulted extensively during which they were informed about the various components of the PMDP, including the solar hybrid power project.

Despite this, specific stakeholder engagements regarding the solar hybrid power project is ongoing to compliment the earlier engagements. This commenced in September 2020 and all arrangements for such meetings were done in collaboration with the Assemblyman of the Kurugu Electoral Area, who was all the time present to help translate the discussions in the local language, i.e., Mampruli, or Talenli as appropriate. Based on the issues raised at the project briefings, status quo conditions of the study area and the nature of the proposed development, the key issues of concern identified and that must be considered during project implementation for the solar hybrid project are summarized as below:

- Land Acquisition & Compensation for Loss Property
- Employment for Community Members
- Skills Development for Youth
- Land ownership and availability for affected farmers
- Relocation of Cultural Properties
- Implementation of a Corporate Social Responsibility Programme
- Grievance Redress Mechanism
- Provision of Electricity for Project Impacted Communities
- Upgrade of Feeder Road to Project Site
- Gender & HIV & AIDS
- Improvement of Livelihoods
- Acquisition of Permits
- Continued Engagement During Construction & Operational Phase
- Effective Project Monitoring & Evaluation Process

It must be noted that a stand-alone "**Stakeholder Engagement Plan**" (SEP) is to be prepared as part of the suite of documents for the EIA Study (Volume IV) to inform and guide in the stakeholder process, and must be referred to for further details on the stakeholder engagement process.

KEY ISSUES & POTENTIAL IMPACTS

A key part of the scoping process is a preliminary identification and consideration of the ways in which the project may interact (positively and negatively) with environmental and socio-economic resources or receptors for concurrence with the EPA. The scoping exercise is therefore to ascertain the environmental issues associated with the project on which the EIA study will be focused by reviewing the project information and ascertaining likely environmental issues associated with the project activities. This process helps in ensuring that all the relevant issues are identified and addressed in an appropriate manner in the EIA Study. The table below summarises the key characteristic of the potential impacts identified for each environmental and social aspect under consideration.

Phase of project	Issues
Preconstruction Phase	• Socio-economic and local community impacts, including compensation for loss of crops, economic trees and land • Stakeholder Engagements

Phase of project	Issues
Construction phase	• Greenhouse Gas • Air Quality • Noise & Vibration • Water Resources • Topography & Drainage • Geology & Soils • Waste Generation • Landscape & Visual Intrusion • Ecology • Archaeological, Heritage & Cultural Structure • Occupational Health & Safety Landscape • Socio-economic and local community impacts, including compensation for loss of crops, economic trees and land • Stakeholder Engagements
Operational & Maintenance Phase	• Greenhouse Gas • Water Resources • Visual & Aesthetic Landscape • Community, Health, Safety & Security • Socio-economic and local community impacts • Stakeholder Engagements
Decommissioning Phase	• Transport and Traffic • Air quality & Dust • Noise & Vibrations • Community, Health, Safety & Security • Wastes • Stakeholder Engagements

PLAN OF EIA STUDY

Following this scoping exercise, it is planned to continue with the various specialist studies as outlined in the table below, following which a summary of the results and other relevant project information for the solar power facility will be integrated into the EIA Report.

#	**Study Area**	**Nest Steps**
1	Stakeholder Engagement	Publish scoping notice and organise public hearing as well as continue to engage community members on the project. Prepare a **Stakeholders Engagement Plan** for the Project.
2	Land Acquisition & Resettlement	Finalize valuation of crops and economic trees and agree on land cost for compensation purposes. Prepare a **Land Acquisition & Resettlement Plan** for the project
3	Ecological Survey & Habitat Assessment Study	Engage the Forestry Commission to undertake detailed listing and quantification of the flora and faunal resources in the project area
4	Archaeological, Historical & Cultural Impact Assessment	Engage the caretakers of the sacred grove and shrine and agree on relocation requirements for input into the EIA.

#	Study Area	Nest Steps
5	GHG Emissions	The carbon stock associated with tree clearing as well as GHG emission savings from power displaced are to be quantified and, how this contribute to global warming considering the combined emissions of other broad-scale causes of climate change.
6	Physical Environment	Compile noise and air data and access project impact on receptors. Undertake climatological analyses, to provide a clearer picture of the climatic conditions in the project area. Estimate water requirement for both constructional and operation phase and the impact on the resource at the community level.
7	Visual & Aesthetic Landscape Assessment	Assess landscape receptors and determine value added impact from project actions
8	Socio-economic Impact Assessment	Compile community specific data on Kurugu and Kpatusi and assess impact on overall socio-economic development potential in the area including impacts on commercial enterprises nearby the site (incl. tourism, agriculture, small businesses and others).

The EIA Report will include a provisional Environmental Management Programme (EMP), which will be prepared in compliance with the relevant regulations. Actions in the EMP will be drawn primarily from the management actions in the specialist studies for the construction and operational phases of the project. The EIA report will also include a Table of Contents, a Glossary of Terms and Abbreviations and a Reference List and Annexes. The report will also provide maps, figures and process diagrams to facilitate understanding of the descriptive elements of the report. The font style will be Size 12 of Times New Roman, with a 1.5 spacing and printed on both sides.

It is expected that the EIA study will be completed latest by March 2021 for the issuance of an environmental authorisation. It should be noted that this schedule could be revised during the EIA process, depending on factors such as the time required for decisions from authorities. It must be noted that it is an offense under LI 1652 to commence constructional activities without an Environmental Permit and VRA will endeavour to adhere to this legal requirement. The Report will be released for a 50-day review period. This shall be done through an Advertisers Announcement and in addition through formal notification of key state agencies.

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50MW SOLAR HYBRID PROJECT IN THE WEST MAMPRUSI MUNICIPAL OF THE NORTH EAST REGION, GHANA







ENVIRONMENTAL IMPACT ASSESSMENT: SCOPING REPORT

CHAPTER 1: INTRODUCTION

CHAPTER 1 : INTRODUCTION

1.1. THE PROJECT

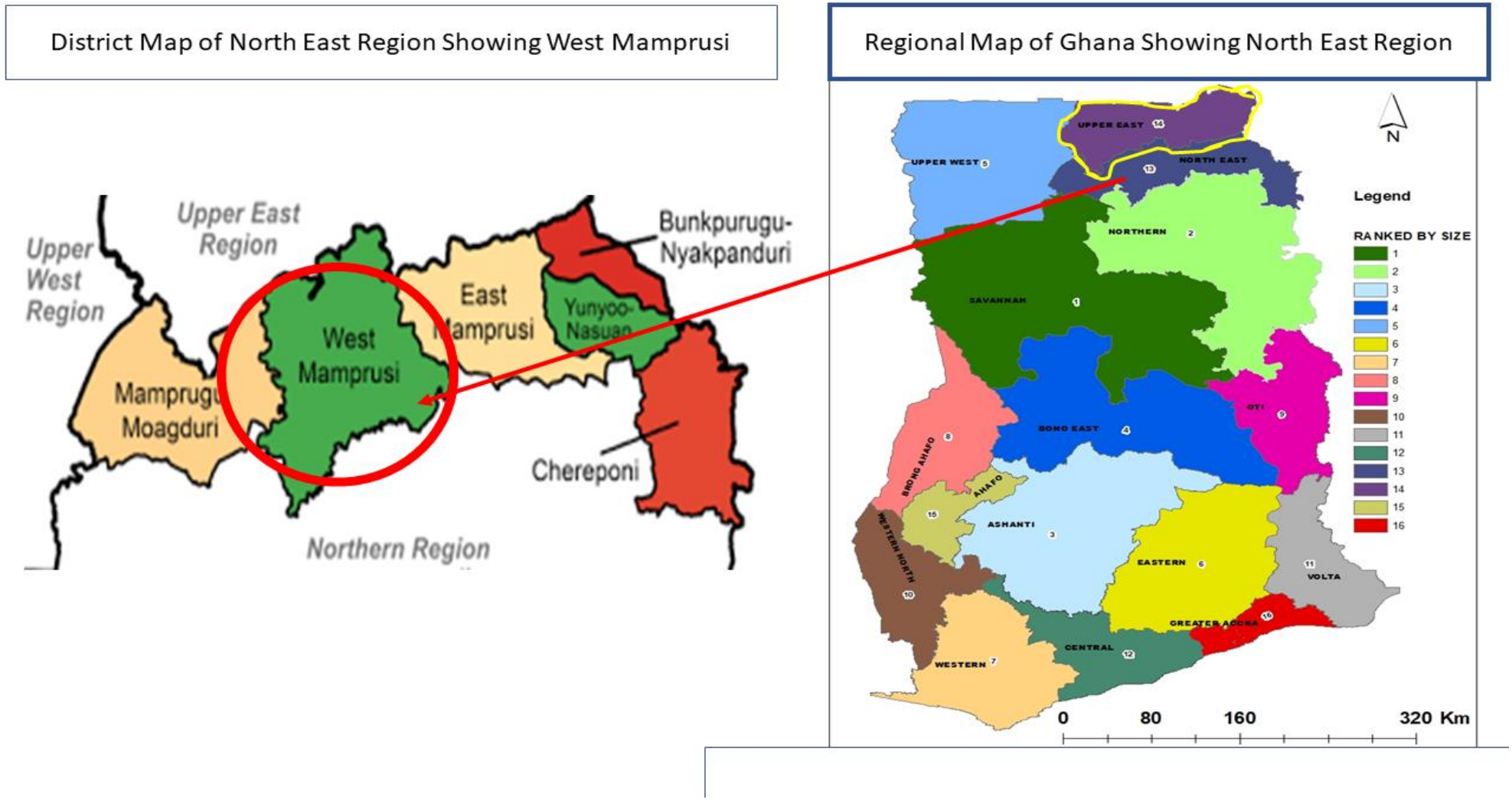
The Volta River Authority (VRA) proposes to construct and operate a 50MW solar power plant on a 1.40 Km^2 of land at Kurugu, in the West Mamprusi Municipal in the North East Region of Ghana. Figure *1-1* shows the location of the municipality within the context of the region in Ghana. The project involves the development of a solar hybrid project to meet the power system demands of the associated 59.6MW Hydroelectric Power Plant (HPP) component of the Pwalugu Multipurpose Dam Project (PMDP). The solar power station will have a 2-circuit outgoing lines which will be connected to a 34.5kV busbar side of Pwalugu Hydropower Station step-up substation via common-tower double-circuit 7 Km overhead transmission line. The project, titled the "***Pwalugu Multi-Purpose Dam Project – 50MW Solar Hybrid Project***" (hereinafter referred as the "Project"), will be at an estimated cost of US$55.3 Million and the EPC Contractor is Power China International Group Limited.

1.2. THE APPLICANT

The VRA was established on April 26, 1961 under the Volta River Development Act, 1961 (Act 46) of the Republic of Ghana with the mandate to generate, transmit and distribute electricity. Under the Volta River Development (Amendment) Law, 1987, PNDC 171, responsibility for distribution of power in the Northern part of Ghana was transferred from the then Electricity Corporation of Ghana, later becoming Electricity Company of Ghana to the VRA and this was performed by its Northern Electricity Department (NED). NED has now been transformed into the Northern Electricity Distribution Company (NEDCo), a stand-alone, wholly owned, subsidiary of VRA with the responsibility of electricity distribution in Northern Ghana and became operational in May 2012.

The Volta River Development Act, 1961 (Act 46) was amended by the Volta River Development Amendment Act 2005 (Act 692) in the context of the Ghana Government Power Sector Reforms, and the power transmission function of the VRA was transferred to a separate transmission utility, known as the Ghana Grid Company (GRIDCo), which became operational in August 2008. The amendment was aimed at creating the requisite environment to attract Independent Power Producers (IPPs) into the Ghana energy market. Based on the various amendments to Act 46, VRA's current mandate has now been largely restricted to generation of electricity and distribution of electricity in the northern parts of the country. NEDCo is currently the sole distributor of electricity in the Upper West, Upper East, North East, Northern, Savannah, Bono, Bono East, Ahafo and parts of Ashanti and Oti Regions of Ghana.

Figure 1-1: West Mamprusi Municipality Within the Context of the North East Region of Ghana



Source: Project Management Team (September 2020)

VRA as of January 2020 had an installed electricity generation capacity of 2,519.5MW, with a dependable capacity of 2260.0MW and this is from two hydroelectric plants, one solar power plant and six thermal power plants. VRA reaches its customers in Ghana and neighbouring countries through GRIDCo. VRA's regulated customers are the Electricity Company of Ghana for the southern part of Ghana and to its subsidiary company, NEDCo for the northern part and Enclave Power located within the Tema Export Processing Zone Bulk sales are also made to de-regulated customers (mining/industrial companies) as well as import/export of power with Communauté Electrique du Benin (Togo and Benin), Compagne Ivoirienne d'électricité (La Cote d'Ivoire) and SONABEL (Burkina Faso). Details of the VRA can be accessed on its website www.vra.com.

1.3. PROJECT RATIONALE

The Pwalugu Multi-Purpose Dam is to be located on the White Volta River on the boundary of the Upper East and North East Regions of Ghana. It is a comprehensive hydro-project integrating irrigation, flood control, power generation, fishery farming and urban & rural water supply, with a proposed installed capacity of 59.6MW. The development of a 50MW Solar (PV Power) Hybrid Project is intended to meet power system demands of the 59.6MW Pwalugu Multi-Purpose Dam. In the daytime when the PV power generation output is high and the system demand is small, the output of the hydropower station can be reduced and reservoir filling can be carried out; while when the system demand is high and the PV power generation output is small, the reservoir can discharge water for power generation, and the power generated by the hydropower station and the PV power station can be delivered at the same time to meet power system demands and to keep water volume balance in a day without affecting power generation benefits of the hydropower station. The power generated is planned to be connected to the expanded substation of Pwalugu Hydropower Station for combined operation, featuring hydro-photovoltaic hybrid demonstration effect.

1.4. PROJECT'S BENEFITS

To address the attendant effects of short-term planning of the overall development of the renewable energy sector, the Renewable Energy Master Plan (REMP), February 2019, has been developed by Government of Ghana (GoG) with the goal to provide investment-focussed framework for the promotion and development of the country's rich renewable energy resources for sustainable economic growth, contribute to improved social life and reduce adverse climate change effects. The REMP is to be implemented in three (3) cycles with the first cycle (or transition phase) running from 2019 to 2020. Subsequent cycles will run from 2021 to 2025 and 2026 to 2030 respectively. The successful implementation of the plan would lead to an installed electricity capacity of 1363.63 MW (with grid connected systems totalling 1094.63 MW), the creation of 220,000 jobs, and carbon savings of about 11 Million Tonnes of CO_2 by 2030.

Public utility companies such as VRA, Bui Power Authority and the Renewable Energy Authority (yet to be established) are to be encouraged to grow and expand the renewable energy electricity space through public sector led investments and or through public private partnerships. In view of this, the Energy Commission has exempted VRA from the current moratorium placed on the issuance of Provisional Licences, Siting and Permits for utility-scale power projects with public utilities as potential off-takers (http://www.energycom.gov.gh/public-notices).

In line with national actions in the renewable energy sector, VRA in February 2010 adopted a Renewable Energy Policy in order to develop and operate RE plants in an efficient, cost effective and environmentally sustainable manner and the development of a 50MW Solar (PV Power) Hybrid Project is in line with the objectives of this RE Policy. In addition to the economic and environmental benefits, other benefits of the project can be considered from the political and social aspects and these are discussed below:

1.4.1. Political and Social Benefits

Electricity available in Northern Ghana are transmitted over long distances from the south where over 99% of power generation is produced. This is capital intensive and result in transmission loses. The siting of the project in the North East Region will minimize the cost of transmission and transmission loses as well. Therefore, the presence of the power plant will improve electrification for increased physical security. The location of the plant would help to improve voltages in the locality and can be configured with some minor modifications to ensure local agro based industries improve reliability of power. This will attract new industries, businesses and services that otherwise would have been difficult to bring to these communities and therefore allows for distributions of wealth and income by having jobs spread all around the country.

The project seeks to foster sustainable low carbon energy provision, provision of jobs in local communities and global partnerships that ensure that the projects should have some form of local content during development and operation. It also illustrates the country's commitment to renewable energy generation as well as being a flagship project which evidently illustrates the country's commitment to renewable energy generation.

1.4.2. Environmental Benefits

Solar energy is clean, renewable (unlike gas, oil and coal) and sustainable, helping to protect our environment. It does not pollute our air by releasing Carbon Dioxide, Nitrogen Oxide, Sulphur Dioxide or Mercury into the atmosphere like many traditional forms of electrical generation do. Therefore, solar energy does not contribute to global warming, acid rain or smog. It also actively contributes to the decrease of harmful Greenhouse Gas (GHG) emissions. Solar plants operate silently, have no moving parts, do not release offensive smells and do not require fuel. More solar panels can easily be added in the future when the demand for more power grows. Given the low GHG emissions from solar power, increasing its adoption is an essential strategy in efforts to combat climate change, and this is excatly what the project seeks to achieve.

1.4.3. Economic Benefits

Beyond initial installation and maintenance, solar energy is free, and therefore reduces the exposure of the electricity power price to imported fossil fuels. In addition, one of the biggest advantages of the project is the ability to avoid the politics and price volatility that is increasingly characterizing fossil fuel markets. Thus, the key economic benefits include a generated power price from the solar facility that is independent from the price of crude, the up-skilling of the Ghanaian labour force and the contracting of a local civil construction companies and labourers.

Solar energy systems are virtually maintenance free and will last for decades. Once installed, there are no recurring costs. Solar energy supports local job and wealth creation, fuelling local economies.

1.4.4. Employment Benefits

There will be employment opportunities created for the local labour force during the construction with the attendant invaluable up-skilling of both the local labourers and client's workers. Up skilling of the workforce for both men and women in construction and operation of renewable energy technologies, and training provided to employees will provide individuals with a skill set that will be highly desirable throughout the industry sector in Ghana, increasing potential opportunities available to such individuals and shall contribute to sustainable socio-economic development

1.5. OUR APPROACH & METHODOLOGY FOR THE EIA STUDY

In Ghana, environmental assessments are regulated by the Environmental Assessment Regulations, 1999 (LI 1652). EIA Guidelines have been prepared for various sectors, including that of energy, to assist with the process. The general methods used in an EIA Study under the Ghana EIA Procedures is shown in Figure 1-2 and the process is supervised by the Environmental Protection Agency (EPA). Under LI 1652, it is a legal requirement in Ghana that development projects such as the 50MW solar power facility with a land size of 140.279 Ha is subject to an EIA process. VRA has subsequently embarked on the EIA Study to seek environmental authorisation.

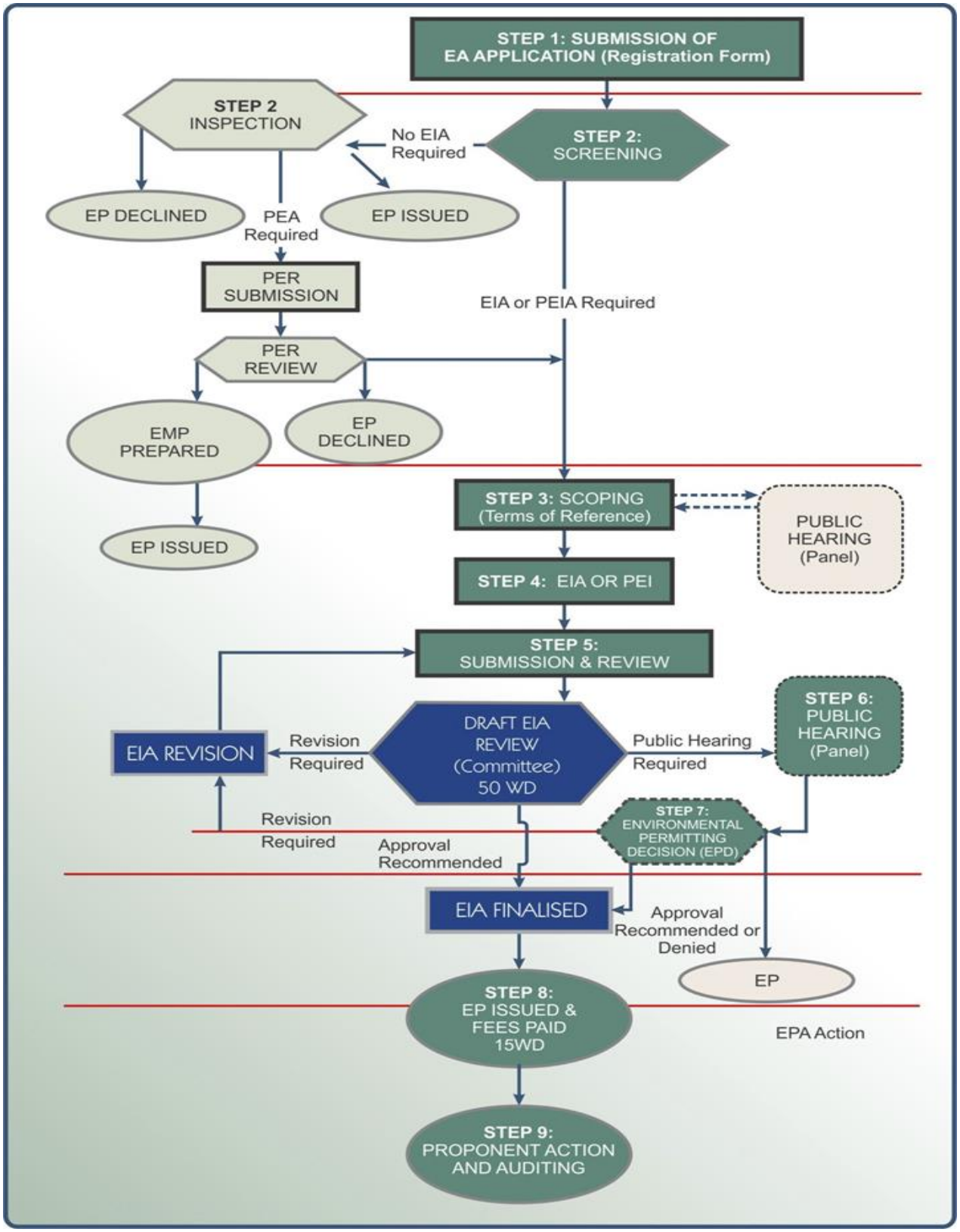
The EIA is being undertaken by a team of in-house experts who were responsible for the successful preparation of the EIA Reports for the 35MW Solar Power Project as well as the 40MW Bongo Solar Power Project in the Upper West and Upper East Regions of Ghana respectively and similar strategies have been adopted for this Report. As required by the Ghana EPA, summary of the members of the EIA Study team is provided in Appendix 1. Details of their roles will be provided in the Main EIA Report.

The general methods and approach being used in the EIA Study is largely informed by the requirements of the "***Ghana EIA Guidelines for the Energy Sector, Volumes 1 & 2, September 2011,*** as well as the ***"EIA Technical Review Guidelines: Energy Generation & Transmission",*** Volumes 1 & 2 that was prepared by CAFTA-DR and U.S. Country EIA and Energy Experts in July 2011 and this is discussed below:

1.5.1. Step 1 - Project Registration

VRA registered the project with the EPA in September 2020 as one that falls into a category of undertakings for which an EIA is mandated and this was done through the submission of a completed "**EPA Form EA2**".

Figure 1-2: Flow Chart of the EIA Process in Ghana



Source: EIA for VRA Wind Power Project 1 – Dec. 2017

1.5.2. Step 2 - Screening

Based on the screening of the Completed Form EA2, the EPA in response to the registration in October 2020, confirmed that the project falls into a category of undertakings for which an EIA is mandated. The EPA subsequently directed VRA to prepare a Scoping Report to generate the relevant terms of reference to guide a satisfactory EIA Study as well as serve scoping notice to facilitate stakeholder involvement. A sample of the scoping notice was provided. See Appendix 2 for EPA's response letter.

1.5.3. Step 3 - Scoping Exercise

This scoping exercise has been undertaken to help provide an indication of the ecological, social and economic impacts that may arise following the establishment of the solar hybrid power facility, based on which the terms of reference for the study, including the spatial and temporal boundaries for the EIA, has been defined for approval by the EPA.

Actions undertaken so far includes:

- Site Hunting & Investigations to identify potential sites was completed by the contractor in March 2019
- Identification of potential site and land verification process was completed June 2019.
- Design Studies for the preparation of Project Feasibility Report for the Solar Power Component was completed in September 2019.
- Surveying & Mapping of Selected Site was completed in August 2020.
- Valuation for Land Acquisition & Compensation payment to Property Affected persons was completed in August 2020.
- Stakeholder Engagements, and this is linked with the Multipurpose dam has been ongoing since 2015. Specific engagements regarding the solar power components commenced in August 2020 and will be ongoing through the project phase.
- Site Reconnaissance visit for Scoping Study was completed September 2020

The scoping exercise has culminated in the production of this Scoping Report, which comprises of eight (8) chapters, the contents of which are described in Table 1-1.

Table 1-1: Structure & Content of Scoping Report

Title	Content
Chapter 1: Introduction	An Introduction which analysed the need for the undertaking and presents the process undertaken thus far and describes the remaining phases.
Chapter 2: Description of Existing Policy, Legal & Administrative Framework	An outline of the Legislative, regulatory and policy framework, within which the proposed project is required to operate.
Chapter 3: Project Description & Consideration of Alternatives	Brief on the various activities during the pre-construction and construction as well as occupancy phase is described, including project justification. The project costs, project timelines as well as project management structure is provided.
	Project alternatives to be considered in the Main EIA Phase, including the no-go option for the project

Title	Content
Chapter 4: Baseline Environmental Conditions of the Study Area	An identification of existing environmental conditions including social, economic and other aspects of major environmental concern
Chapter 5: Stakeholder Engagements	This Chapter provides a brief on the stakeholder engagements till date, and outstanding as well as future consultations, including public disclosure.
Chapter 6: Key Issues & Potential Impacts	This Chapter provides a brief on the potential environmental concerns likely to arise from the development and key outstanding issues to be considered for inclusion in the Main EIA Report
Chapter 7: Plan of EIA Study	This Chapter outlines methodology for the assessment of identified impacts, issues required to be considered in the EIA Study, structure of the EIA Report, plan of study for the Main EIA study and timeline for the completion of the EIA Process.
Chapter 8: Reference List	
Appendices	

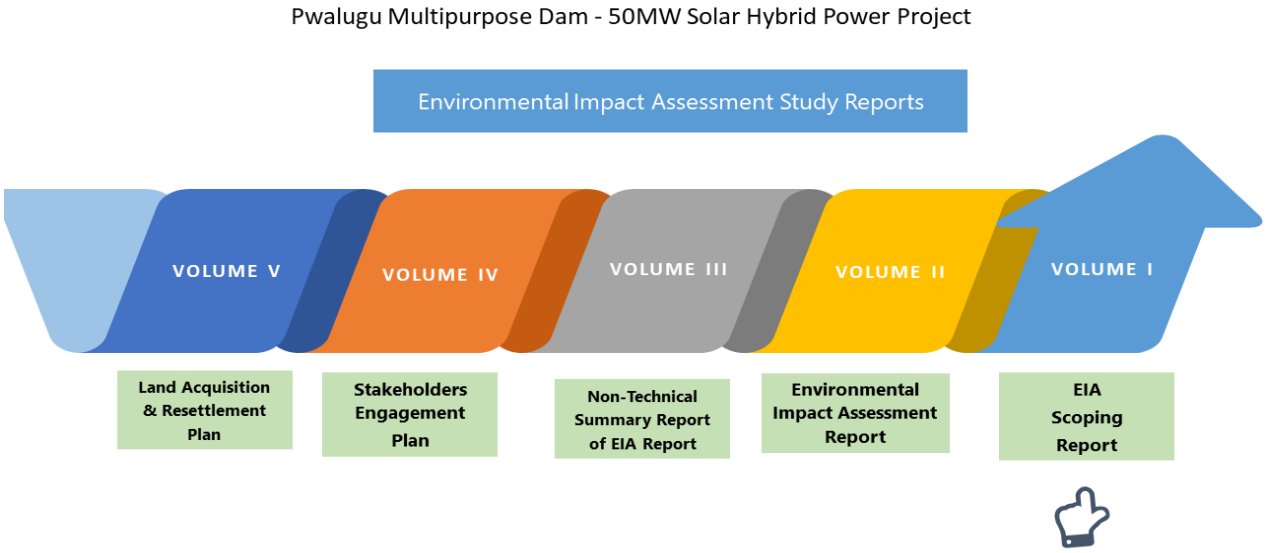
1.5.4. Step 4 - Main EIA Report

Following the approval of the Scoping Report, a draft EIA Report is to be prepared for review by the EPA. Based on the review of the draft report, the Final EIA Report will be submitted to EPA for environmental authorisation and the issuance of an Environmental Permit to enable project construction to commence, as required from Steps 5-8 in Figure 1-2.

1.6. ORGANISATION OF ENVIRONMENTAL ASSESSMENT REPORTS

Even though this Scoping Report is a standalone document, it is to form part of the suite of documents that are being prepared as part of the environmental assessment process of the project to ensure adherence to international best practice and represents Volume I of the expected five (5) reports as shown in Figure 1-3. It is therefore important that the implementation of the outcome of the Environmental Assessment is linked to the requirements of all these documentations.

Figure 1-3: Suite of Documents for EIA Study



PWALUGU MULTIPURPOSE DAM PROJECT:
50MW SOLAR HYBRID PROJECT IN THE WEST MAMPRUSI MUNICIPAL OF THE NORTH EAST REGION, GHANA







ENVIRONMENTAL IMPACT ASSESSMENT: SCOPING REPORT

CHAPTER 2: POLICY, LEGISLATIVE & ADMINISTRATIVE REQUIREMENTS

CHAPTER 2 : DESCRIPTION OF EXISTING POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1. OVERVIEW

It is a requirement to provide an overview of all national legislation and international conventions/guidelines that may inform the EIA Process in Ghana to ensure that the proposed power project meets relevant legal requirements. Subsequently, the institutional and administrative framework of the power sector in Ghana as well as the relevant national policies and legislative requirements that must be considered for the successful implementation of this project have been gathered and how they apply discussed as part of this environmental assessment exercise. In addition to national laws, the proposed project has also committed to align as far as possible with the requirements of international environmental and social safeguards, specifically that of the World Bank Group (WB) Environmental and Social Standards (ESS), August 2016.

2.2. RELEVANT VRA CORPORATE POLICIES

The VRA is committed to providing exemplary levels of care and safety for employees, the local populations and the environment in general. As such, VRA's environmental strategy aims at conducting all its operations in such a manner that the safety, health and welfare of its workers and the integrity of the environment will be safeguarded always. To achieve these, VRA has developed corporate policies regarding environmental protection, health and safety of its workers as well as welfare of the affected population. These policies and how they are expected to be applied in implementation of this project will be provided in the Main EIA Report.

2.3. INSTITUTIONAL & ADMINISTRATIVE FRAMEWORK OF THE POWER SECTOR IN GHANA

The power sector in Ghana is under the sectoral/ministerial supervision of the Ministry of Energy. A key goal of the Ministry of Energy (MoEn) is to support the development of a reliable, high-quality energy service at the minimum cost to all sectors of the economy through the formulation, implementation, monitoring, and evaluation of energy sector policies. The policies and programmes cover downstream and upstream petroleum subsectors and the power subsector (including renewable energy for power generation). MoEn is also responsible for the implementation of the National Electrification Scheme, which seeks to ensure the provision of universal access to electricity for all communities in Ghana by 2020.

The electricity subsector in Ghana currently has an unbundled structure with separate entities having functional mandates over power generation, transmission, and distribution. The objective of this unbundled structure is to provide open and non-discriminatory access to transmission services to encourage private sector participation and market competition in the generation and distribution business functions. Power generation companies (GENCos) include the state-owned utilities, the Volta River Authority and Bui Power Authority (BPA) and a number of private Independent Power Producers (IPPs). These IPPs have been licensed by the Energy Commission (EC) to build, own, and operate power plants, and sell their power to bulk customers or to distribution companies.

Fuel for power generation is on the whole procured by the GENCo's themselves. Supplies of natural gas come from N-Gas of Nigeria, through the West African Gas Pipeline, and from the Ghana National Petroleum Corporation (GNPC) and the Ghana National Gas Company (GNGC). GNGC is currently the owner and operator of the gas processing plant in Atuabo and is the licensed natural gas transmission utility. GNPC is the national gas aggregator, and holds equity positions in the investments for natural gas development for the Government of Ghana. Fuel oil, light crude oil, and diesel come from a variety of suppliers contracted by the power plants.

Power distribution companies (DISCos) include the two state-owned utilities and Enclave Power Company, which is a private company that distributes power in the free zones enclave in Tema. The state-owned ECG distribute electricity in the southern parts of the country (which accounts for about 71% of the total electricity consumed annually), and the Northern Electricity Distribution Company (NEDCo), a subsidiary of VRA, distributes electricity in the northern parts of Ghana (9%) and Enclave Power Company (1%). Other bulk customers (some industrial customers, mining companies, hotels, etc.) consume 19% of the total energy transmitted. The transmission function is performed by the Ghana Grid Company (GRIDCo), a state owned entity.

The operations and activities of all entities within the power sector are governed by contracts and electricity regulations. The provision of electricity services by the distribution utilities to both public and private consumers are subject to an independent regulator. There are two main electricity regulators in the sector:

a. The Public Utility Regulatory Commission (PURC), an independent body, was set up as a multi-sectoral regulator under the Public Utilities Regulatory Act, 1997 (Act 538) to regulate the provision of utility services in the electricity and water sectors, and by virtue of the Energy Commission Act, 1997 (Act 541), PURC also has regulatory responsibility over charges for natural gas supply, transportation, and distribution of natural gas services.

b. The Energy Commission (EC), which was set up in 1997 under the Energy Commission Act, 1997 (Act 541) to regulate and manage the development and utilisation of energy resources in Ghana as well as to provide the legal, regulatory, and supervisory framework for all providers of energy in the country. The EC under Section 2.2(c) of Act 541 is mandated to "prepare, review and update periodically indicative national plans to ensure that all reasonable demands for energy are met". The Act also mandates the EC to grant licences for the construction and operation of all transmission, wholesale electricity supply and distribution assets within the sector, and to enforce performance standards (technical and operational rules of practice) of the utilities. The EC also grants licences for natural gas and related matters.

VRA has obtained the required Siting Permit for the solar hybrid project, which is numbered EC/HHS/SP/09-20-001, dated September 17, 2020 and this is attached as Appendix 3.

2.4. KEY LEGISLATIONS IN THE GHANA ELECTRICITY SECTOR

The various legislations that guide the operation of the Ghana power sector to be discussed in the Main EIA Report shall be as follows:

- Volta River Development Act, 1961 (Act 46)
- Volta River Development Amendment Act 2005 (Act 692)
- Public Utilities Regulatory Commission 1997 (Act 538)
- Energy Commission Act, 1997 (Act 541)
- Renewable Energy Act, 2011 (Act 832)
- Electricity Transmission (Technical, Operational, and Standards of Performance) Rules, 2008 (LI 1934)
- Electricity Supply and Distribution (Standards of Performance) (LI 1935)
- Electricity Regulations (LI 1937)
- Electricity Supply and Distribution (Technical and Operational) Rules, 2005 (LI 1816)
- National Electricity Grid Code of Ghana, 2009

2.5. LEGISLATION AND GUIDELINES OF RELEVANCE TO THE PROPOSED PROJECT

Key national policy and legislation, with their relevant standards, guidelines and codes applicable to the envisaged project relates to that of the following:

- Assessment and Management of Environmental and Social Risks and Impacts
- Labour & Working Conditions
- Resource Use Efficiency & Pollution Protection
- Community Health, Safety and Security
- Land Acquisition & Involuntary Resettlement
- Cultural Heritage
- Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Financial Intermediaries
- Climate Change
- Gender & Vulnerability

The categorisation has been done in order to align with that of environmental and social safeguards standards of international funding agencies, specifically that of the World Bank Group and includes cross cutting issues such as Climate Change and Gender & Vulnerability, as required by Ghana EPA. Within this context, the list of national legal instruments as compared to the requirements of the ESS, August 2016 are illustrated in Table 2-1. How the project intends to comply with these legal instruments shall be discussed in the Main EIA Report.

2.6. INTERNATIONAL CONVENTIONS

Key international conventions that will be discussed in the Main EIA to guide adherence shall be the United Nations Framework Convention on Climate Change; the Kyoto Protocol the Sustainable Development Goals; Africa Union Agenda 2063 and the International Labour Organization Fundamental Conventions.

Table 2-1: List of Applicable National & International Legal Requirements

Focal Area	National Requirement	International Requirement
Assessment and Management of Environmental and Social Risks and Impacts	▪ Environmental Protection Agency Act, 1994 (Act 490) ▪ Environmental Assessment Regulations 1999, LI 1652 and related guidelines in the Energy and General Construction Sectors ▪ The Environmental Assessment Fees and Charges (Amendment) Instrument, 2015 LI 2228	**WB ESS1:** Assessment and Management of Environmental and Social Risks and Impacts
Labour & Working Conditions,	▪ Labour Act No (2003) Act 651 ▪ Labour Regulations, 2007 (LI 1833) ▪ Children's Act No. 560 of 1998 ▪ Workmen's Compensation Act, 1987 (PNDC Law 187) ▪ Commission on Human Rights and Administrative Justice Act (Act No. 456 of 1993) ▪ National Vocational Training Act (Act No. 351 of 1970) ▪ Ghana Investment Promotion Centre ACT, 2013 Act 865 ▪ Public Procurement Act, 2003 (Act 663) ▪ Criminal Code, 1960 (Act 29) ▪ National Employment Policy, 2014	**WB ESS2:** Labor and Working Conditions
Resource Use Efficiency & Pollution Protection	▪ Hazardous & Electronic Waste Control Management Act, 2016 (Act 917) ▪ Land Planning and Soil Conservation Act, 1957 ▪ Water Resources Commission Act, 1996, Act 552 ▪ The National Land Policy, 1999 ▪ Pesticides Control and Management Act (1996) Act 528 ▪ Ghana Standards Authority (GSA) Standards Decree, 1973 (NRCD 173) and applicable standards for ambient air quality, ambient noise control and effluent discharges	**WB ESS3:** Resource Efficiency and Pollution Prevention and Management
Community Health, Safety and Security	▪ Factories, Offices and Shops Act (1970) Act 328 (As amended by the Factories, Offices and Shops (Amendment) Law, 1991 (PNDCL 275) ▪ Ghana National Fire Service Act of 1997 (Act 537) and related Fire Precaution (Premises) Regulations, 2003, LI 1724 ▪ National Road Safety Commission Act, 1999 (Act 567) ▪ Driver & Vehicle Licensing Authority Act, 1999 (Act 569) ▪ Ghana National Building Regulations, 1996, LI 1630 ▪ Health Care Waste Management Policy & Guidelines, 2006 ▪ Environmental Sanitation Policy, Revised 2010 ▪ Road Traffic Acts, 2004, Act 683 ▪ National Road Safety Policy, 2007	**WB ESS4:** Community Health and Safety

Focal Area	National Requirement	International Requirement
Land Acquisition & Involuntary Resettlement	▪ Immovable Property Rate Regulations (1975) LI 1049 ▪ Lands Statutory Wayleaves Act, (1963) Act 186 ▪ Lands (Statutory Way leaves) Regulations, 1964 (LI334) ▪ Survey Act 1962, Act 127 ▪ State Lands Regulations (1962) LI 230 / State Lands (Amendment) Act (2005) Act 586 ▪ Stools Lands Act, 1994 (Act 481) ▪ Arbitration Act 1961 (Act 38) ▪ Volta River Authority (Transmission Line Protection) Regulations, 1967 (LI 542) ▪ Volta River Authority (Transmission Line Protection) (Amendment) Regulation, 2004 (LI 1737), ▪ Resettlement Policy Framework (RPF), 2011 of the Ministry of Finance	**WB ESS5:** Land Acquisition, Restrictions on Land Use and Involuntary Resettlement
Biodiversity Conservation and Sustainable Management of Living Natural Resources	▪ Wildlife Reserves Regulations 1971 (LI 710) ▪ Wild Animals Preservation Act, 1962 (Act 43) ▪ Economic Plants Protection Act, 1979 ▪ Forest and Wildlife Policy, 2012 ▪ Economic Plants Protection Act, 1979 (AFRCD 47) ▪ Wildlife Conservations Regulations, LI 685, 1971 (and Amendments) ▪ National Wildlife Management Policy, 2006 ▪ Forest and Wildlife Policy, 2012	**WB ESS6:** Biodiversity Conservation and Sustainable Management of Living Natural Resources
Cultural Heritage	▪ National Museums Act, Act 387 of 1969 (formerly National Museums Decree (1969) NLCD 387)	**WB ESS8:** Cultural Heritage
Stakeholder Engagements	▪ Environmental Assessment Regulations 1999, LI 1652 and related guidelines in the Energy and General Construction Sectors	**WB ESF10:** Stakeholder Engagement and Information Disclosure
Financial Intermediaries	▪ Ghana Sustainable Banking Principles and the Sector Guidance Notes of the Bank of Ghana (November 2019)	**WB ESS9:** Financial Intermediaries
Climate Change	▪ National Climate Change Policy, 2013	Cross Cutting theme
Gender & Vulnerability	▪ Persons with Disability Act, 2006 Act 715 ▪ Domestic Violence Act (Act 732) of 2007 ▪ Ghana Gender Policy, 2015 ▪ Persons with Disability Act, 2006 Act 715 ▪ National HIV/AIDS STI Policy, 2004	IFC PS 2 - Paragraph 15 on Non-Discrimination and Equal Opportunity

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CHAPTER 3: PROJECT DESCRIPTION & ALTERNATIVES

CHAPTER 3 : PROJECT DESCRIPTION AND CONSIDERATION OF ALTERNATIVES

3.1. INTRODUCTION

This Chapter provides a description of the project in terms of location, facilities and associated project infrastructure and activities during the project lifecycle and facilitates a comprehensive identification of the potential impacts on resources and receptors that could result from project activities during the pre-construction, construction, operation and decommissioning stages. The preparation of project design documents for the PV plants, both civil and electrical, are ongoing by Power China International Group Limited. A Technical Proposal was completed in September 2019 and this has provided information on the solar resource analysis, design of the overall system scheme and calculation of power generation, electrical system, civil works and the fire protection requirements. Details of this report has informed the project description. Figures, maps and pictures have been provided as illustration for a better understanding of the project components

3.2. OVERVIEW OF SOLAR ENERGY GENERATION PROCESS

The process of solar power generation is basically using a photovoltaic technology to produce solar power. Solar PV plants generate electricity from solar radiation using a PV Module, which comprises of several solar cells. The solar photovoltaic cells consist of a positive and a negative film of silicon placed under a thin slice of glass. Solar cells produce Direct Current (DC), which is converted to Alternating Current (AC) in inverters before the plant is connected to the grid. During this process, the photovoltaic cells absorb the particles of light known as photons. As the photons of the sunlight beat down upon these cells, they knock the electrons off the silicon. The negatively charged free electrons are preferentially attracted to one side of the silicon cell, which creates an electric voltage that is collected and channelled. The energy produced will then be released during the process of absorption and will be transferred as the electrical current. A simplified setup of the proposed PV plant is as shown in Figure 3-1.

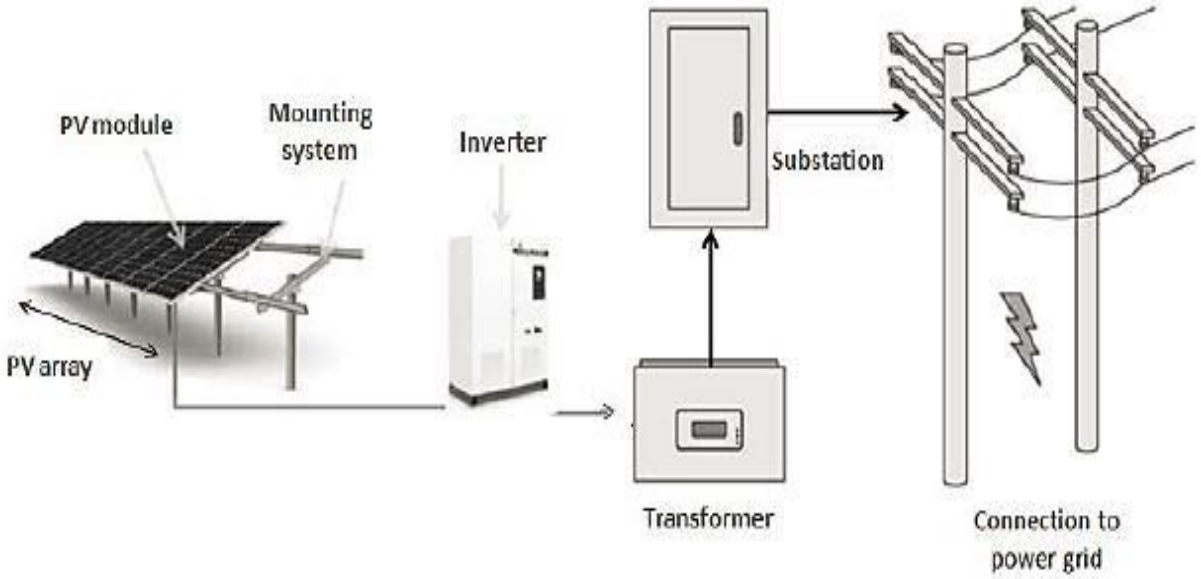


Figure 3-1: Setup of a Typical Solar PV Plant

3.3. PROJECT LOCATION & SITE SETTING

The proposed site at Kurugu is about 6.0km due west of the proposed Pwalugu Hydropower Station dam and powerhouse and covers a geographical area of about 140.279 Ha (1.40 km^2). The Kurugu community is about 1km North of the site. The Kpatuse village is also located about 0.5km South of the site (see Figure 3-2). The site has flat terrains and bounded at all ends by farmlands and uncultivated savannah vegetation, with the exception of the easting end which is an untarred feeder road, which provides access to the site. The site is currently for agricultural use, with current agricultural practises including mixed farming of crops such as maize, millet, soya bean, groundnut, okro, Bambara beans and tomatoes. There is a new 34.5kV line from Wulugu to Kurugu which is still under construction and runs along the road on the side of the site.

3.4. PROJECT SITE ACCESSIBILITY

The solar site is 13km off the Walewale-Bolgatanga N10 Highway at Wulugu. Along the 13km stretch of road from Wulugu are the communities of Kulunga, Kparkpiri, Kpatusi and Kurugu. The Wulugu – Kurugu road is an untarred feeder road and poor in nature (See Figure 3-3) and lies about 100m from the project site. Indeed, because of the PMDP, this feeder road has been partly reconstructed but can be waterlogged during the raining season, as was experienced during the baseline survey and this must be factored in during project development.

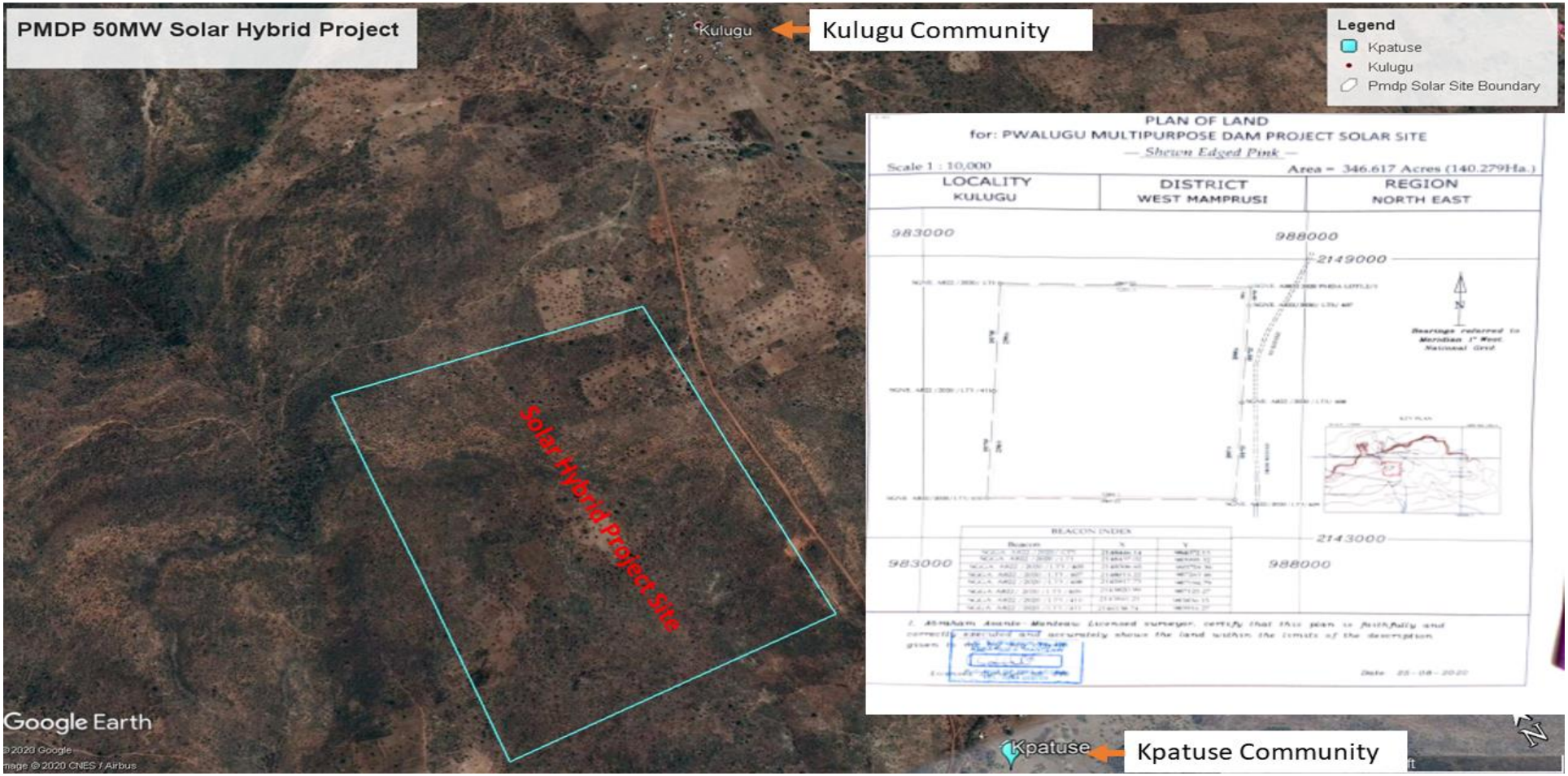
The N10 Highway is part of the trunk roads between major urban centers and forms part of the backbone of the road system in Ghana. It runs from Kumasi, through Techiman to Fufulso and to Tamale and finally to Bolgatanga. To join Kumasi from the Capital of Accra is the N6 Highway. These highways are all asphalted and are classified as a first-class road. Equipment procured will be brought from Tema on the N1 Highway to Accra and transported overland to the project site through the N6 and N10 Highways, a distance of about 785 Km.

3.5. PROJECT FACILITIES & COMPONENTS

3.5.1. Generation Yield

The annual global solar radiation of the project site in typical years is 7240.3 MJ/m2, which is considered to "most abundant" based on the Annual Irradiance Rating of Global Solar Radiation. The project site has a Rating of Solar Energy Resource Stability (RW) of 0.755, thus, is considered to have "very stable" solar energy resources with the Month of March having the highest (i.e. 22.00 MJ/m2/d) and August (16.60 MJ/m2/d) having the lowest. This value of irradiation makes Kurugu a suitable site for the development of the solar hybrid plant.

Figure 3-2: Location of proposed Solar Power Project Site



Source: Project Management Team (September 2020)

Figure 3-3: Project Site Accessibility Map

Source: Project Management Team (September 2020)

3.5.2. Project Components

The components of the PV Facility and the sub transmission line has been indicated in Table 3-1. Details of these facilities will be discussed in the Main EIA Report. Most of the components for the power plant, both solar and sub-transmission line, will be manufactured and procured internationally, specifically from China as they are not available for purchase in Ghana. The testing standard shall be in line with the Ghana Standards Authority GS International Electrotechnical Commission (IEC) 61836 - Solar Photovoltaic Energy Systems. Manufacturer's authorizations are to be provided showing that the EPC Contractor has been duly authorized by the main manufacturers for this project to supply and install that item in Ghana. The EPC Contractor is to provide all documents obtained from the supplier during tendering process. Catalogues, certificates, references list, ISO and OHSAS certificates, etc. are to be provided to VRA for concurrence.

Table 3-1: Key Project Components

Component	Description
Project Capacity	50 MW
Project Area	140.279 Ha
Technology Type	Photovoltaic (PV) Polycrystalline technology
Mounting Type	Fixed
Orientation	12° South
Module Power (Wp)	345Wp
Modules in String	32
Total Modules	172,753
No. of Inverters	272
Rating	196kW
Infrastructure	• PV solar panels/modules (arranged in arrays) • Fixed PV module mountings • DC-AC electricity inverters and transformers • A 'loop-in loop-out' substation facilitating connection to the national grid • A substation located within the PV footprint • Underground cabling and Overhead power lines • On-Site buildings (including an operational control centre, office, inverter room and transformer units' warehouse, and a guard house) • Access roads and internal road network • Ancillary infrastructure, incusing security fencing
Transmission Line	• 7km 34.5Kv sub transmission line component is to connect the PV plant directly to the Hydropower Plant Substation for mutualization of the electrical components and easy operation of both plants. • The sub transmission line shall consists of many various components, the most important being Suspension lattice steel towers and conductor wires which allow electricity to be transmitted from power plants to the customers. Other necessary smaller

Component	Description
	components are insulators, overhead ground wire, spacers and brackets and optical ground wire for data transfer.

3.6. PROJECT ALTERNATIVES

The Environmental Assessment process as required under LI 1652 of 1999 mandates the provision of an outline of the main alternatives considered and the main reasons for the preferred choice. Subsequently, the alternatives to be considered in this study are as follows:

a. 'No Action' Alternative
b. Alternatives for the Generation of Electricity from a Non-Renewable Resource
c. Site Location Alternative
d. PV Technology Alternatives
e. PV Module Technology Selection
f. Transmission Line Selection

This will be expanded based on review comments on this Scoping Report from the Ghana EPA. Following this, a full description of the process followed to select the proposed preferred activity, considering environmental, social and economic variables will be provided in the Main EIA Report. This analysis will aim at comparing, based on a set of previously established criteria, the best feasible alternatives to identify the one causing the least impact and allowing to determine the optimal option for the project location.

3.7. ACTIVITIES DURING PRE-CONSTRUCTION PHASE

3.7.1. Identification of Land Area for Project Site

Investigations of various sites to be acquired for the installation of the proposed project commenced in 2019 by the EPC Contractor which resulted in the section of the project site at Kurugu. The process entailed a systematic, on-the-ground site inspection as an essential first step in acquiring the land. The proximity to the PMDP dam site, topography, elevation, ground conditions, easy access for transportation and avoidance of resettlement were considered in the site selection process. The feasibility of the proposed site at Kurugu for project development was confirmed by VRA in June 2019, after extensive consultations with the land owners, led by the Kuru-Naa, J. Banyisi Sulemana (the Kurugu Chief). VRA in collaboration with the Lands Commission has placed marked survey pillars at vantage areas for the identification of the project site, as shown in Plate 3-1.

Following this, a land verification exercise is to be done at the Lands Commission to ensure that the rightful owners are identified for compensation payment. This process is expected to be completed latest by February 2021, which is necessary to enable the VRA formally acquire the site to allow for physical construction.

Plate 3-1:Survey Pillars at Solar Power Project Site at Kurugu

3.7.2. Property Valuation for Compensation & Land Acquisition

No involuntary resettlement is expected under the solar hybrid project since there are no residence and structures at the site. The selection of the land site took into consideration the need to avoid such structures. The total land coverage demarcated for the solar power project at Kurugu is 140.279 Ha and is intended to be acquired by VRA via the compulsory land acquisition provisions of the 1992 Constitution of Ghana as part of the Pwalugu Multi-purpose Dam Project. The land acquisition process, involving valuation and compensation, commenced in June 2020, and is ongoing. The valuation exercise for crops and economic trees for the solar site has been incorporated into that for the associated dam and was completed in August 2020. A total of 14 farmers were noted to have been affected. The most recent valuation rates issued by the Lands Commission is to be adopted and applied in the assessment of crops / economic trees affected by the project. These rates are captured in stands (per tree) or in acreage and are used in computing the compensation payable for each person. These rates are issued periodically by Lands Commission and are arrived at by considering factors such as:

- The farm gate price of the produce at the time period.
- The yield of the crop/ tree
- The stage and health of the produce, and
- Cost of establishing the farm produce at the various stages.

The total cost implication for the implementation of the land acquisition processes is yet to be determined and VRA shall be responsible for making funds available for these activities, through project funding. It must be noted that a stand-alone "**Land Acquisition & Resettlement Plan**", as shown in Figure *1-3* is to be prepared as part of the suite of documents for the EIA Study (Volume V) to inform

and ensure that the planned development of the solar power plant and associated land acquisition and involuntary resettlement actions does not cause major adverse impacts among the people affected, and that the public is informed on the process for transparency purposes. Details of this shall be discussed in the Main EIA Report.

3.8. ACTIVITIES DURING CONSTRUCTIONAL PHASE

Construction phase of project activities will include the following:

- Contractor mobilization
- Site Preparation including fencing, clearing of bushes, pit filling, levelling and grading
- Construction of site office and internal roads
- Construction of temporary storage facilities
- Foundation laying for ground mounted structures
- Storage of PV modules delivery and their installation
- Laying of internal electrical connections
- Construction of sub-station and office buildings
- Installation of inverter and transformers
- Excavation foundation and erection of transmission line towers
- Stringing of transmission lines.

All systems will undergo a full functional and safety test to ensure that they are fit for purpose. The contractor will be responsible for functional testing, commissioning, performance testing and reliability testing of the complete plant. Testing and commissioning will require 24-hour operations. Upon completion of the construction phase, the EPC Contractor shall be responsible for all demobilisation activities in accordance with the requirements of the contract agreement documents.

3.9. PROJECT ACTIVITIES DURING OPERATIONS & MAINTENANCE PHASE

Solar power plants do not require sophisticated operational and maintenance (O&M) activities. Operation and maintenance of the system would involve replacement of modules, cleaning of PV modules, repair of inverters and other supporting equipment, which would be expected to occur on a limited basis at certain points during the system's estimated life cycle. That of the transmission line will include line patrols, climbing inspections, tower and wire maintenance, insulator washing in selected areas as needed, vegetation management, land uses, and access roads repairs. Faulty components will be replaced as soon as problems are identified. VRA will be having a dedicated O&M Team comprising of technical staff to conduct the aforesaid maintenance activities. This will also require additional resources in the form of water (for module cleaning), consumable spares and insurance.

3.10. DECOMMISSIONING ACTIVITIES

The average life span of the solar modules is 25 years. At the end of this life cycle, the solar modules will either be revamped or replaced and continue with its operation. If decommissioned, all components including foundations and internal roads of the project will be removed and the site will be restored to its pre-construction state. The concrete pedestals of the ground mounted structure foundations will be

demolished and removed from the sub-surface. The associated infra-structures will be returned to the government for use. A Decommissioning & Site Closure Plan is required to guard against the remote possibility that the project ceases to operate and the facilities are abandoned by VRA, and this shall be discussed in a separate chapter in the Main EIA Report.

3.11. RESOURCE REQUIREMENTS

3.11.1. Manpower Requirements

It is expected that a peak construction work force of approximately 70 locals will be contracted, including community members, during the construction period. This work force will be employed on short term basis during the project. The EPC Contractor and Consultant direct workers staff will comprise of about 10 expatriates and 15 Ghanaians. During the operational phase, a dedicated team of about 10 VRA engineers and technicians will be responsible for the upkeeping of the plant. Security and cleaning tasks will be outsourced and supervised by VRA.

3.11.2. Land Take Requirements

Land area of 140.279 Ha is to be acquired at Kurugu, and it is within this site that the associated substation will be developed. In addition, the associated 7 km sub-transmission line will utilise the RoW of the Kurugu – Pwalugu Road as well as the associated 161kV Bulk transmission line for the PMDP and therefore will require no additional land.

3.11.3. Water Requirements

Water will be required for both the constructional and operational phase and details of these water requirements will be discussed in the Main EIA Report. Estimations of the water requirements will be based on past experiences in the construction of similar PV projects in Ghana, and compared to that from the literature.

3.11.4. Raw Materials Requirements

Raw materials required such as aggregates, cement, reinforcing bars, fencing materials and other materials for the construction of the project can be locally procured and to be sourced from the Bongo District and the Bolgatanga Municipality, as appropriate, and will be done in consultation with the local government authorities to ensure the acquisition of any permits if required. Winning of sand and aggregates will require state permitting, subsequently, the EPC Contractor will most likely outsource the acquisition of these materials to local contractors who already have such permits. Other local procurement will include foodstuffs and miscellaneous supplies and services.

3.11.5. Cultural Heritage Resources

Based on desktop research as well as a field investigation undertaken by the EIA Team in the scoping phase, no archaeological material was found and recorded. However, a shrine (Kpatusi) is located at the project site and a sacred grove covering an area of about 4,400 square meters is located about 100m beyond the Northern end of the project site. VRA in principle negotiates on the cost of items required for any relocation and agrees on the monetary value which is later presented to the appropriate person(s) for the necessary rites to be performed. Dates for performing such rites are agreed and is usually

witnessed by the VRA team for records purposes, and this is to be replicated on the project, if required and the details provided in the Main EIA.

3.11.6. Power Requirements

As indicated earlier, there is a new 34.5kV line from Wulugu to Kulugu which is still under construction and runs along the road on the side of the site (See Plate *3-2*). This line is being constructed by the MoEn and when completed will be handed over NEDCo for O&M purposes. The project will consume about 30Kwh mainly for site works, lighting purposes and constructional work, during the constructional period. Power for construction and project activities will be obtained from the new 34.5 kV power system as well as a 135kV Stand-by generator. For the operational phase, the proposed project will not consume energy, but will instead provide a new source of clean, renewable electricity not only into the national grid but for operational activities of the solar facility itself.

Plate 3-2: Ongoing Development of new 34.5 kV sub-Transmission line by PV Project Site

Source: VRA Field Survey Report, July 2020

3.12. RISK ASSESSMENT & MANAGEMENT

Risk assessment and management shall be an integral part of the proposed project's execution. Risks related to project execution and operations shall be identified by a structured approach. Risk assessments shall be planned and conducted in advance of appropriate activities to allow resolution of risk without schedule interruption. Competent personnel shall be included in risk assessments to ensure that risks are correctly identified and assessed. The responsibility of risk management in the proposed project lies with the EPC contractor, and would involve developing a detailed site risk assessment and control to cover all aspects of the work. Monitoring by the VRA Project Management Team will ensure that contractor processes are being implemented fully and effectively.

3.13. FUTURE UPGRADES

While no specific upgrades to the solar arrays or project footprint are planned at this time, it would be reasonable to expect that future technological improvements may warrant changing some or all PV panels in order to achieve improved efficiency. It is also conceivable that future upgrades, employing similar updated technologies, could be proposed to expand the arrays beyond their current proposed footprint. Any future upgrades would be reviewed through established EPA procedures.

3.14. ACQUISITION OF PROJECT PERMITS & LICENSES

Various statutory permits and licenses are to be acquired for the various phases of the project as shown in Table 3-2. VRA has commenced activities to acquire the regulatory permits/licenses from the relevant state agencies to ensure adherence. For the pre-constructional phase, VRA has obtained the Siting permit from the Energy Commission, and as indicated the preparation of this Scoping Report is the initial step for the acquisition of the Environmental permit.

Table 3-2: Required Project's Permits & Licenses

#	Project Phase	Type of Permit/License	Issuing Authority
1	Pre-Construction	Environmental Permit	Environmental Protection Agency
2		Siting Permit	Energy Commission
3		Fire Permit	Ghana National Fire Service
4		Development Permit	West Mamprusi Municipal
5	Construction	Water Use Permit	Water Resources Commission
6		Construction Permit	Energy Commission
7	Operational & Maintenance	Generation & Electricity Wholesale Supply Licence	Energy Commission
8		Environmental Permit	Environmental Protection Agency
9		Water Use Permit	Water Resources Commission
10		Fire Permit	Ghana National Fire Service

3.15. PROJECT FINANCING DETAILS

Ghana's Parliament in Feb. 2020 endorsed a contract agreement covering over US$993 million between the Government of Ghana and Power China International Group Limited for the construction of the PMDP[1]. The cost of the 50MWp solar hybrid facility plant is expected to be around US$ 55.3 Million and is funded by the Government of Ghana. VRA on behalf of MoEn is the Project Executing Agency.

[1] Sourcehttps://goldstreetbusiness.com/business/parliament-approves-proposed-us993m-mul…

3.16. PROJECT SCHEDULE

Subject to obtaining the necessary consents, project construction is expected to start in the third year after commencement of that of the hydropower project, i.e. in 2023, and is targeted to take approximately 10 months to complete as shown in the project schedule illustrated in *Table 3-3*. The programme for the sub-transmission line works is critical to the optimum timing for the project and it will be essential to have this infrastructure in place prior to completion and commissioning of the substation.

Table 3-3: Project Schedule

ACTIVITY	PLAN START	PLAN DURATION	1	2	3	4	5	6	7	8	9	10	11	12
	Month	Month	MONTH											
Advance Payment	1	1												
Engineering Design	1	2												
Procurement of Equipment and Transportation	2	7												
Construction Work	1	8												
Installation Works	5	5												
Commissioning	9	1												
Test Run	10	1												
Turn Over	10	1												

PWALUGU MULTIPURPOSE DAM PROJECT:

50MW SOLAR HYBRID PROJECT IN THE WEST MAMPRUSI MUNICIPAL OF THE NORTH EAST REGION, GHANA







ENVIRONMENTAL IMPACT ASSESSMENT: SCOPING REPORT

CHAPTER 4: DESCRIPTION OF EXISTING ENVIRONMENT

CHAPTER 4 : DESCRIPTION OF EXISTING ENVIRONMENT

4.1. INTRODUCTION

This Chapter provides a detailed report covering all aspects of the existing physical environment, biological environment, ecological sensitive areas as well as socio-economic conditions. It must be noted that even though the project is specific to the Kurugu and Kpatusi, which can be described as the immediate impact area or the Area of Influence (AoI), assessed to be within 2km from the project site, its environmental and social influence may affect a large area of the other parts of the affected West Mamprusi Municipal. Thus, aside providing specific data on the project site, it also includes information such as climate, social-economic development that transcends the specific communities and is general to the West Mamprusi Municipal, defined as the broader impact area.

4.2. DATA COLLECTION METHODOLOGY

Specific study on the existing biophysical and social environment for the solar hybrid project site commenced in September 2020 and this was achieved through the collection of both primary and secondary data. For primary data, a site reconnaissance visit was done to collect baseline data in the context of physical and ecological environment as well as socio-economic and land use. Baseline data on noise and ambient air quality at the project site were obtained during the visits. VRA is also in discussions with the Forest Commission, West Mamprusi Municipal, to undertake a quantification and listing of identified flora and fauna within the project site for inclusion in the Main EIA Report.

The compilation of the social data, including cultural heritage sites, in the communities was mainly coordinated in consultation with the locals. The secondary data to supplement the primary social was collected through a wide literature review on the project as well as the project area (see Reference Section). Various EIA Reports for solar power projects in Ghana, e.g. 2.5MW Navrongo Solar Power Project, 35MW Upper West Regional Solar Power Project and the 40MW Bongo Solar Power Project and elsewhere were also reviewed.

In 2013, VRA received funding from Agence Francaisede Development to undertake Feasibility Study, an environmental assessment for the hydropower component of the PMDP. The environmental assessment, which was undertaken by Mott MacDonald (UK)/EEMC (Ghana) culminating in the preparation of a Scoping Report and a Draft EIA Report. Due to project re-design, VRA in 2018 engaged Tractebel Engineering/SRC Consulting to update the Draft EIA and prepare a Resettlement Action Plan for the hydropower component, and an Inception Report for the services was submitted in July 2020. It must be noted that the location of Kurugu in the West Mamprusi Municipal is located in an area that is covered under these studies, and therefore, these reports have provided detailed baseline data on biophysical and social environment which has complimented that of the ongoing EIA studies for the solar hybrid component of the PMDP.

4.3. GENERAL SITE INFORMATION

4.3.1. Geographical Location

As indicated, the PV project is located in Kurugu within the West Mamprusi Municipal in the North East Region of Ghana. The Municipal is located within longitudes 0°35'W and 1°45'W and Latitude 9°55'N and 10°35'N with a total land area of 2610.44 sq km. It shares boundaries with East Mamprusi Districts to the East, Savelugu-Nanton Municipal to the South, Talensi-Nabdam District to the North and to the West, Mamprugu Moagduri District. Other neighboring Districts are Gushegu to the South East-East, Karaga to the South-South East, Kumbungu to the South West, Builsa South to the North West-West and Kassena Nankana East to the North-North West. The North East Region is bordered on the north by the Upper East Region, on the east by the Eastern Ghana-Togo international border, on the south by the Northern Region, and on the west by the Upper West Region (See Figure 1-1).

4.3.2. Land Use

The soils of the district exert great influence on the pattern of land-use. Land is basically allocated for farming, grazing, forest reserves, settlements, road network, dams and dug-outs. Land use at the site was identified as being mainly for farming purposes. Indeed, during the field survey farms of maize, millet, groundnuts, soya bean, Bambara beans, okro and tomatoes were observed at the project site (See Plate 4-1). Economic trees such as Shea and Dawadawa are also common. Livestock like cattle, goats and sheep were abundant in the area. There are no visible sources of surface water on the PV site. There is a new 34.5kV line from Wulugu to Kulugu which is still under construction and runs along the road on the side of the site (See Plate *3-2*).There are some settlements (hamlets) of Fulani herdsmen just outside the area of acquisition but within the area of interest (See *Plate 4-2*) shaded blue near B1 in the satellite image shown in Figure 4-4 under Section 4.4.5. It must be noted that there will be no need to relocate these Fulani herdsmen as they fall outside the project area.

The immediate neighbourhood of the project site at Kurugu and Kpatusi are not covered by any layout. Most of the developments within the project enclave are traditional mud houses designed for occupation by households. They are roofed with either thatch or zinc sheets (See Plate 4-7). Compound subsistence farming is the pattern of farming in the area, as shown in Plate 4-1. This involves the deliberate use of lands and plots by individual families and households around their homesteads or family compound homes as farms through the effective combination and interaction of cropping, livestock, poultry, and agroforestry schemes. These farms represent an integral component of rural agroecosystems in the socio-ecological landscape. The neighbouring / sensitive features around the immediate project site (within 2km) of the solar project sites and their coordinates as well as distances from the project site are shown in Table 4-1 and a satellite view shown in Figure 4-1.

Table 4-1: Neighbouring Infrastructure Within the Project Area

Name of Neighboring Sensitive Facility	Latitude	Longitude	Distance from PV Site (km)
Kurugu Church of Pentecost	N10°36' 00.4"	W0° 45' 03.0"	1.24
Kurugu Primary School	N10° 35' 57.7"	W0° 45' 08.7"	1.09
Kpasurugu Sacred Grove	N10° 35' 30.8"	W0° 45' 23.6"	0.15
Kpatusi Tree Shrine	N10° 34' 50.8"	W0° 45' 48.6"	Within the site
Kurugu Mosque	N10° 36' 02.2"	W0° 44' 59.0"	1.36
Kurugu CHIPS Compound	N10° 35'55.03"	W0° 45'10.10"	0.99
Fulani herdsmen hamlets	N10° 34' 38.74"	W0° 45'25.15''	0.25

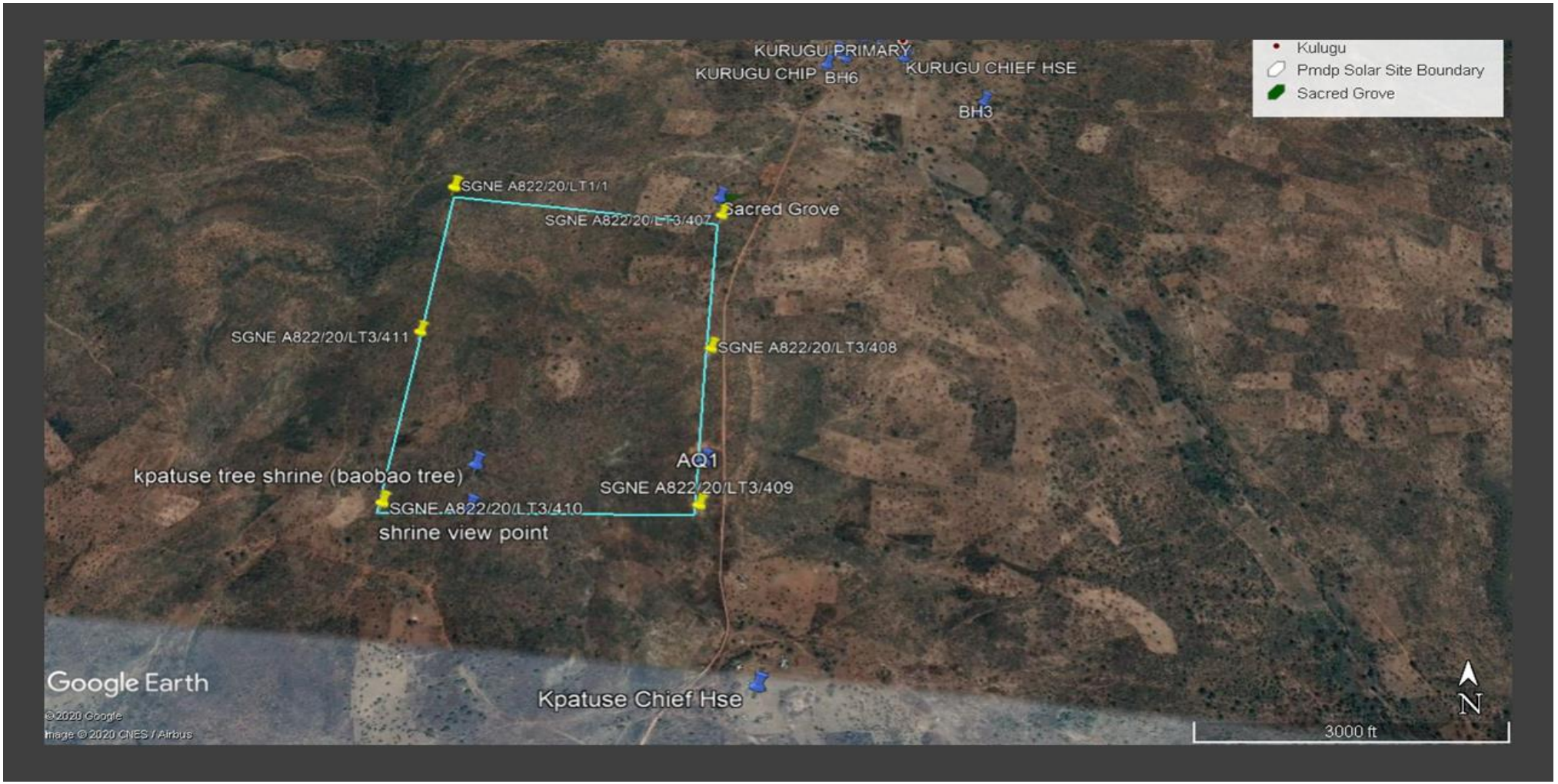
Plate 4-1: Land Uses at Project Site

Source: VRA Field Survey, September 2020

Plate 4-2: Fulani Hamlets Close of Project Site

Source: VRA Field Survey Report (July 2020)

Figure 4-1: Project Site Showing Key Social Features



Source: Project Management Team (September 2020)

4.3.3. Traffic & Transportation

The Municipal has a road density of about 0.0950 / km^2 and is relatively one of the lowest in the country. The major means of transportation in the Municipal are the use of bicycles and footing. Other means include the donkey with cart and motorbikes. This was confirmed during the field survey, where it was noted that the use of donkey carts, motorcycles, bicycles and auto rickshaws are common sights in the District. The N10 Highway Section of the Bolgatanga – Tamale, which links to Wurugu is the busiest busiest route in the Municipal and is asphalted. There is a feeder road from Wurugu to the Solar Hybrid project site. The proposed solar site of Kurugu is rural and serene and experiences virtually no public transportation. Thus, traffic load from vehicles on that road network is very low. Within the project site itself, are various routes that are being utilised by the local communities on a daily basis for their movements and the acquisition of the land will require a diversion of these routes.

Information on the existing traffic and transportation survey data and road traffic accidents and safety statistics have been provided in the Draft EIA Report of the hydropower component that was issued in 2015. In that Report, primary and secondary traffic data were collected using Traffic scheme surveys, road junction surveys and road conditions surveys. This is to be complemented by current data from this study and provided in the Main EIA Report.

4.4. PHYSICAL ENVIRONMENT

4.4.1. Atmospheric & Climatic Conditions

The rainfall in the District is seasonal and is characterized by a single maximum, which starts in late April with little rainfall. The second and third quarters of the year generally record the heaviest rainfall rising to its peak in July-August and also the greatest number of rainy days declining sharply to a complete halt in October-November. Annual rainfall ranges between 950mm - 1,200mm. Maximum day temperatures are recorded between March-April, while minimum night temperatures are recorded in December-January. The monthly average air temperature of the project site doesn't vary a lot, with the temperature differences of no more than 10°C. Monthly average wind speed of the project site is 2.5 to 3.7 m/s. The humidity levels between April and October is generally high in the night and falls low during the day. Energy generation yield of the project location has been provided under Section 3.5.1.

Climatic data covering years 2010-2019 has been obtained from the nearest national synoptic weather station at Navrongo, Weather station: 654010 (DGLN) located at Latitude: 10.9 | Longitude: -1.1 | Altitude: 201 and this will be provided in the Main EIA Report for climatological analyses, to provide a clearer picture of the climatic conditions in the project area. This weather station is very representative of the West Mamprusi Municipal, within which the proposed project will be located.

4.4.2. Ambient Noise

The Ghana Standard for Health Protection – Requirements for Ambient Noise Control (GS 1222:2018) specifies the requirements for acceptable ambient noise control emission levels within categorized locations. Classification of areas of noise descriptions by zones by the GS1222:2018 is shown in Table 4-2. The permissible noise requirements per each zone is also provided in Table 4-3. Surveys of baseline day- and night-time noise levels were carried out within the environs of the project site at Kurugu in September 2020 where noise was likely to be an impact during the constructional and operational phases of the project cycle. The baseline noise was observed to be exceptionally tranquil and rural and comprised mainly of natural noise form sources such as insects, birdsong and wind in the trees and foliage. From the definitions and the existing conditions at Kurugu, the project site can be described as belonging to Zone A Category, i.e. residential areas for now but will move to Zone C Category during project operations. The results of this baseline data on noise levels will be provided in the Main EIA Report.

Table 4-2: Classification of Area of Noise Description into Zones

Zone	Description of Area
A	Residential areas
B	Educational (school) and health (hospital, clinic) facilities, office and courts
C	Mixed used (Residential areas with some commercial or light industrial activities)
D	Areas with some light industry, places of entertainment or public assembly, and places of worship
E	Commercial areas
F	Light industrial areas
G	Heavy industrial areas

Source: Ghana Standard - GS 1222:2018

Table 4-3: Ambient Noise Control Level Requirement

Zone	Permissible Noise Level In dB(A)	
	DAY (6:00am - 10:00pm)	NIGHT (10:00pm - 6:00am)
A	55	48
B	55	50
C	60	55
D	65	60
E	75	65
F	70	60
G	70	70

Source: Ghana Standard - GS 1222:2018

4.4.3. Air Quality

The Ghana Standard for Environment and Health Protection- Requirements for Ambient Air Quality and Point Source/Stack Emissions (GS 1236: 2019) specifies the requirements and

methods of analysis for ambient air. The Standards mandates the use of "ASTM D4096-17, Standard Test Method" or the determination of Total Suspended Particulate Matter in the Atmosphere (High Volume Sampler Method). Per the standard, the maximum permissible levels for ambient air pollutant is shown in Table 4-4.

Table 4-4: Ambient Air Pollutants – Maximum Limits

#	Substance	Max. Limits	Averaging Time	Test Method
1	Sulphur Dioxide (SO2), µ/m^3	520	1 Hour	AS 3580.4.1
		50	24 Hours	
2	Nitrogen Oxides (measured as NO2), µ/m^3	250	1 Hour	ISO 7996
		150	24 Hours	
3	Total Suspended Particulate Patter, µ/m^3	150	24 Hours	ASTM D4096-17
		80	1 year	
4	PM_{10}, µ/m^3	70	24 Hours	ASTM D4096-17
		70	1 year	
5	$PM_{2.5}$, µ/m^3	35	24 Hours	ASTM D4096-17
6	Black Carbon, µ/m^3	25	24 Hours	ASTM D6602-13
7	Benzene, µ/m^3	**5**	**1** year	ASTM D5466 - 15
8	Lead µ/m^3	0.5	1 Year	ISO 9855
		1	24 Hours	

Source: Ghana Standard - GS 1236: 2019

Air quality is not considered to have likely long term impacts and is largely associated with the construction phase. There is no current baseline data for the Project area although given the rural nature of the Project area existing pollutant concentrations of NO_2 and SO_2 are expected to be low and well below relevant national and international standards. In addition, there will be no operational emissions and therefore emission limits will not been considered within this section. For this EIA, measurement of air quality on the project site is being established for monitoring purposes. The Envea Global's Cairnet Air Monitoring System was used for the monitoring of the ambient air quality within the project area. The results of this baseline data on air quality levels will be provided in the Main EIA Report.

4.4.4. Water Resources & Flooding

The prevailing rainfall and the nature of the underlying rock formation determines to a large extent the ground and surface water potential for the district. With regards to surface water, the Municipal is drained by the White Volta and its tributaries, the Sissili and the Kulpawn rivers. The White Volta passes through the Municipal at Nasia and Pwalugu as well as Misio and Shelinvoya and is the nearest surface water body to the project site as shown in the Figure 4-2. The shores of the White Volta is within 5km of the project site. The present combination of heavy run-off, high evaporation and transpiration and low infiltration rates to recharge aquifers in some areas in the district, contribute to water deficiencies especially to the west of White Volta, the south around Fio area and eastern parts around Shelinvoya.

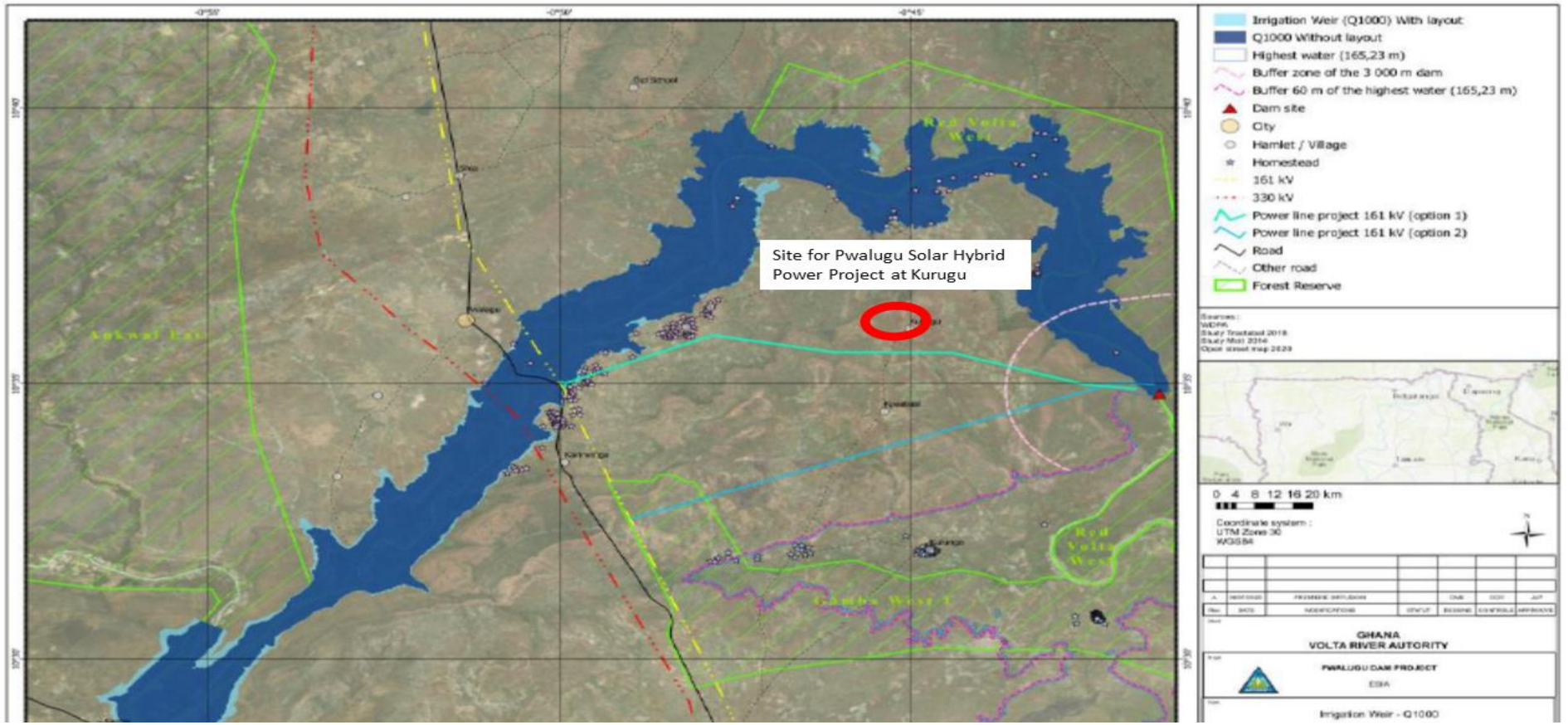
In West Mamprusi, most of the successful boreholes are not deeper than 60m. This indicates that the favourable fractured zones are within the first 60m of drilling. If no water is encountered when the first 40 to 60m is excavated then the chances of finding water inflows in deeper layers are not great. The water table in the district is usually very low though the area is generally low lying. Probably the intake points to support the charging of aquifers are inadequate.

Hand-dug wells have been found to be the most preferred option of sources of water for the community members. This is because the local people are able to sink some on their own and in some areas they prove to be more successful than boreholes. The average depth of hand-dug wells is 15m. There is a 90% success rate for hand-dug wells in the district. This has resulted in a very dense network of hand dug wells in all the communities of the district. From the field study, water supply to the project communities is mainly from groundwater and seven (7) boreholes were identified within Kurugu and Kpatusi Communities, the project area of influence.

Flooding by the White Volta is an annual problem caused mainly by the numerous small rivers, which flow into it especially below Pwalugu. Occasional flash floods have also been caused by spilling of waters from streams further upstream in Burkina Faso. There were no visual signs of flooding or erosion observed at the site at the time of the site reconnaissance visit by the EIA Team. Hydrological simulations of various flood scenarios carried out as part of the EIA shows that Kurugu is not flooded even under a 1-in-1,000 year flood (See Figure *4-3*) Interviews during the fieldwork also suggests that Kurugu does not suffer from flooding. This is because elevation of Kurugu is about 200 metres above mean sea level (amsl) compared to the elevation of the river bank of about 140m amsl.

Figure 4-2: Water Resources Within Project Site

Figure 4-3: Limits of a 1000-Year Return Period With and Without PMDP



Source: EIA/RAP Study Inception Report, PMDP, July 2020

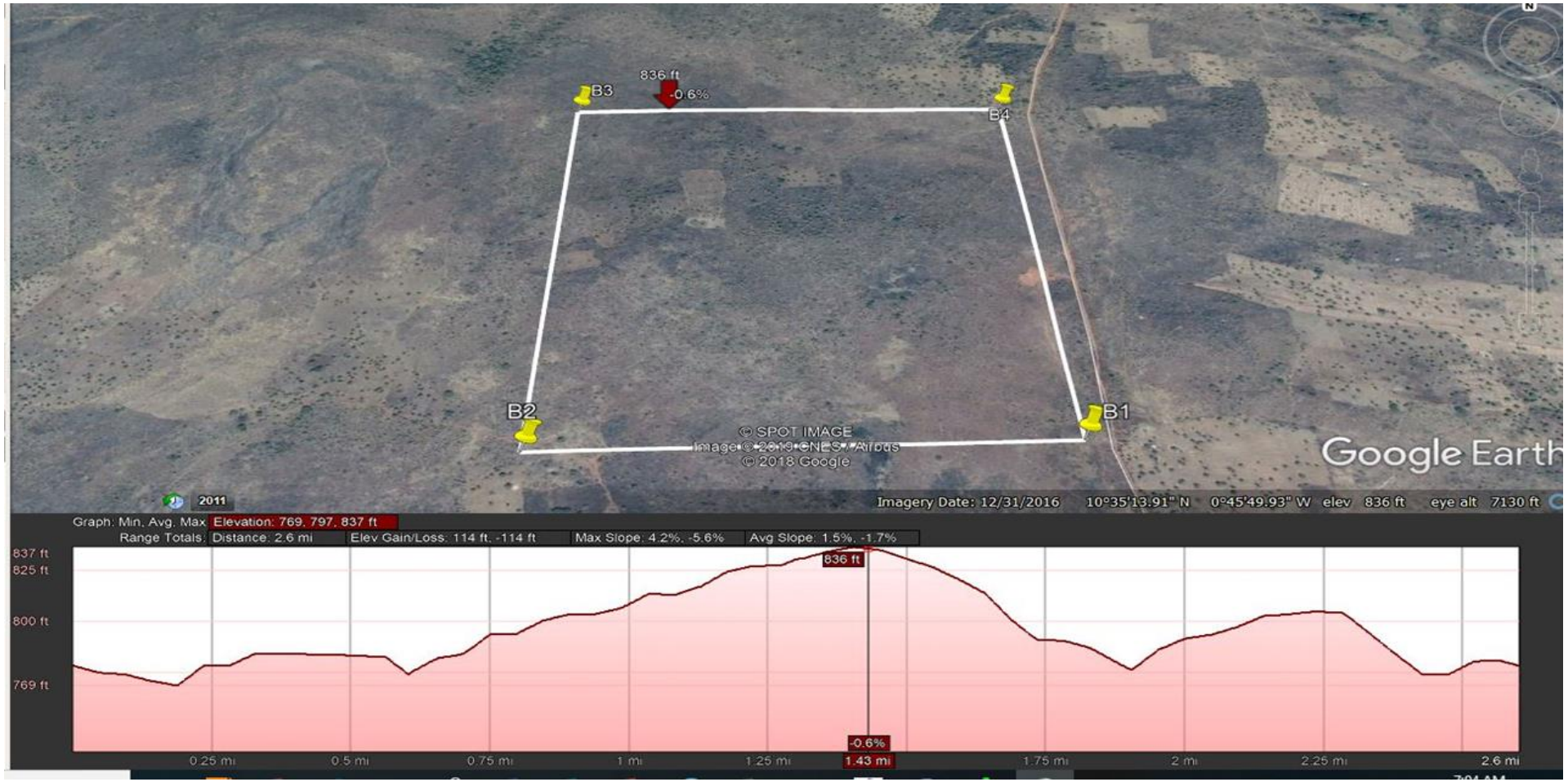
4.4.5. Topography

The West Mamprusi Municipal has an undulating terrain characterized by gentle slopes from north-east to south-west. There are however, a few isolated visible outcrops and uplands of not more than 10% slope. Isolated hills, which break the monotony of the landscape, can be found around Karimenga, Shelinvoya, Suhuluya, Manga and the outskirts of Wulugu. From the field survey, the solar power site is situated with boundary coordinates B1 (10°34'38.23"N 0°45'24.01"W), B2 (10°34'37.23"N 0°45'55.86"W), B3 (10°35'13.70"N 0°45'56.75"W) and B4 (10°35'14.73"N 0°45'25.02"W) as shown in the profile graph in Figure *4-4*. From the profile graph, the land starts rising from B1 to the mid of B3-B4 through B2 and starts descending from mid of B3-B4 to B1 with the highest elevation of 836ft (254.8m) being near B3 and the lowest between B1 and B2. The site has an elevations of 235 - 255m and slopes downwards from the northern part (B3-B4) to the southern part (B1-B2) and has flat terrains (See Plate *4-3*).

Plate 4-3: Flat Terrain Nature of Project Site

Source: VRA Field Survey Report (July 2020)

Figure 4-4: Satellite Imagery & Profile Graph of Project Site



Source: VRA Field Survey Report (July 2020)

4.4.6. Geology and Soil Characteristics

The Geological formation in the West Mamprusi Municipal is underlain mainly by the Middle Lower Voltaian, comprising sandstone, arkose, mudstone and shale. The western part of the district is underlain by the Lower Voltaian formation consisting of sandstones and grit. The northern tip is underlain by the Birimian Rock Formations. Birimian rocks are metamorphosed lavas, with ply units, schists, tufts and greywacke. Regarding the middle Voltaian, the depth and degree of weathering depends on the lithology. These hold a lot of positive effects for the district development. Most of these stones are rich in potassium useful for the manufacture of fertilizer for agricultural purposes. They aid in the trapping of moisture laden winds necessary for the formation of rain clouds, and hence rainfall for crop growth.

The geological formation is very important in determining the amount of underground water. From available data, success rate of boreholes in the district is about 50%. Besides the 50% chance in hitting water when a borehole is drilled, the yield is very low but sufficient for hand-pump installation. Some wells do get dry in the dry season between March to June. This is as worrisome as pressure is exerted on the few high yielding one leading to frequent pump breakdowns. Since that is also the lean season, it is the time that the people struggle to survive and so contribution of money to buy spare parts becomes a big issue. Some communities close to the District capital are compelled to move in on daily bases to search for water.

The predominant soil types in the Municipality are sandy, loam, sandy-loams, and clayey soils. Naturally this provides the municipality an opportunity for the cultivation of a diversity of crop types be it upland crops such as maize, groundnuts or valley crops such as rice. Soils are prone to sheet and gully erosion especially under cultivation. If organic materials are not applied regularly to these soils, heavy nutrient leaching will occur. The project site is generally lateritic gravel with fused laterite and the soil type in some areas is however loamy.

4.5. BIOLOGICAL ENVIRONMENT

4.5.1. Vegetation

The natural vegetation of the district is classified as Guinea Savannah Woodland, and is generally composed of short trees of varying sizes and density, growing over a dispersed cover of perennial grasses and shrubs and tis is typical of the project area. The savanna is an 'arrested climax' vegetation due to regular fires which create the open cover and a relatively small number of species all of which are relatively fire resistant. The AoI is dominated by woodland habitat. The woodland has been managed over generations to favour certain plants and tree species of value such as the shea tree (*Vitellaria paradoxum*) whilst simultaneously providing sustainable ecological conditions to provide forage for livestock and land for agriculture. Typical canopy species include *Afzelia africana*, *Anogeissus leiocarpus*, *Pericopsis laxiflora*, *Pterocarpus erinaceus*, *Terminalia avicennioides* and shea tree.

The acacia is an important fodder provider while the sheanut is an important commercial tree. It is mainly wild although sometimes planted and often inherited. The Shea tree usually grow in the

wild, although sometimes planted and often inherited and is used as a community resource. Women mostly collect the kernel of the Shea fruit for processing into Shea Butter, as shown in *Plate 4-4.* Seedlings germinate from the fallen nuts and the corky bark is resistant to the regular fires. Seedlings are difficult to transplant due to their fire resistant tap root. The trees which are very long lived take at least 15 years to fruit while taking 30 years to mature. For this reason planting is less satisfactory than harvesting the wild trees. The yellow flowered shrub *Cochleospermum tinctorium* which is abundant beneath the trees is sometimes used for giving a yellow tint to the shea butter. As indicated earlier, the Forest services Division (FSD) office in West Mamprusi Municipal is to undertake a quantification and listing of identified flora and fauna within the solar hybrid project site and this information, including pictures, is to be included in the Main EIA Report.

Plate 4-4: Shea Fruits Collected by a Woman in the Wild for Processing

Source: PMDP ESIA Scoping Report, June 2014

4.5.2. Fauna

The fauna of the project area has been extensively affected by alteration and fragmentation of habitat resulting from especially fire, human settlements, and agricultural activities. A faunal survey carried out showed insects such as grasshopper and butterflies as common to the area. Birds such as Vulture, Cattle Egret, Harrier Hawk were common. Reptiles identified included the agama lizard and snakes. In addition, rabbits, squirrels, bush guinea fowls are animals that are commonly hunted by the locals.

Faunal species play very important and sometimes critical roles in food chains and by implication in the ecosystems in which they live. The presence or absence of some species may act as key ecological indicators. They may also be sources of food for the local human populations. Because of their roles in food chains, any anthropological activities that may impact negatively on them directly or their habitats may pose problems for the survival of other species in other trophic levels.

Therefore, all human developments within their habitats should be carried out with due consideration for environmental concerns.

4.5.3. Environmentally Sensitive Areas

It is imperative that no endangered or threatened species or designated protected areas be adversely impacted by the power or transmission line project. If this occurs, these species should receive particular attention during the assessment of impacts on flora and fauna, striving for no net loss. All activities proposed for the project should be overlaid on maps of the habitats for endangered and threatened species as well a protected areas, to identify any potential impacts.

Investigation did not suggest or provide any information describing or prescribing the site as a low range or habitat or ecological sensitive area for any wildlife. As a result, clearing of the site vegetation to give way for the construction of the Solar Project would not have any significant impact for wildlife habitat. According to the Draft EIA report for the hydropower project, several sites with high biodiversity value have been identified in the study area and more precisely in the footprint of especially the reservoirs, dam and weir are seven (7) forest reserves (Tankwidi, Red Volta west, Red Volta East, Marago River, Gamba West, Gambaga Scarp West, Gambaga Scarp East). From the field study in September 2020, the Gambaga Scarp West Forest reserve (Block 2) is the closest Environmentally sensitive area within the vicinity of the project area (See Figure *4-5*). It is, however, envisaged that the project will have no impact on the forest reserve.

4.6. SOCIO-ECONOMIC & CULTURAL ENVIRONMENT

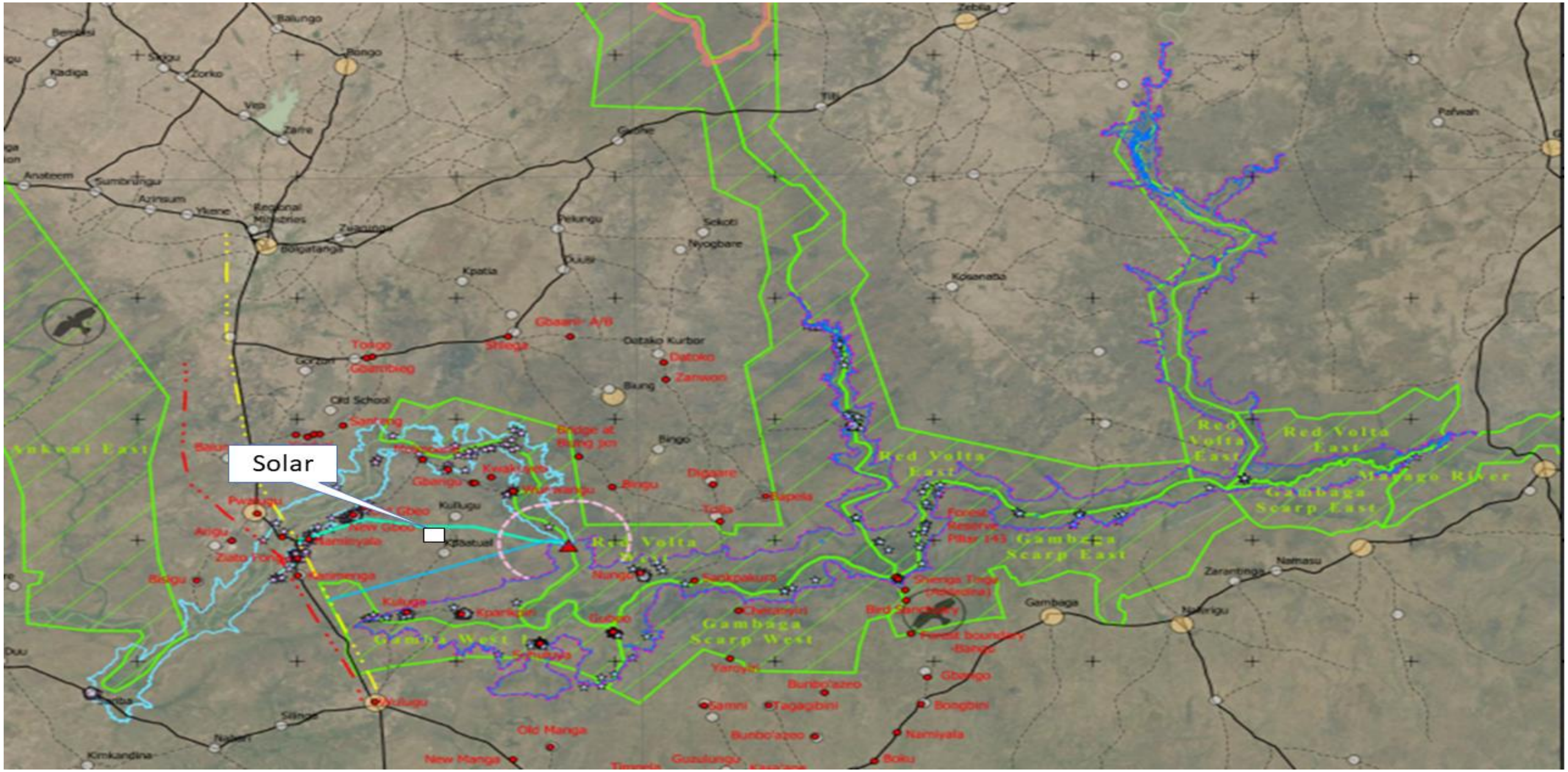
4.6.1. Overview

The Ghana EIA requires the discussion of the following issues as part of the socio-cultural baseline information and these have been examined in this Report:

- The land area taken up by the development, its location clearly shown on a map and geographical coordinates provided.
- Human beings: (population composition and distribution, socio-economic conditions, cultural and ethnic diversity, population growth rate);
- Land use: (agriculture, forests, industrial, commercial, residential), transportation routes such as roads, rail, water and air, utility corridors)
- Social services: (electricity, telecommunication, water supply, hospitals, etc);
- Cultural heritage: (unique features of the area or its people; cemetery, fetish grove, festivals etc).

This section presents a brief description of the social and economic characteristics of the project area It is anticipated that the most significant socio-economic impacts will occur within the West Mamprusi Municipal and its environs within the North East Region of Ghana. For this reason, the discussion of baseline socio-economic conditions was looked at within the context of this Municipality.

Figure 4-5: Environmental Sensitive Areas in the Context of the Solar Hybrid Project



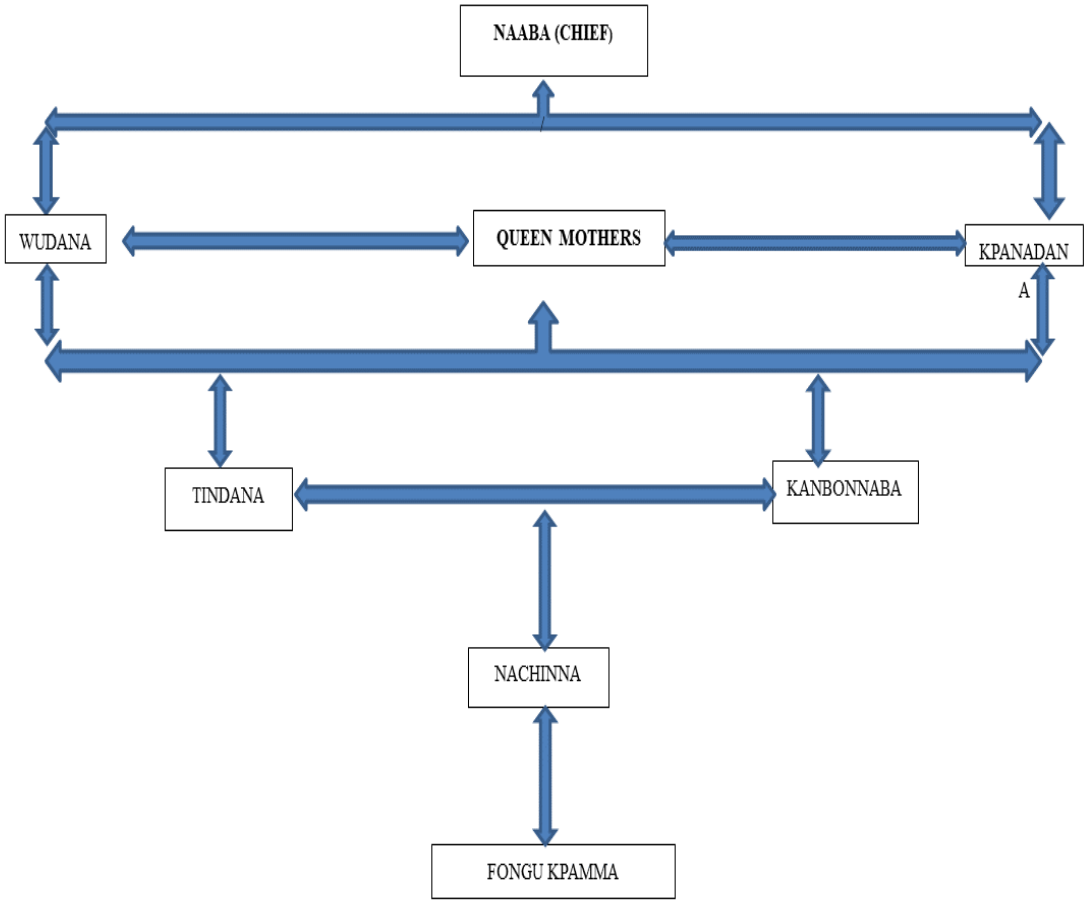
Source: PMDP Draft ESIA Report, Feb. 2015

4.6.2. Governance Structure

Traditional Authority

A typical social hierarchy in a Mamprusi Community is shown in Figure 4-6. It consist of the Chief, the Wudana who is the linguist in the village and leader of the elders; The Maasu/ Kpanadana (the elders of the Community and advisors to the chief), the Tindana (in charge of the Gods in the Community/ Fetish priest), the Kanbonnaba (the Chief Warrior), the Nachinaa (the Youth Leader), the Mangazia (the Women's Leader), the Fongu Kpamma (the Sectional Heads). There are four main paramountcy in the District all answerable to the King of Mamprugu – the Nayiri. These include the Wulugu Traditional Area (headquarters at Kpasenkpe), Soo Traditional Area (headquarters at Janga), Wungu Traditional Area (headquarters at Wungu) and Kurugu Traditional Area (headquarters at Kurugu), under which the project area is. There are also a number of divisional chief under these major chiefs. There are no known chieftaincy disputes currently in the District and the commendation goes to the traditional authorities and the people for the roles they play in ensuring peace in the District.

Figure 4-6: Traditional Political Structure of a typical Mamprugu Community



Source: 2018-21 Medium Term Development Plan – West Mamprusi Municipal

Political Authority

The West Mamprusi Municipal is one of the six (6) administrative assemblies in the North East Region of Ghana with Walewale as its capital. Although it is in the North East, it has strong economic and functional linkages with some major settlements in the Northern and Upper East Regions. The Municipality is headed by a Municipal Chief Executive (MCE), in the person of Honourable Arimyao Somo Luc at the time of this study, who serves as a representative of the President. As head, the MCE is responsible for executive decisions and approvals to guide the daily administration of the District Assembly. In all the legislative arm of the Assembly has a membership of forty-six (46) members made up of thirty-one (31) elected members, thirteen (13) government appointees, the Municipal Chief Executive, the Member of Parliament, and the District Co-coordinating Director who serve as a Secretary to the Assembly. Within this context, the EIA team's activities during the scoping exercise were done in collaboration with the Assemblyman of the Kurugu Electoral Area, Honourable Alhassan Mohammed.

4.6.3. Land Management & Land Tenure System

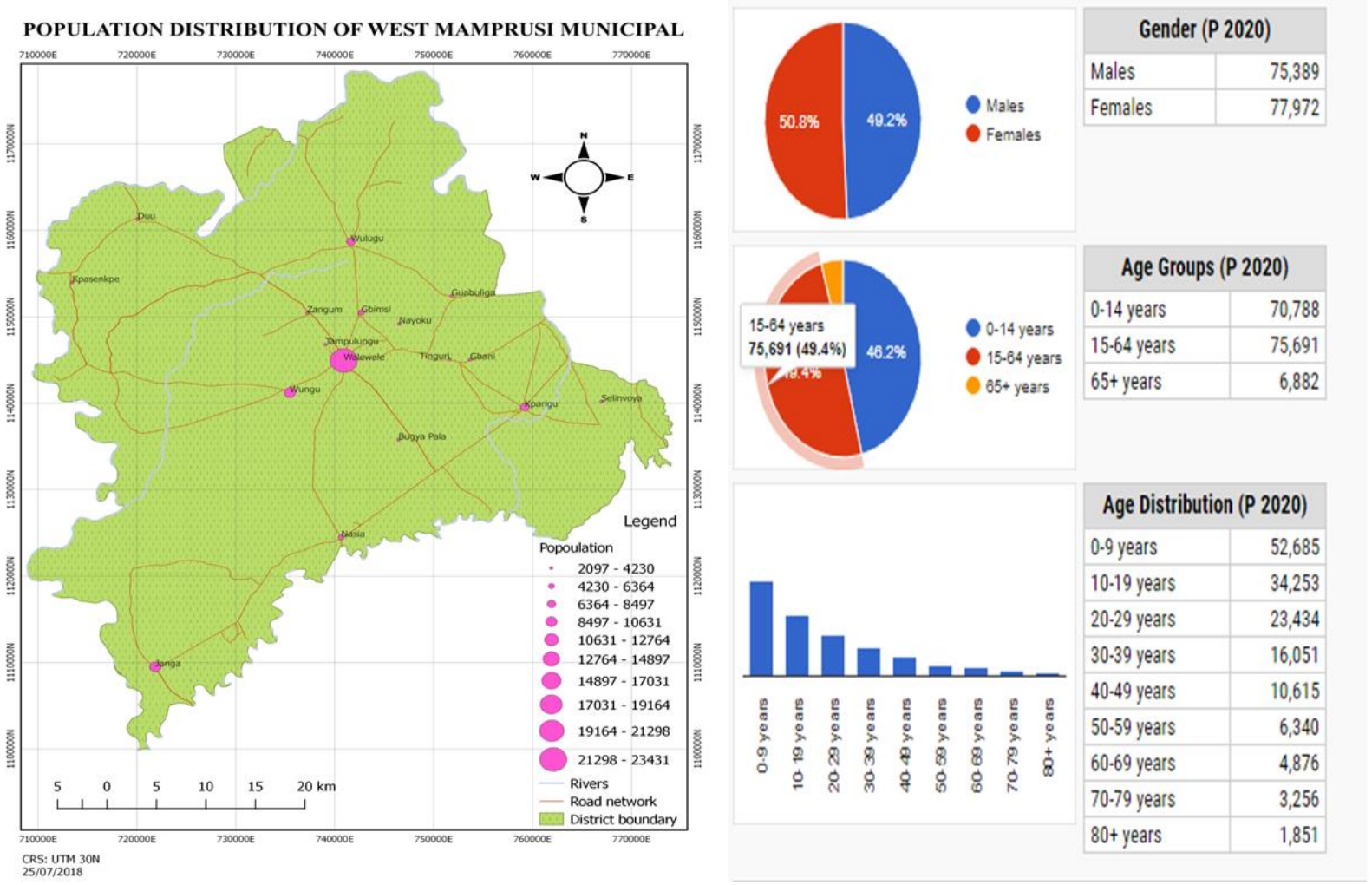
A description of land take requirements, for both the solar hybrid and the sub-transmission component, have already been discussed under Section 3.11.2 and all this land will fall within the jurisdiction of the West Mamprusi Municipality. It is within this site that the 50MW Solar Hybrid facility will be developed. All the lands belong to the Mamprugu skin and the divisional chief of the town acts as the resident trustee on behalf of the 'Nayiri'. Title to lands is derived from the allodia superior title. Lesser interests are derived from this and one unique thing about this tenurial arrangement is that, ownership becomes perpetual after acquisition for housing purposes. Though still under the legal ownership of the skin, once the proper procedure of land acquisition for housing development is complete, the interest on land perpetuates.

This however, does not apply to agricultural lands. Here, no agricultural lands are sold, hired or leased for, at least, of processed products were marketed within the settlements where production occurred. According to the Chief of Kurugu, land in the area is owned by the Chief and it was the responsibility of the Chief to provide land to subjects for farming purposes. When this is done, the land will now be owned by the individual families whose control rest in the family head as the sole custodian.

4.6.4. Demographic Profile

The population of West Mamprusi District, according to the 2010 Population and Housing Census, is 121,117. Using the 2.2% estimated annual growth in population, the projected population of the District as at beginning of 2020 was 153,361, with a dominant male population of 50.8%. The population density is 46.4 per Km^2 and sex ratio of 96.8. 63.2% of the population in the Municipal is found in the rural areas while 36.8 percent live in the urban areas. Urbanization in the District is centered in Walewale, which is the dominant urban centre having many social amenities. Details of the population structure in the West Mamprusi Municipal is as shown in Figure 4-7.

Figure 4-7: Population Structure of the West Mamprusi Municipal



4.6.5. Migration

Migration is the physical movement of people from one place to another. People migrate either within or from one Municipal or region to another for variety of reasons such as economic and educational opportunities. The 2010 PHC information regarding usual place of residence and current residence as well as place of enumeration are used to discuss migration dynamics in the Municipal. The migrant population in the West Mamprusi Municipal is 9541. The highest number of migrants born elsewhere in another region come from Upper West (1810) followed by migrants born outside Ghana (1116) and Ashanti region (707). Consequently, migrants from the Central region constitute the least of the migrant population (74). About 20 percent of the migrants have lived for 20 years and over in the Municipality while another proportion of nearly 40 percent have stayed from 5-19 years. About 46 percent have stayed for less than 5 years in the Municipal.

Of the 4,944 migrants born elsewhere, nearly 22 percent have stayed for less than 1 year while 19 percent have stayed for 20 years and over in the Municipal. Overall, of the migrants born elsewhere who have stayed in the area over 20 years, migrants from the Volta region constitute the highest proportion of about 32 percent.

4.6.6. Ethnic & Religious Composition

The predominant ethnic group is the Mole Dagbani (Mamprusis and Dagombas). The District is largely inhabited by the Mamprusi (75%) who coexist harmoniously with other minor group, such as the Builsa (4.7%), Frafra (2.7%), Kasena (2.2%), the Dagomba (1.8%), and some other ethnic groups in Ghana, (2010 PHC, GSS). The main language spoken is Mampruli, however, for the project area, the Talenli language is also spoken. The dominant religious groups are Islam (79.4%), Christianity (15.6%) and the Traditionalists (3.7%), (GSS, 2010 PHC). There is peaceful co-existence among the various religious grouping and efforts must be made to consolidate the peace.

4.6.7. Tourism Potential

The district has important tourism related socio-cultural resources and this includes:

- Traditional Bone Specialist at Loagri on the Tamale Walewale High Way
- Annual cultural festivals, Damba (celebrated on the 11^{th} – 17^{th} of Damba of the Luner calendar)
- Annual bugum festivals (celebrated on the 9^{th} Day of Bugum. of the Luner calendar)
- Largely unadulterated cultural heritage, particularly in the rural areas.

The district is abound with unique tourist sites like the local architecture especially a traditional mosque at Wulugu, and the mysterious light on Wungu road. The traditional mosque was built by an Islamic scholar in Wulugu during the 1980s. Although a mud wall built with simple local materials such as gravel and stone without cement, the mosque has withstood natural disasters such floods and storms and remain very strong as though it was built with modern materials such as concrete. The mysterious light on the Wungu road also dates back into history. From a distance, the light appears bright and broad but gets narrow and narrow as you move near it. Although inhabitants speculate how the light come to be, no one seems to know as a matter of fact when and how the light came there.

There are other sites like the Kpabgu cave which is believed to be housing a lion and python. Moachira at Bimbinni where the White and Black Volta meet but run parallel no matter the disturbances for it to mix. The Mysterious Golinga (Soglinga) springs at Duu that runs in the dry season. Kugyinni (a big stone sitting on a very small stone where a lion periodically rest under) about 2km off Walewale-Wungu Road.

4.6.8. Archaeological, Heritage & Cultural Structure

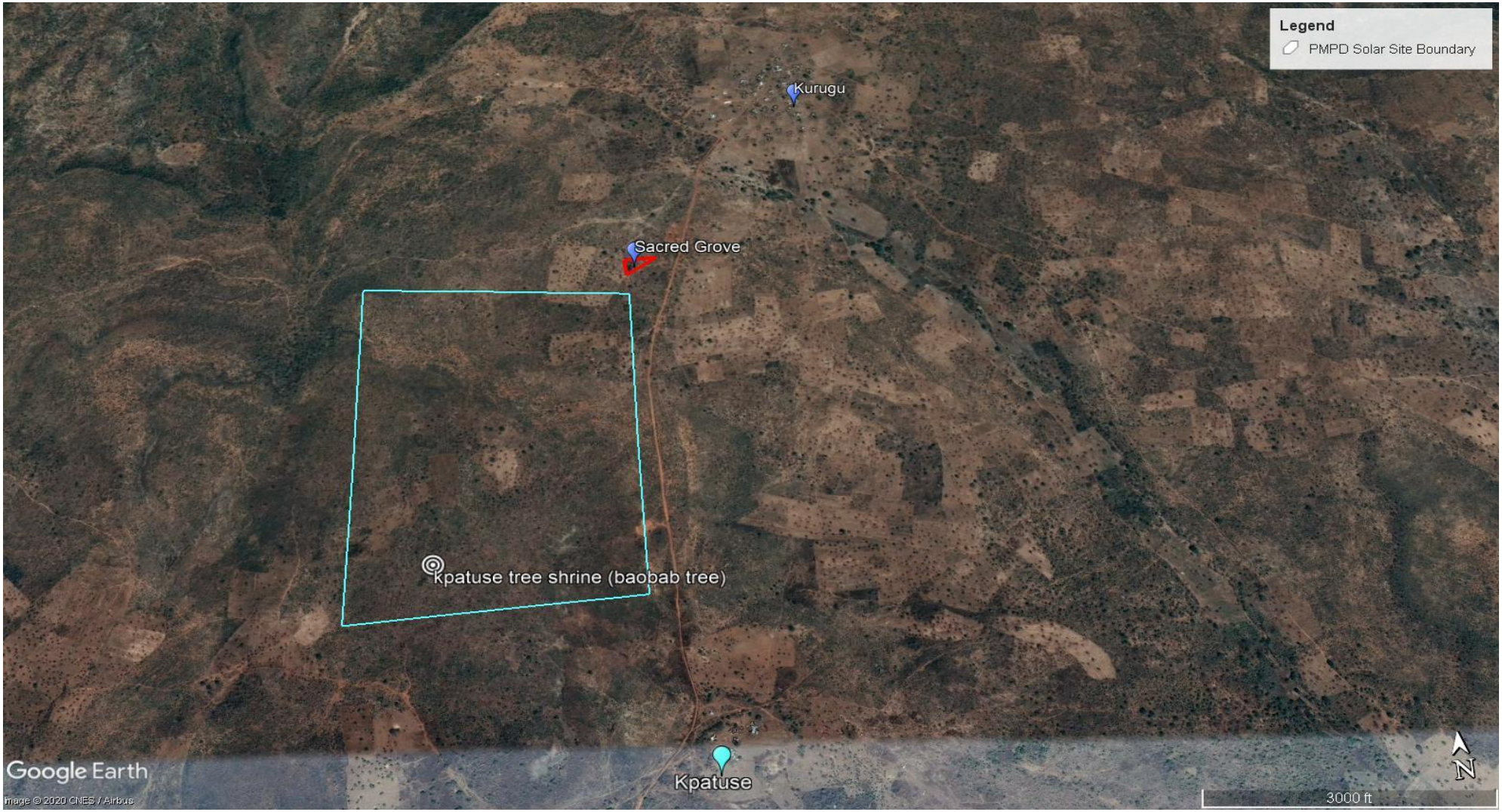
The main traditional festivals celebrated in the district are the Bugun (fire festival) and Damba festivals. Being a predominant Moslem District, the people also celibate the two festivals of Eid-ul Fitir and Eid-ul Adha. The people have a high spirit of local participation especially when there are full consultations on issues of development. They are also naturally friendly to anybody either a citizen or a stranger. This accounts for the comparative peaceful coexistence of the people.

Based on desktop research as well as a field investigation undertaken by the EIA Team, no archaeological material was found and recorded. However, a shrine (Kpatusi) is located at the project site and a sacred grove covering an area of about 4,400 square meters is located about 100m beyond the Northern end of the project site. According to the locals, the Kpatusi shrine (See Plate 4-5) belonged to the original settlers on the land where sacrifices and prayers were offered. The shrine is a baobab tree and people are not allowed within close proximity of the tree. Rituals are done annually at the shrine. The locals indicated that no day has been slated as a taboo day. The sacred grove near the project site is called "Kpasurugu" and sacrifices are offered twice of thrice a year depending on the instructions of the soothsayer. Figure *4-8* shows the relation between the project site and these cultural sites.

Plate 4-5: Cultural assets within the vicinity of the project site

Source: VRA Field Survey, September 2020

Figure 4-8: Shrine and Sacred grove within vicinity of Proposed Site



Source: Project Management Team (September 2020)

4.6.9. Economic Characteristics

The major economic activities in the district are basically primary activities and these include;

- Agriculture - basically at the peasant level
- Trading in foodstuff such as maize, beans, rice and other grains,
- Sand winning mostly for construction work in the district
- Quarrying
- Fishing along the White Volta
- Sheanut processing
- Petty trading such as provision stores

At the district level, the economic base of the West Mamprusi Municipal is agriculture with an average 80% of the economically active population engaged in one form or other of it. Agricultural activities in the district include crop production, livestock and fisheries. Only 54.7% of the 80% however farm as a major activity. Agriculture is basically on a subsistence level with smallholder farmers representing the main users of agricultural land. The average farm sizes vary from 0.5 ha to 2.4 ha. Crop production in the district is on a subsistence basis where small farm holder farmers produce for family upkeep and occasional sale. There are however, some forms of commercial farming. Major cash crops grown in the district are groundnuts, rice, tobacco and cotton. The major crops grown in the district are maize, millet, rice, groundnuts, beans, sorghum, bambara beans and yam. Vegetables grown include pepper, tomatoes and onions and this is done along the banks of the White Volta. These crops are grown during the rainy season. Dry season farming is done along the banks of the White Volta during which crops such as tomatoes, onions, soybeans, pepper and tobacco are cultivated. The potential of dry season farming is limited by inadequate water-retaining structures including dams and dugouts.

The directly affected villages of Kurugu and Kpatusi are subsistence based relying on mainly farming with sometimes fishing to contribute to food security. Many of the women rely on sheanut collection to support household income, especially for school fees. Typical crops in the area are rice, maize, millet, soya, leafy greens, groundnut, and pepper. Local habitat is also used to collect medicinal products. The villages are quite small and tend to rely on district level markets for trade. Livestock and cattle grazing is an important livelihood. Animals such as cattle, goats and sheep are the most reared in the district, and area common sight in project communities as shown Plate 4-6 in at Kurugu.

Plate 4-6: Animal husbandry within the Project Site

Source: VRA Field Survey (September 2020)

4.6.10. Social Services

Information, Communication & Technology

ICT plays a vital role in the socio-economic development of any environment, particularly in the ordering of daily activities. It is one of the several means of sharing information either by voice or data. The flow of information plays an essential role in the diffusion of new technology and ideas at the level of individual enterprise, the industrial sector and the national economy. There are two established Community Information Centers at Janga and Walewale that was constructed under the Ghana Investment Fund for Electronic Communication. These centers are however challenged with adequate computers and accessories, poor network facilities and other relevant accessories

Mobile phone has predominantly become a part of the daily communications gear. Owing a mobile phone has become a practical necessity and a symbol for social status. Mobile-cellular penetration in the district is good with the availability of private communication operators such as TIGO, VODAFON, MTN and Airtel. This has tremendously improved communication through mobile phones and internet connectivity.

Banking Services

Commercial activities and banking services are made easy with the presence of financial institutions such as Agricultural Development Bank, Ghana Commercial Bank and Bangmarigu Community Bank. Mobile money transfer services are also being provided by the afore-mentioned dominant mobile telephony companies.

Access to Electricity and Energy

A number of major communities have electricity and many others are not hooked to the national grid. Major communities such as Walewale, Gbimsi, Janga, Nasia, Wulugu, Sayoo, Tinguri are hooked to the national grid. The two project communities, are Kurugu and Kpatusi not hooked on to the national grid. The District has the potential for both large scale commercial solar energy

generation due to the intensity of the sunshine and the availability of land. Additionally, the challenges experienced by the national electricity generation in the country suggest alternative sources of power that will be more reliable.

Housing Facilities

The district is predominantly a rural one, with majority of the population living in rural areas. Most of the Project area is dominated by rural communities. Villages tend to have a number of compounds owned by a number of households, scattered around farmlands. Compounds made of mud and landcrete bricks or sandcrete blocks with thatch or corrugated sheets are common as shown Plate 4-7. Many houses lack basic facilities such as toilets and bathrooms. The residents' ethnic group can often be determined by the type of roofing and style of compound entrance.

The West Mamprusi Municipal has a vast land for real estate development and affordable housing projects. Most of the inhabitants move to the District Capital coupled with other migrants to enjoy urban life. About 80 percent of single persons household use one room while 14.2 percent of same single households use two rooms. For the households of size four, 45.6 percent occupy two rooms. Household of size 3, 5-8 use three rooms whereas household of sizes 9-10 occupy an average of 4 rooms.

Plate 4-7: Typical Housing Infrastructure Within the Project Enclave

Source: VRA Field Survey, September 2020

Water & Sanitation

Water facilities in the District are woefully inadequate. Although a few communities have access to potable water facilities, majority are in need of such facilities. This is because though some communities have been served, the facilities are either low yielding or seasonal in nature. In some cases, the population has outnumbered the available facilities. This exerts pressure on the available ones leading to frequent breakdowns. The potable water supply is therefore inadequate to serve the needs of the people. It is however worth stating that most of the water facilities, Boreholes and/or Hand Dug Wells in the Communities, as shown in Plate *4-8*, taken at Kurugu, dry up in the dry

season, reducing the coverage and access level within the period. A cursory look at the specific community analysis indicate that most communities have good coverage and access to water, but this is only practicable during the rainy season. With this scenario, much is still required to be done on the water sector to meet the SDG 6.

Solid waste generated per capita per day is about 72,040.08tonnes. This is more in the urban center, Walewale than other parts of the District. About 54,887.68 cubic litters of liquid waste is generated each day. Using indicators set for Open Defecation Free in the WASH sector, with a total of 16,830 households, only 14 percent have Household Latrines and 40 percent have Hand Washing Facilities. A total number of 62 latrines can be identified in both schools and health institutions.

Plate 4-8: Typical Boreholes Within the Project Area

Health Services

The district health infrastructure is made up of one Hospital in Walewale, one Polyclinic in Janga, two Health centres at Kpasenkpe and Wulugu, three clinics (Our Lady of Rocio, Plan Parenthood Association of Ghana (PPAG Kparigu), and Nelson Mandela Clinic Walewale). Nine CHPS compounds at Gbeo, Nasia, Yama, Tinguri, Daboya, Duu, Nabari, Arigu, Guabulga and 2 Reproductive and Child Health (RCH) at Walewale and Janga. There is a CHIPS center at Kurugu but this is not currently in use, and the residents within the project area patronise the health center at Wulugu or the Hospital in Walewale.

Clinical care services are provided by all the health facilities in the municipality. However, the ranges of service widely vary from one facility to another depending on the category of facility. It is, however, significant to note that the Walewale Municipal Hospital and Janga Polyclinic are the primary referral facilities with medical officers. Surgical interventions and limited essential obstetric care services are also provided at these facilities.

Health Profile

Malaria is the leading cause of OPD morbidity in the Municipality contributing to 23.48% of all conditions in the year 2019. The cases continue to increase despite several interventions and this could be attributed to the inadequate and at some point, the stock-out of RDTs to test all cases before treatment. *Table 4-5* reflects the top ten causes of OPD morbidity compared for the periods of 2016 to 2010 within the municipality. HIV Prevalence in the West Municipal is amongst the lowest in the country and was determined to be 0.09% by the 2017 Ghana AIDS Commission Report. The Ministry of Health personnel, District AIDS committees, and community organisations have been carrying out activities to check the spread of the disease and stigmatisation of people living with HIV/AIDS using various formats and strategies to share information. Most of the activities target those from 16 to 40 years of age.

Table 4-5: Top Ten Causes of OPD Morbidity from 2017 to 2019

2017			2018			2019		
Condition	No.	%	Condition	No	%	Condition	No.	%
Malaria	10,693	26.37	Malaria	13,520	25.88	Malaria	22,957	23.48
Diarrhoea	6,779	16.72	URTI	8,043	15.40	URTI	14,463	14.79
URTI	6,544	16.14	Diarrhoea Dx	6,797	13.01	Diarrhoea	11,054	11.31
Intestinal Worms	1,574	3.88	Intestinal Worms	2,389	4.57	Rheum.& Other joint	5,447	5.57
Skin Dx	1,513	3.73	Rheum.& Joint Pains	2,126	4.07	Intestinal Worms	4,822	4.93
Anaemia	1,397	3.45	Anaemia	1,883	3.60	Anaemia	4,449	4.55
Pneumonia	1,147	2.83	Pneumonia	1,715	3.28	Skin Dx	3,914	4.00
ARTI	896	2.21	Skin Dx	1,664	3.19	Pneumonia	2,644	2.70
Rheum.& Joint	854	2.11	AUTI	1,495	2.86	AUTI	2,036	2.08
Hypertension	619	1.53	Hypertension	1,038	1.99	Typhoid Fever	1,595	1.63
TOTAL	32,016	78.97	TOTAL	40670	77.86	TOTAL	73,381	75.05

Source: Ghana Health Service, 2019 Annual Performance Report for West Mamprusi Municipal

Education

The District is endowed with a number of educational facilities especially from Pre School to Junior High levels. It has a total of 81 pre-schools and 87 primary Schools, 50 Junior High Schools, 5 Senior High Schools and 1 Vocational/Technical school (District Directorate of GES, 2017). Majority of children within the school going age in the District Capital, Walewale are in school. The converse of the above situation exists in so called interior villages. The District Education

Directorate has not relented in its effort to ensure that every child of school going age is in school by 2020. Gross primary enrolment rate has consistently increased from 74.3% in 2013 to 86.7 in 2016. School completion rate also increased consistently from 75.3% in 2013 to 81.4% in 2016. Transition rate from primary to JHS has however been inconsistent over the years but from JHS to SHS has been encouraging increasing from 58% in 2013 to 81.6% in 2016. School dropout rate decreased drastically from 5.5% in 2013 to 1.0% by end of 2016 academic year (District Directorate of GES, 2017). Gender Parity Index for KG stand at 0.9, Primary, 1.02 and JHS, 0.99. The Teacher situation in the District in terms of quality has not been the best since 2013.

The Kurugu M/A Primary School is the closest educational facility to the project site (about 1.2km). There is no educational facility at Kpatusi, thus, pupils from Kpatusi attend the Kurugu M/A Primary School. There is, however, no Junior High Secondary (JHS) facility at Kurugu, thus, pupils from both Kurugu and Kpatusi attend JHS at Wulugu after completion of their primary school education. Table 4-6 provides enrolment information on the schools utilised within the project area.

Table 4-6 Enrolment figures for schools utilised within project vicinity

S/N	NAME OF SCHOOL	ENROLMENT FIGURES FOR FOUR SCHOOLS - AS AT 7TH SEPTEMBER, 2020																		
		P1		P2		P3		P4		P5		P6		JHS 1		JHS 2		JHS 3		TOTAL
		B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	
1	Kurugu M/A Primary School	18	28	24	18	18	25	22	18	14	22	15	18							240
2	Wulugu M/A J.H.S													32	36	52	42	35	38	235
3	Wulugu Zaami M/A J.H.S													38	32	44	39	36	49	238
4	Wulugu Ranch J.H.S													14	21	31	15	28	19	128
	TOTAL													84	89	127	96	99	106	841

Source: GES –West Mamprusi Municipal, 2020

4.6.11. Gender & Vulnerability

The Ghana EIA study requires the assessment of the vulnerable as part of the process and this is to be discussed in this EIA Report. Generally, the project area is characterized by gender disparities at levels of education, illiteracy, access to productive resources, and involvement in decision making. Women suffer discrimination and nutritional restrictions. Females can be subjected to harmful socio-cultural practices. Women have limited access to land, labour and credit, earn lower incomes than men, have a higher incidence of poverty, bear a disproportionate burden of care giving to children, the aged and people living With HIV/AIDS, and are more vulnerable to HIV/AIDS and numerous other health problems. More girls than boys drop out of schools. Women farmers are less organized. They carry out the bulk of the household subsistence activities such as planting, weeding, harvesting and selling, as well as such chores as cooking and fetching water.

Women play a prominent role in agriculture in the Municipality yet they face persistent economic and social constraints. Majority of women in the district are comfortable with providing input

related to production decisions. They however have less control over the use of household income. Access to land by women in the traditional framework subtly deprived women because of the patrilineal system of inheritance and the role assigned to women by the society.

Under the Livelihood Empowerment Against Poverty (LEAP) programme; there are 349 extreme poor households in twelve communities in the Municipal. Beneficiaries of the program are Orphan Vulnerable Children (OVCs), person with disability without productive capacity, older people above 65 years without productive capacities and pregnant women from extreme poor household. Out of the total population, 1.7% has some form of disability or the other. Both males and females have equal proportions of disability (1.7%) in the district. Females with other forms of Disability (8.6%) are slightly lower than males (9.7%) with the same conditions in the District.

The predominant type of farm labour is from the immediate family (man, wife or wives and children) a factor that may account for the love of large families. There are however periods where farm labour is hired to supplement family labour. Because children in the family, especially those above 15 years are intensively used, there is an unacceptably low enrolment of children in primary and junior secondary school as captured under the current status of education in the district.

4.6.12. Road Network

The total road network of the district is made up of primary, secondary and feeder roads. At the Municipal level, the West Mamprusi is served by about a total of 476.3Km of roads made up of 116km of trunk roads and 360km of feeder roads. The Municipality has a road density of about 0.0950 / km2 and is relatively one of the lowest in the country. The busiest route in the district is the Tamale-Bolgatanga trunk road. The road that is asphalted passes through Walewale, the district capital and other communities including Nasia, Gbimsi and Wulugu. Access road to the project site has been described under Section 3.4., and comprise of the linkage on the Tamale – Bolgatanga N10 Highway at Wulugu, and from there on a feeder road to Kurugu.

The feeder roads in the Project area tend to vary in condition. It is important to indicate that road accessibility in the district is very poor and this has had a ripple effect on the provision of other social and economic services. During the rainy season a number of settlements in West Mamprusi, are cut off from the rest of their district due to flooding of the White Volta. The major means of transportation in the villages are bicycles, donkey carts and motorbikes along with walking. There is a bussing system which connects the regions to the south and to neighbouring countries as well as among the main urban settlements. The road infrastructure affects the movement of people and goods.

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ENVIRONMENTAL IMPACT ASSESSMENT: SCOPING REPORT

CHAPTER 5: STAKEHOLDER ENGAGEMENTS

CHAPTER 5 : STAKEHOLDER ENGAGEMENTS

5.1. INTRODUCTION

This section presents an overview of consultation undertaken to date for the project and summarizes the proposed consultation activities for the remainder of the project. It must be noted that a stand-alone "**Stakeholder Engagement Plan**" (SEP), as shown in Figure 1-3 is to be prepared as part of the suite of documents for the EIA Study (Volume IV) to inform and guide in the stakeholder process, and must be referred to for further details on the stakeholder engagement process.

5.2. STAKEHOLDER MAPPING

A stakeholder mapping was done to identify Interested & Affected Persons (I &APs) that are critical to be consulted within the setting of this project. It therefore largely involved identifying stakeholders located within the project's proximity as they are the most likely persons to be impacted upon, like those whose properties will be affected by the project, or those who reside in the communities. From this, four (4) categories of stakeholders were identified with respect to the levels of interest and influence of impact they have on project outcomes and these are categorized and presented in Table *5-1*.

Table 5-1: Project Stakeholder Mapping

Category	Stakeholder Type	Stakeholders for Consultation
1	<u>High Interest/High Influence</u> • Traditional Authorities • West Mamprusi Municipal Assembly	▪ West Mamprusi Municipal Assembly ▪ Chief of Kurugu ▪ Chief of Kpatusi
2	<u>High Interest/Low Influence</u> • Land/Crops Owners • Caretakers of Cultural Assets • Community Representative on Local Government • Community members	▪ Landowners of the 50MW Solar Hybrid Project Site at Kurugu ▪ Crop owners ▪ Caretakers of cultural sites, namely the Kpasurugu Sacred Grove and the Kpatusi Tree Shrine ▪ Kurugu Assemblyman ▪ Members of Kpatusi and Kurugu neighbouring communities
3	<u>High Influence /Low Interest</u> • Permitting Issuing State Agencies • Key state actors within the North East Region and West Mamprusi Municipal • Policy and law makers	▪ Environmental Protection Agency ▪ Energy Commission ▪ Water Resources Commission ▪ Ghana National Fire Service, West Mamprusi ▪ District Education Service, West Mamprusi ▪ District Health Services, West Mamprusi ▪ Land Use & Spatial Planning Department ▪ Department of Feeder Roads ▪ National Disaster & Management Organisation ▪ Lands Commission, ▪ Northern Electricity Distribution Company ▪ Forestry Services Division, West Mamprusi
4	<u>Low Influence /Low Interest</u> Non state actors with facilities within immediate impact area and has	Proprietors of facilities/activities identified closed to the project site, including churches and schools, and these were

Category	Stakeholder Type	Stakeholders for Consultation
	indirect role in the project development process	▪ Kurugu Church of Pentecost ▪ Kurugu Primary School ▪ Kurugu Mosque ▪ Fulani herdsmen residing in hamlets within project proximity ▪ Road users along the project route from Wuluga, Kulunga, Wulugu, Kpakpiri, Kpatusi and Kurugu (impacts associated with road transportation)

5.3. METHODOLOGY FOR STAKEHOLDERS' ENGAGEMENTS

The wide range of stakeholders engaged is because from our perspective, diversity of opinion rather than consensus building is likely to enrich ultimate decision-making, which is critical for project success. Depending on the stakeholder, the type of engagements made were either formal/informal meetings, one-on-one meetings, telephone or community gatherings. Generally, depending on the stakeholder, project information provided during the consultations centered on the following:

a. Project Rationale, Objectives and Benefits within the context of the PMDP and the complimentary nature of the solar hybrid project in providing reliable and stable electricity supply to the national grid and keeping water volume balance during the daytime without affecting power generation benefits of the hydropower station.
b. Project development activities, including skills development
c. Project Impacts, both positive and negative
d. Rational for EIA Study and data collection strategy.

Through these consultations issues for inclusion within the EIA has been identified and recorded.

5.4. RECORD OF STAKEHOLDERS' ENGAGEMENTS TO DATE

The engagements process for the EIA study for the PMDP commenced in 2014 by Mott MacDonald (UK) / EEMC (Ghana). During the period, 42 individual meetings with a range of governmental, NGO and local community members were organised. Six public consultation meetings were held in Bolgatanga, Zebilla, Garu, Walewale, Gambaga, and Tamale. The six scoping public consultation meetings were attended by 375 people (including 41 women) representing a range of interests. In addition, during the detailed EIA Study, a total of 63 individual meetings with stakeholders were held and 14 group meetings organised. The main issues of interest during those stakeholder engagements and how they are to be addressed were provided in the Draft EIA Report, 2015 that was submitted to the EPA.

Based on re-design of the hydropower project component and discussions, the EPA in a letter dated April 30, 2019 (See Appendix 2) requested VRA to update the EIA Report, upon which a public hearing will be held at relevant locations to solicit concerns and views from the affected/interested stakeholders. It was based on this that VRA in 2018 engaged Tractebel Engineering/SRC Consulting to update the Draft EIA and prepare a RAP for the hydropower component. As part of

the process, a pre-site entry stakeholder engagements at the community level for the PMDP was performed by VRA in June 2020. The purpose of these stakeholder engagements was basically to inform the communities sited around the reservoir boundaries in the North East and Upper East Regions on the official start of the EIA / RAP.

The VRA Team visited five (5) districts in the Upper East Region and three (3) districts in the North East Region. Those consulted included the Regional Ministers of the North East and Upper East Regions as well as the Chief Executives of the West Mamprusi, East Mamprusi, Bawku Central and Bawku West Municipalities as well as the Nabdam, Garu, Binduri and the Bunkpurugu / Nak panduri District Assemblies. The traditional authorities in these areas were also consulted, including the Kuru-Naa J. B Sulemana (Kurugu Chief). The meetings afforded VRA the opportunity to introduce to these communities, the Tractebel Engineering/SRC Consulting, Power China (the EPC Contractor) and the various surveyor firms who would demarcate the boundaries of the reservoir. The stakeholders consulted in during the engagements in June 2020 are listed in Table 5-2. In addition to the listed stakeholders, the following communities were also visited Gbangu, Pwalugu, Karimenga, Wulugu, Kulunga, Walewale, Gambaga, Nalerigu, Nakpanduri, Namasu, Zarantinga, Gambaga, and Zebilla.

Table 5-2: Project Consultation Meetings by Tractabel/SRC Consulting in June 2020

Date	Name of Stakeholder	Venue
June 3, 2020	Lands Commission	Head Office, Accra
June 4, 2020	Minerals Commission	Head Office, Accra
	EPA	Head Office, Accra (via VC)
	Water Research Institute	Head Office, Accra (via VC)
June 5, 2020	Forestry Commission	Head Office, Accra
June 8,2020	EPA	Upper East Regional Office, Bolgatanga
	Lands Commission	Upper East Regional Office, Bolgatanga
	Forestry Commission	Upper East Regional Office, Bolgatanga
June 9,2020	Minerals Commission	Upper East Regional Office, Bolgatanga
	Chief & Elders of Timonde	Timonde Palace
	Assembly Member of Timonde	Timonde
	Bawku West Municipal Assembly	Zebilla
June 10, 2020	Ministry of Fisheries	Upper East Regional Office, Bolgatanga
	Chief & Elders of Pwalugu	Pwalugu Palace
June 11, 2020	Water Resources Commission	Upper East Regional Office, Bolgatanga
	Customary Land Secretariat	Tongo
	Upper East Regional Coordinating Council	Upper East RCC Office, Bolgatanga
	Ministry of Food and Agriculture	Upper East Regional Office, Bolgatanga
June 12, 2020	Assembly Member of Pwalugu	Pwalugu
	West Mamprusi Municipal Assembly	West Mamprusi Municipal Assembly, Walewale

Date	Name of Stakeholder	Venue
	East Mamprusi Municipal Assembly	East Mamprusi Municipal Assembly, Gambaga
	District Forest Services Division	West Mamprusi, Walewale

Source: PMDP EIA Inception Report, July 2020

It must be noted that the above engagements also discussed issues regarding the need for the solar hybrid project in addition to that of the hydropower and irrigation components. Thus, the West Mamprusi Municipal as well as the communities of Kurugu and Kpatusi have been consulted extensively where they have been informed about the various components of the PMDP, including the solar hybrid power project. Despite this, specific stakeholder engagements regarding the solar hybrid power project is ongoing to compliment these earlier engagements. This commenced in September 2020 and all arrangements for such meetings were done in collaboration with the Assemblyman of the Kurugu Electoral Area, Honourable Alhassan Mohammed who was all the time present to help translate the discussions in the local language, i.e., Mampruli, or Talenli as appropriate. Also present were officials from the Land Commission to help explain the land acquisition process.

For the affected communities, engagements were held with the Chiefs and elders of Kurugu and Kpatusi as well as persons whose crops/economic trees were on the selected site and were to be affected by the project development. State agencies consulted within the West Mamprusi Municipal Assembly included the following:

- West Mamprusi Municipal Assembly
- Land Use & Spatial Planning Department
- Ghana Education Service
- Ghana Health Service
- Social Welfare Service
- Forestry Commission

Specifically for the solar hybrid project, the communities and other stakeholders, including the state agencies from the various engagements generally welcomed the plans to establish the proposed solar power project in the area. Since the project would not directly affect them, the community members generally did not have any apprehension or reservation about the project. They nevertheless viewed the project as one that would create employment opportunities and small business/trade opportunities for the local population.

As to be expected, these stakeholders raised a series of questions, comments and concerns and a summary of the main inquiries, proposals and concerns raised by the stakeholders during these various community engagements events and the responses provided are to be provided in the Main EIA Report. Based on the issues raised at the project briefings, status quo conditions of the study area and the nature of the proposed development, the key issues of concern identified and that must be considered during project implementation for the solar hybrid project are summarized as below:

- Land Acquisition & Compensation for Loss Property
- Employment for Community Members
- Skills Development for Youth
- Land ownership and availability for affected farmers
- Relocation of Cultural Properties
- Implementation of a Corporate Social Responsibility Programme
- Grievance Redress Mechanism
- Provision of Electricity for Project Impacted Communities
- Upgrade of Feeder Road to Project Site
- Gender & HIV & AIDS
- Improvement of Livelihoods
- Acquisition of Permits
- Continued Engagement During Construction & Operational Phase
- Effective Project Monitoring & Evaluation Process

Pictures from these engagements are provided in Appendix 4. Signed list of key participants during the engagements are provided in Appendix 5, and details of all engaged will be provided in the SEP.

5.5. PUBLIC DISCLOSURE

As indicated under Section 1.5.2, with respect to public disclosure under the EIA Study, the EPA has requested VRA to publish a Scoping Notice and the sample format for the publication provided. The rationale for public disclosure in an EIA exercise is to ensure accountability and transparency in line with international best practice. As is usually done by VRA, the Scoping Notice on the project is expected to be published in the Daily Graphic and Ghanaian Times to enable the public make inputs or provide review comments. The Daily Graphic and the Ghanaian Times are the two (2) most widely circulating newspapers in the country.

Copies of these reports will be made available at the following locations:

- VRA Corporate website at www.vra.com
- VRA Head Office Library in Accra
- VRA Environment & Sustainable Development Department Library in Akosombo
- EPA (Head office in Accra / Local Offices at Nalerigu and Walewale).
- West Mamprusi Municipal Assembly.
- North East Regional Coordinating Council,
- Bolgatanga Municipal Assembly
- Kurugu Traditional Authority

Comments are to be provided to the VRA at the address, tel. numbers or e-mail address provided below. All comments received following the release of these reports, through meetings and or written correspondences, will be reviewed and addressed as necessary. Additionally, review comments from the EPA on this Scoping Report will also inform future stakeholder engagements during the main EIA and the project development phases.

The Chief Executive
Volta River Authority
Electro Volta House, 28Th February Road
P. O. Box MB 77, Accra
Digital Address: GA-145-7445
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Email: corpcomm@vra.com

5.6. GRIEVANCE REDRESS MECHANISM

As required, VRA will establish a grievance redress mechanism for the project basically as a formal procedure through which communities and individuals affected by project activities can formally communicate their specific concerns and grievances and facilitate resolutions that are mutually acceptable by the parties and within a reasonable timeframe. The grievance procedure is to be used by anyone without any concern or fear of retribution. For project affected persons and communities who may not have direct access to the internet or have difficulty understanding the English Language, VRA communicate the contents of the GRM in locally accepted languages agreed with the affected parties.

5.7. PUBLIC HEARING

The planned public hearings as requested by the EPA in their letter of April 30, 2019 to engage stakeholders to discuss issues regarding the hydropower, irrigation and the solar hybrid power components of the PMDP is expected to take place by close of January 2021, and this will provide opportunity for further engagement especially with state agencies. Feedback from the public will be used as input for the Main EIA Report.

5.8. NEXT STEPS IN THE STAKEHOLDER ENGAGEMENT PROCESS

In accordance with the philosophy of Integrated Environmental Management, it is important to focus the EIA on the key issues, such as those issues that are considered critical for decision-making. Chapter 7 of this Scoping Report which provides for the EIA Study Plan has outlined strategies on how VRA intends to consider the such issues, and how they are to be addressed is to be discussed at the appropriate sections of the Main EIA Report and or the related documentations. Further consultation is planned to refresh the project information and to disclose the mitigation and other management plans during the Main EIA and upon commencement of constructional activities.

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CHAPTER 6: KEY ISSUES & POTENTIAL IMPACTS

CHAPTER 6 : KEY ISSUES AND POTENTIAL IMPACTS

6.1. OVERVIEW

A key part of the scoping process is a preliminary identification and consideration of the ways in which the project may interact (positively and negatively) with environmental and socio-economic resources or receptors for concurrence with the EPA. The scoping exercise is therefore to ascertain the environmental issues associated with the project on which the EIA study will be focused by reviewing the project information and ascertaining likely environmental issues associated with the project activities. This process helps in ensuring that all the relevant issues are identified and addressed in an appropriate manner in the EIA Study.

Consequently, the purpose of this Chapter is to present a synthesis of the key issues and potential impacts that have been identified thus far as part of the Scoping Process. The approach which has been adopted in scoping the EIA and how each of the environmental and social aspects will be addressed is presented. Owing to site conditions there are certain possible interactions that will not take place, and thus are scoped out and not discussed. The projected physical and biological environment as well as socio-economic impacts commonly associated with such a solar infrastructure development facility during the various phases will basically encompass both positive and negative changes and these are elaborated below.

6.2. PROJECT POSITIVE IMPACTS

As indicated earlier, the PMDP is a comprehensive hydro-project integrating irrigation, flood control, power generation, fishery farming and urban & rural water supply, with a proposed installed capacity of 59.6MW. The development of a 50MW solar hybrid project is intended to meet power system demands of the hydropower component and to keep water volume balance during the daytime without affecting power generation benefits of the hydropower station. The power generated is planned to be connected to the expanded substation of Pwalugu Hydropower Station for combined operation.

The support for renewable energy projects is guided by the need to address climate change as well as a rationale that Ghana has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least-cost energy service in many cases - and more so when social and environmental costs are considered. The proposed project will have significance positive environment impacts when compared to other forms of power production including the thermal power production, which involves the burning of fossil fuel. The major positive impacts of the project will include stabilization of electricity in Ghana, Greenhouse gas minimisation and potential for carbon market, promotion of economic growth in the country, increased employment in the project area among other positive benefits.

These positive project benefits have been explained earlier under Section 1.4. To get the full benefit of potential positive impacts such as job creation and induced economic development, a local content strategy focussing on skills development and procurement processes will need to be

developed. The main EIA will consider this and other strategies to enhance the co-benefits of the project development.

6.3. NEGATIVE IMPACTS ON PHYSICAL ENVIRONMENT

Negative impacts associated with energy generation and transmission projects can vary considerably as the activities associated with individual projects can be quite different. However, there are several activities that are common to nearly all projects such as land clearing and shaping, construction of facilities and support structures, and construction or upgrade of access roads and connections to the grid. Key issues and impacts have been identified via initial site visit, the environmental status quo of the receiving environment (baseline information as discussed in Chapter 4 of this report), discussions with the project team, issues and concerns raised by key stakeholders during the initial consultation process, and available information about the environmental effects of similar solar energy developments.

6.3.1. Greenhouse Gas Emissions

The IFC PS3 - Resource Efficiency and Pollution Prevention mandates proponents to reduce their GHG emissions. Under the Equator Principle 10 - Reporting & Transparency, clients are to publicly report GHG emission levels (combined Scope 1 and Scope 2 Emissions) during the operational phase for Projects emitting over 100,000 Tonnes of CO_2 Equiv). Section 4 of the EIA Guidelines for Power projects, Volume 2 requires proponents to assess the potential contribution of the proposed power plant to a reduction in greenhouse gases. Thus, it will be relevant to quantify GHG emissions for the current proposal and there is also the need to carefully consider detailed information about the potential for construction, operation, maintenance and decommissioning related activities to emit GHGs and, thereby, contribute meaningfully to global warming considering the combined emissions of other broad-scale causes of climate change.

The Equator Principles advises that public reporting requirements can be satisfied via regulatory requirements for reporting or through EIAs as well as voluntary reporting mechanisms such as the Carbon Disclosure Project where such reporting includes emissions at project level. VRA has initiated a Carbon Footprint Management Programme (CFMP), where GHG Inventory Report are being prepared annually. Currently, the GHG Report for the period 2012-2018 has been prepared and is available on the corporate website at www.vra.com. Similarly the GHG savings from operation the solar power facility will be determined and provided in the Main EIA report

Clearing of vegetation because of project activities will be insignificant with respect to carbon sink reduction generally, however this needs to be calculated to confirm such an assertion. Using the IPCC Guidelines for National GHG Inventories, which estimates carbon stock using the tree species, diameter, height and basal area, the estimated Tonnes of CO_2e per year expected to be lost from the atmosphere will be calculated. It is therefore important that VRA considers mitigation measures to reduce proposed action-related GHG emissions from all phases and elements of the proposed action and alternatives over its/their expected life, subject to reasonable limits based on feasibility and practicality. A climate change impact assessment will be undertaken as part of the

EIA to ensure that adaptation measures are included in the design as necessary, and this will include carbon offsetting as well as annual Carbon Accounting Programme, which is underway by the VRA.

6.3.2. Air Quality

The current air quality is generally good given that the area is predominantly agricultural and that it is rural in character. The absence of industries also contributes to the good air quality of the area. Potential impacts on air quality due to constructional activities include temporary decrease in air quality (i.e. limited to the construction phase of development). The source, location, duration and intensity of emissions (dust, exhaust fumes) generated by construction activities will be assessed in terms of their potential impact on sensitive receptors, including residential/commercial properties and ecology. During the operational phase, potential impacts to air quality will be minimal and may occur as a result of routine maintenance and/or rehabilitation of Project related infrastructure.

The impact of the project on air quality is considered negligible and does not require a specialist study during the EIA process. From the baseline survey, it is identified that only a qualitative assessment is to be undertaken to assess air quality impacts, and no modelling of emissions is deemed to be required for the construction phase or operational phase. Subsequently, analysis of the air quality at the project site to provide baseline information has been undertaken and details will be provided in the Main EIA report. Mitigation measures will be developed to minimise impacts and will include standard good practice techniques to minimise construction emissions. Thus, management actions for mitigation will be incorporated into the EIA Report.

6.3.3. Noise and Vibration Impacts

Noise impacts resulting from construction, operation, maintenance and decommissioning of the project could result in a cumulative effect with other past, present, or reasonably foreseeable future actions and this is to be investigated in the main EIA Study. GSA: 1212:2018 requires that an entity responsible for a construction site shall erect an acoustic barrier around the construction site and ensure that the maximum noise level near the construction site does not exceed 66 dB (A) Leq (5 min.) in other areas. It is generally accepted that predicted noise levels from the development need to be compared with existing background levels at particularly sensitive residential locations close to the site. Neighbouring infrastructure within the project sites at Kurugu that can be affected with noise and vibrational effects.

A standardised impact assessment methodology will be used to evaluate the impact during the construction, operational and maintenance phases of the project on each noise sensitive area. Pre-construction noise levels within the project sites and neighbouring communities has been carried out to prepare the basis for monitoring during the project construction and operational phases. As indicated, data on pre-construction noise levels will be provided and potential noise impacts will be addressed and appropriate mitigation measures included in the Main EIA. Regarding that, noise will be monitored periodically during the construction period and results compared to that of the GSA Standard. VRA will maintain records of noise monitoring activities and include such results in progress environmental reports to demonstrate compliance with the noise limits set and to provide

information for any necessary mitigation measures. Cumulative noise impacts resulting from the constructional work associated with the hydropower component needs to be considered as both components will utilise the same route to the project sites.

6.3.4. Water Resources

It is expected that the project throughout the construction phase will require water for potable usage (drinking, showering, etc) and non-potable usage (mainly used for minimizing fugitive dust emissions, and to some extent for cleaning of machinery and vehicles). Construction of the project will require water from local sources to carry out its activities. The water requirements throughout the construction phase will be temporary (for construction period only) and are considered minimal and not significant. Construction phase impacts on the local water environment will largely be controlled through the application of good construction methodology including consideration of drainage on the construction site and appropriate control and storage or potential pollutants such as fuels or cementitous material used in the construction process. Water requirements and sources for the project are to be provided in the Main EIA Report.

Contamination of ground and groundwater at the development site may be present because of past releases. However, as the site is a greenfield development, these risks are considered low, however, geotechnical investigations by the EPC Contactor shall confirm this and data made available as appropriate.

PV panels do not use water for the generation of electricity. However, water is required for their maintenance, for the systems to maintain their maximum performance. Specifically, water is necessary for the cleaning of the panels, the amount of which greatly varies depending on the location of the system. This may result in competing demands with the community members. Ground water is to be utilised from the use of the boreholes and the volumes required during the operational phase is to be estimated.. Estimated volume of water demand for wet cleaning of solar panels is to be determined and provided in the Main EIA Report. Even though, water from the borehole will be filtered to make it fit for consumption, it is expected that water for drinking purposes will sourced mainly from local merchants during operations. The EIA therefore will ensure that adequate water resources are available which would be able to meet the Project requirements without entailing any constraint on the existing users, such as the local community.

There is the need to ensure that enough water is available and that there is no negative impact on the drinking water supply situation of the nearby communities which may create substantial social conflicts. In view of this cumulative impacts resulting from the utilisation of ground water on nearby Kurugu and Kpatusi communities will have to be analysed.

6.3.5. Topography & Drainage

From the field survey, the topography of the proposed project site itself is largely flat and predominantly utilised for agricultural purposes. The elevation of the project site at Kurugu does not make it flood prone. A network of storm drains shall be constructed at the PV Plant to collect

and direct storm water away from the power site. During operations, drainage channels from on-site precipitation shall be in place to collect surface run off water into larger gravel filled channels at the fences where it can trickle away into the municipal drainage. It is expected that the topography and drainage during this phase will not be altered in any form. The Main EIA shall analyse the project design vis-à-vis the topographical alteration and provide relevant mitigations and management measures.

6.3.6. Geology & Soils

The physical effects of developments can lead to changes in local topography and soil damage and erosion. Indeed, no significant impact is expected on the soils on and around the site, due to the following management measures to be put in place:

- All solid wastes and hazardous wastes from the plant complex are collected properly, stored and disposed.
- Appropriate storage of oil and lubricants on site
- The entire plant site area is well drained and thus there is no leaching of any substances in case of spills, which are well confined and decontaminated.

The EPC contractor is expected to carryout investigation of the soil conditions to cover all the requirements for design of relevant works as well as the borrow pits (for verification of the suitability and adequacy) where materials for embankment formation will be obtained and submit a report to the VRA for approval. The soil investigation shall be carried out in accordance with BS 5930:1999 or any other approved standard. A copy of the soil investigation report shall be submitted to the EPA for informational purposes, if so required. The risks during the construction phase are localised, can be clearly identified and adequately mitigated by good design and good construction practices. Risks during the operational phase can be mitigated by good environmental management practices and these shall be provided in the Main EIA Report.

6.3.7. Waste Generation

Due to the nature of the site and the works to be undertaken, general construction wastes and hazardous wastes are predicted to be low. Septic tanks will be installed on the site for the construction period. During the civil works, the period when the largest workforce numbers will be on site, it is possible that these tanks could supply a workforce of up to 100 people, although this total number is unlikely to occur at any one time during this period. Sewage wastes will be removed from the site and disposed of in an appropriate manner by an approved contractor. The Design Specification will require that that water/liquid retaining structures should be in accordance with BS 8007 "***Design of Concrete Structures for Retaining Aqueous Liquids***" as appropriate or equivalent international or Ghana standard.

Given the existing knowledge about the anticipated waste outputs and the management measures in place, waste generation is not considered to require a specialist study and will not be considered further in the EIA process. Waste streams comprising of non-hazardous and hazardous wastes shall be associated with the constructional and the operational and maintenance phases of the project

and these shall be determined and appropriate waste management actions determined and outlined in the Main EIA Report. Proposed mitigation plan suggests maximum reuse/recycle of construction waste on site or removal of waste at the site and proper disposal, which would reduce the impact significantly.

6.3.8. Visual & Aesthetic Landscape Intrusion

The construction of associated infrastructure of the solar energy facility (i.e. the substation, associated power line, access road to the site, internal access roads within the site) has the potential of visual impacts on the residents or passers-by. There is the potential visual impact of the construction of ancillary infrastructure on observers residing near of the facility as the proposed development will result in a significant change to the local landscape character. Such potential visual impacts during the construction phase on observers near the solar farm and power line are expected to be of a short duration and limited to the site. The development is also likely to impact the overall sense of place of the wider area.

A desktop Visual Impact Assessment specialist study will be conducted during the EIA Phase, to assess the potential visual impacts of the proposed development on the surrounding communities. An examination of landscape characteristics and elements, including topography and features; changes to local and strategic views, impact on visual receptors, short, middle and longer distance views, landscape character and the local landscape setting of the development and its impact and visibility from surrounding areas and any existing rights of way will be carried out. Consideration will be given to the opportunities to enhance the landscape. Cumulative impacts on landscape and visual intrusion resulting from the constructional activities of the hydropower project will also be analysed. The assessment will also identify appropriate mitigation and management measures to be included in the Main EIA Report.

6.4. NEGATIVE IMPACTS ON ECOLOGICAL ENVIRONMENT

The AoI is dominated by woodland habitat. The woodland has been managed over generations to favour certain plants and tree species of value such as the shea tree (*Vitellaria paradoxum*) whilst simultaneously providing sustainable ecological conditions to provide forage for livestock and land for agriculture. Typical canopy species include *Afzelia africana, Anogeissus leiocarpus, Pericopsis laxiflora, Pterocarpus erinaceus, Terminalia avicennioides* and shea tree. The fauna of the project area has been extensively affected by alteration and fragmentation of habitat resulting from especially fire, human settlements, and agricultural activities. Faunal species play very important and sometimes critical roles in food chains and by implication in the ecosystems in which they live. The presence or absence of some species may act as key ecological indicators.

Currently, floral and faunal survey is underway to determine the level of species and this will be fully documented in the EIA Report. The potential impacts flora and fauna from the construction and operation of the project shall be analysed, together with mitigation and monitoring measures. The analysis shall address potential impacts of the project (including ancillary facilities) to special-status plant species, sensitive natural communities and other significant vegetation resources. Such

impact analyses typically characterize effects to plant communities as temporary or permanent, with a permanent impact referring to areas that are paved or otherwise precluded from restoration to a pre-project state. Direct, indirect, and cumulative impacts shall be analyzed and quantified, if possible.

6.5. NEGATIVE IMPACTS ON ARCHAEOLOGICAL, HERITAGE & CULTURAL RESOURCES

Cultural resources and heritage comprise tangible historical/archaeological sites, documents and artefacts together with religious/spiritual sites (sacred sites) and activities important to local communities, customary law, traditional beliefs, values and practices. The sensitivity of a cultural feature to direct impacts reflects the level of importance assigned to it. This is the product of several factors, including for features of present-day cultural value: its current role; its cultural or sacred associations, its aesthetic value; association with significant historical events or traditions and its role as a sacred site or local landmark; and in addition, for those of heritage value, its potential as a resource of archaeological data. It should be noted that the assessment of impacts and development of mitigation actions for some cultural features cannot be wholly segregated from other social impact assessments and there will be overlap in some mitigation actions.

The project site is not located in a designated archaeological priority area nor contains any scheduled ancient monuments, listed buildings or locally listed buildings. As indicated, no archaeological material has been found and recorded at this scoping stage. Heritage items identified include a shrine (Kpatusi) located at the project site and a sacred grove covering an area of about 4,400 square meters located about 100m beyond the Northern end of the project site. The heritage items within the project site will have to be compensated for the community leaders to re-locate these items and the list of items required for such an activity made available to the VRA for necessary action.

Significant impacts to heritage resources are likely to be limited and may be easily avoided by the final layouts. Based on desktop research and initial site visit, no fatal flaws on heritage resources are anticipated. Since all the activities related to project during construction or operational stage shall be confined to the designated site, and the nature and magnitude of the activities is too small, hence no impact on any of the archaeological or heritage properties identified are anticipated. Thus, the project is unlikely to have an impact on cultural heritage. However, a Heritage Impact Assessment is ongoing with the aim of identifying possible heritage sites and finds that may occur in the proposed development area. This assessment shall aim to inform the EIA in the development of mitigative measures that will assist VRA in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Museums Act, Act 387 of 1969.

6.6. NEGATIVE IMPACT ON OCCUPATIONAL HEALTH & SAFETY

The development of the proposed Solar PV facility will involve a range of activities that could potentially be unsafe to workers without mitigation measures. To complete this analysis of environmental consequences associated with impacts on public health and safety, the study will

consider potential impacts on the following issue areas: hazardous materials/hazardous waste, waste management traffic and transportation safety, worker safety and fire protection, and geologic hazards. Without mitigation measures, all project sites present a risk to public safety, occupational health and safety, including fire hazards. Mitigation measures shall be proposed in the EIA to minimize these potential hazards. The socio-economic assessment will also consider potential impacts to the community, health, safety and security from the project.

6.7. NEGATIVE IMPACT ON SOCIO-ECONOMIC AND LOCAL COMMUNITIES

Based on the status quo conditions of the study area and the nature of the proposed development, the following socio-economic impacts are anticipated:

- Influx of job seekers;
- Increased competition for urban-based employment;
- Increases in social deviance;
- Impact on health;
- Increases in incidence of HIV/AIDS infections;
- Expectations regarding jobs;
- Local spending;
- Change in land use
- Creation of temporary jobs during construction (including local jobs);
- Skills training for local workers during construction;
- Creation of long-term jobs during operations and skills training;
- Potential for sourcing materials locally (during construction and operations); and
- Job losses at the end of the project life-cycle.

These anticipated socio-economic impacts have been summarised into the underlisted five major areas and discussed further:

6.7.1. Land Acquisition

It is anticipated that land acquisition of the Project site would result in economic displacement of farmers at the project site. This potential adverse effect on land ownership and land-use requires mitigation measures to minimize the impact on individuals and the community. This will need to be properly managed through sensitization and information sharing. Understanding the complex socio-economic, biophysical and cultural issues related to land tenure and land acquisition will be essential. This is because from the consultations, it was obvious that the support and involvement of the residents of West Mamprusi Municipal as well as Government agencies is essential to the smooth implementation of the project.

There is the potential of conflict and misunderstanding with individuals and communities, and even state agencies responsible for land management issues and these have to be exhaustively addressed and resolved prior to the implementation of the project. These potential effects will be thoroughly investigated during the study and relevant mitigation measures outlined in the EIA Report. Resettlement planning has been made part of the EIA study and a "Land Acquisition &

Resettlement Plan" (LARP), report specific for the solar component is underway and this should be developed in line with the **WB ESS5:** Land Acquisition, Restrictions on Land Use and Involuntary Resettlement, which provides guidance on the subject matter. This will entail undertaking asset census surveys with all project affected people and socio-economic surveys with some of the households. The LARP will include an entitlement matrix, describe valuation and compensation for losses and propose livelihood restoration measures. Consultation with those affected will be an essential part of the RAP process. To support the production of the LARP, a land market review will be undertaken to guide land compensation.

Currently, project-affected persons (PAPs) are being engaged in a meaningful manner, and to provide opportunity for their participation in the planning and execution of resettlement programs. It is planned that all land acquisition processes will be completed prior to commencement of project operations and the process has commenced where affected crops and economic trees properties have been valued for compensation purposes. The assessment will identify appropriate mitigation and management measures to be included in the Main EIA.

6.7.2. Land Use & Agriculture

The land to be affected by the implementation of the proposed project has the following categories of land-uses, agricultural lands, potential agricultural lands or fallow agricultural lands. Land for the project site has been surveyed and is to be acquired. The demarcation of the land for the project would result in some potential effects on land-use characteristics such as hunting as well on the fauna within the project environment, however, on a very minimal basis. Economic displacement from key activities because of the development such as farming, and associated infrastructure can plunge households into poverty and / or dislocate communities severing extended support networks such as childcare. Thus, the acquisition of the project enclave has the potential to adversely affect land tenure and ownership and land-use planning characteristics, as land will have to be acquired from some individuals, communities and/or skins.

Generally, impacts with regards to land use and agricultural potential which may occur because of the development include:

- Competing land use rights resulting in the solar farm being the main source of income as opposed to farming.
- Loss of agricultural production potential and change in agricultural character.
- Impacts on food security
- Loss of agricultural land occupied by steel towers and other infrastructure for the duration of the project.
- Land surface disturbance due to construction of tower foundations, hard standing areas, roads etc., and its resultant potential impact on erosion.
- Change in land use from agriculture to solar power production.
- Restrictions in movements on the acquired land by both humans and livestock.

The major activity requiring mitigation is the land-use as this ultimately leads to loss of land for agriculture, hunting and possible land-use conflicts. Subsequently, any development that has an impact on the potential land use, could have serious consequence on agriculture and the economy of the locals. The Physical Planning Department (formerly Town & Country Planning) will also have to demarcate the area and map out accordingly and discussion on this commenced during the stakeholder engagements. The study will further analyse such impacts and provide mitigation measures in the Main EIA Report.

6.7.3. Labour & Working Conditions

A summary of key labour related risks associated with the project are as follows:

- Working Conditions and Management of Worker Relationships
- Protection for the Work Force
- Occupational Health and Safety (OHS) Practices
- Gender & Vulnerability
- Grievance Mechanism
- Non-Employee Workers and Supply Chain

Labour and working conditions risk assessment is one of the key tools for improving occupational safety and health conditions at work as well as enhancing productivity and it will be necessary for the EPC Contractor and project parties to ensure appropriate labour and working conditions and facilities are in place for their workforce. Labour and working conditions will be regulated in compliance with Ghanaian labour laws, the ILO requirements and international safeguard policies. Compliance with occupational health and safety standards in the construction phase will be the responsibility of all Project employers. Labour rights will be protected and transparent processes for the recruitment of staff will be identified. Labour and working conditions will need to meet national and international requirements and an assessment if this will be undertaken as part of the study and results made available in the EIA Report.

A skills development programme, as part of the Corporate Social Responsibility, will aim to support a majority of the workforce recruited from the local population, which would mitigate to some extent the risk of the spread of communicable diseases and minimise the likelihood of worker and community conflict. Nonetheless other measures will be required to prevent outbreaks of disease, support targets of zero time lost accidents, and contribute to amicable community relations. At a minimum, a worker's code of conduct, health protection and awareness and occupational health and safety training programmes will be needed.

6.7.4. Community Health, Safety & Security

Nuisance effects from construction, including traffic movements, noise, dust and exhaust emissions are not considered likely to comprise a long term impact but will be assessed. For the EIA study, potential impacts will be identified and reported within the relevant subject specific chapters (i.e. air quality, noise, traffic and transport) with relevant mitigation measures proposed, in particular procedures for blasting, safe driving at appropriate speeds, and dust management. Construction

operations may represent additional health and safety risks to the local community from the influx of workers and followers.

The introduction of the project could pose some health risk on the people of the district and beyond regarding the spread of HIV/AIDS and other communicable diseases. Such impacts are critical and will be assessed under the socioeconomic impact survey of the proposed, which will be fully documented in the Main EIA Report. To support community health and safety, an emergency response plan will be required. Procedures will also be required to safeguard property and materials and to guide security personnel recruitment, management and activities. Typically, for construction projects, there is potential for disease and or community tensions to be introduced by any non-local workforce and these will be addressed as part of the mitigation and labour management measures to be outlined in the Main EIA Study.

6.7.5. Transport & Traffic Impacts

Owing to rural settings of the project area, traffic impacts are expected to be moderately significant during construction and decommissioning phases but of very low significance during the operational phase of project. Further information regarding traffic levels and an assessment of significance will be provided in the EIA. The EIA will include desk-based assessment of the existing capacity of the roads, ability to accommodate wide / heavy loads and give preferences for routing (a traffic assessment study).

Detailed traffic impact assessment is underway in relation with the ongoing EIA for the hydropower component and this will largely provide evidence of the project cumulative impacts on the Wulugu-Kurugu-Pwalugu Road. A traffic management plan may need to be developed. Depending on the sensitivity of the area surrounding chosen transport routes, movements of construction vehicles may be restricted to daylight hours. The socio-economic assessment will discuss potential impacts to local communities from the increased traffic movements. Road maintenance measures and other traffic management measures will be prepared and included within the Main EIA report.

6.8. GENDER & VULNERABILITY

Project development will lead to electricity stabilization and economic growth and this contribute to the positive impacts of the project which has already been discussed. Negative impacts could be on land use and this has been discussed. Workforce during the operational phase will be minimal, and these persons will be accommodated within the communities and therefore will become an integral part of the communities. This notwithstanding, Gender Based Violence and Sexual Exploitation could become an issue at this phase, albeit less likely and gender and vulnerability issues, will be considered in the Main EIA report

6.9. POTENTIAL IMPACTS LINKED TO THE DECOMMISSIONING PHASE

As indicated in Chapter 3 of this report, because of its long-life span of about 25 years, the circumstances under which these facilities might be ultimately decommissioned are difficult to foresee. The decision on whether to decommission or upgrade will depend on the development of the system. Should such a circumstance arise, the potential would exist for impacts from abandonment of the PV plants and or sub-transmission line components such as generation of waste,

loss of employment and aesthetic impacts. A Conceptual Decommissioning and Site Closure Plan (DCP) will be prepared as part of the Main EIA Report to guard against the remote possibility that the project ceases to operate and the facilities are abandoned by VRA. The purpose of this conceptual plan will be to describe the general objectives for the post project land use, and the planning processes leading to development of a Final DCP.

6.10. HAZARD OR RISK ASSESSMENT

Hazard or risk assessment is an instrument for identifying, analyzing, and controlling hazards associated with the presence of dangerous materials and conditions at a project site. WB ESS 1 requires a hazard or risk assessment for projects involving certain inflammable, explosive, reactive, and toxic materials when they are present in quantities above a specified threshold level. This is same under the Ghana EIA process. For certain projects, the environmental and social assessment may consist of the hazard or risk assessment alone; in other cases, the hazard or risk assessment forms part of the environmental and social assessment.

As indicated, the land to be affected by the implementation of the proposed project has the following categories of land-uses: agricultural lands, potential agricultural lands or fallow agricultural lands as well as grazing of animals. It has no history of occupation of any previous industrial facility that could pose the risk of soil contamination and therefore there is no need for any hazard or risk assessment required under this project. Nonetheless, the planned geotechnical analysis to determine the soil type would provide information on the soil profile and quality at the site.

6.11. CUMULATIVE IMPACTS

Cumulative impacts and effects are those that arise because of an impact and effect from the project interacting with those from another activity to create an additional impact and effect. It is a key part of any EIA process that the additional or cumulative impacts associated with nearby existing or proposed developments be considered and the results reported in an EIA Report. For each of the impacts assessed, the EIA is to investigate the cumulative impacts which could result from incremental impacts from other known existing and/or planned developments in the area and based on currently available information on such existing/planned developments.

Within the project area, the planned development of the Pwalugu Multipurpose Dam, with hydropower and irrigation components (See Figure *6-1*), could result in cumulative impacts on the solar component and are to be investigated as part of the EIA. Combined effects occur at areas where there is a concentration of activity. Strategic induced growth refers to the greater demand and availability of electricity and irrigation which will be an inevitable outcome. Potential cumulative impacts associated with the development of the Project as well as other associated facilities such as institutional accommodation for the operational staff, resettlement programme and the upgrade of the Wulugu-Kurugu-Pwalugu Road are likely to be combined effects and induced growth and spatial and temporal crowding.

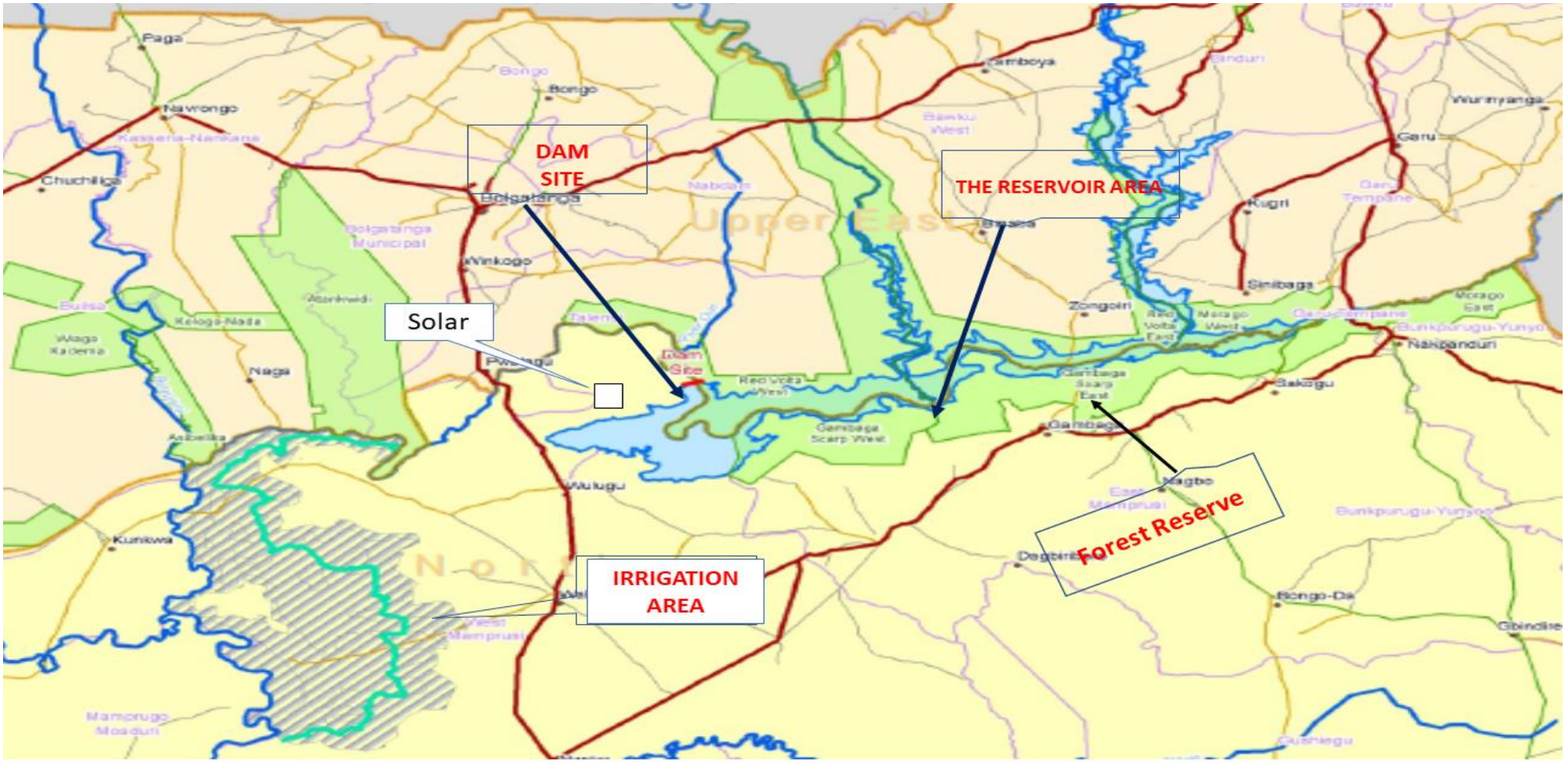
Key anticipated cumulative effects from the planned development of the hydropower and irrigational projects on the solar power facility impacts that needs to be investigated and included in the Main EIA report are:

- Ecological Environment
- Noise & Vibrational Impacts
- Water Resources
- Landscape & Visual Intrusion
- Socio-economic & Local Communities
- Gender & Vulnerability

6.12. TRANSBOUNDARY IMPACTS

The solar power site covering a geographical area of 1.40 km^2 is all located within Ghana, with all project activities and effects being confined within the country. Thus, there will be no further study on the transboundary impacts in the Main EIA.

Figure 6-1: Location of Solar/Dam, Reservoir and Irrigation Area of the PMDP



Source: VRA Project Team

6.13. SUMMARY

Table 6-1 summarises the key characteristic of the potential impacts identified for each environmental and social aspect under consideration as discussed in the sections above. The projected impacts basically encompass both positive and negative changes and the extent of impact has been illustrated using colour codes and numerical expression, explained by its key for easy appreciation. By the key, if the row associated with an activity is 0 or without any colour shade, the impacts from that activity are negligible, or of lower significance and screened out of further consideration. A green shade or +1 is a potential significant beneficial impact and this is an impact that provides direct socio-economic benefit. These considerations form the basis of the terms of reference for the EIA and it is imperative therefore that project developers consider these impacts in execution of the development of the solar PV infrastructure facility.

Table 6-1: Activity Impact Interaction Matrix for Project Phases

Key Broad Activities	Ecology		Climate Change	Physical Environment							Health & Safety		Socio-cultural Environment								
	Flora	Fauna	GHG Emissions	Noise	Air Quality	Water Resources	Topography & Drainage	Geology & Soils	Waste	Visual intrusion	Public Safety	Occupational Safety	Cultural Heritage	Land tenure, Ownership	Traffic & Transportation	Labour	Gender & Vulnerability	Land use	Employment	Economic Growth	Electricity Stabilisation
Pre-constructional Phase																					
Project Feasibility Study	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Survey Exercise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acquisition of Land	0	0	0	0	0	0	0	0	0	0	0	0	-2	-3	0	0	0	-1	0	0	0
Constructional Phase																					
Contractor mobilization, including engagement of labour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	-1	0	+1	0	0
Acquisition of Land	-3	-3	0	0	0	0	0	0	0	0	0	0	0	-1	0	-1	-1	-3	0	0	0
Site Clearing & Land Preparation	-3	-3	-2	-3	-2	-3	-3	-1	-1	-1	-1	-3	-1	0	-3	-1	-1	-3	+1	0	0
Transportation of equipment	-3	-3	-3	-3	-2	0	-3	0	-1	-1	-1	-3	-1	0	-3	-1	-1	0	+1	0	0
Civil works to prepare site	-3	-3	-2	0	-2	0	-3	0	-1	-1	-1	-3	-1	0	-3	-1	-1	0	+1	0	0
Installation of facilities	-3	-3	-2	0	0	0	0	0	-1	-1	-1	-3	-1	0	-3	-1	-1	0	+1	0	0
Demobilisation	0	0	-2	0	0	0	0	0	-1	-1	-1	-3	0	0	-3	-1	-1	0	+1	0	0
Testing & Commissioning	0	0	0	0	0	0	0	0	-1		-1	-3	0	0	0	-1	-1	0	+1	0	0

Key Broad Activities	Ecology		Climate Change	Physical Environment							Health & Safety		Socio-cultural Environment							
	Flora	Fauna	GHG Emissions	Noise	Air Quality	Water Resources	Topography & Drainage	Geology & Soils	Waste	Visual intrusion	Public Safety	Occupational Safety	Cultural Heritage	Land tenure, Ownership	Traffic & Transportation	Labour	Gender & Vulnerability	Land use	Employment	Economic Growth	Electricity Stabilisation
Operational & Maintenance Phase																				
Plant O&M	-1	-1	+1	-1	0	0	0	0	0	-1	-1	-1	0	0	-2	-1		-3	+1	+1	+1
PV Site Landscaping	0	0	0	-1	-1	-1	-1	-1	-1	0	0	0	0	0	0	0	0	-3	+1	0	0
PV Cleaning	0	0	0	-1	-1	-1	-1	-1	0	0	0	-1	0	0	0	0	0	-3	+1	0	0
RoW Maintenance	-1	-1	0	-1	-1	-1	-1	-1	0	0	-1	-1	0	-2	0	0	0	-3	+1	0	0
Line Route O&M	0	0	0	-1	-1	-1	-1	-1	0	0	-1	-1	0	0	0	0	0	-3	+1	+1	0

Key

Level of Impacts	
Positive	+1
Fatally Flawed Negative	-5
High Negative	-4
Medium Negative	**-3**
Low Negative	**-2**
Very Low Negative	-1
	0

PWALUGU MULTIPURPOSE DAM PROJECT:
50MW SOLAR HYBRID PROJECT IN THE WEST MAMPRUSI MUNICIPAL OF THE NORTH EAST REGION, GHANA







ENVIRONMENTAL IMPACT ASSESSMENT: SCOPING REPORT

CHAPTER 7: PLAN OF EIA STUDY

CHAPTER 7 : PLAN OF EIA STUDY

7.1. OVERVIEW

As discussed under Section 1.5.3, the scoping phase represents an initial step of the EIA process and a key outcome includes the identification of key issues for the development of a Terms of Reference (TOR) for approval by the Ghana EPA for the preparation of the Main EIA. This chapter presents the Plan of EIA Study which sets out the process to be followed in the EIA Phase. The plan discussed is based on the outcomes of the Scoping Phase and provides the Terms of Reference (TOR) for the key issues identified under Section 6.0 as well as the stakeholder engagement process that have been undertaken to date.

7.2. ISSUES TO BE ADDRESSED IN MAIN EIA PHASE

The issues to be considered and addressed during the various phases of the project are discussed in Chapter 6 of this Scoping Report and summarised below in Table 7-1.

Table 7-1: Summary of Issues to be Addressed During the EIA Phase

Summary of Issues		
Construction phase	Operation phase	Decommissioning phase
• Greenhouse Gas • Air Quality • Noise & Vibration • Water Resources • Topography & Drainage • Geology & Soils • Waste Generation • Landscape & Visual Intrusion • Ecology • Archaeological, Heritage & Cultural Structure • Occupational Health & Safety Landscape • Socio-economic and local community impacts, including compensation • Stakeholder Engagements	• Greenhouse Gas • Water Resources • Visual & Aesthetic Landscape • Community, Health, Safety & Security • Socio-economic and local community impacts • Stakeholder Engagements	• Transport and Traffic • Air quality & Dust • Noise & Vibrations • Community, Health, Safety & Security • Wastes

7.3. ALTERNATIVES TO BE ASSESSED AT THE EIA PHASE

A list of the five (5) alternatives that will be assessed or considered during the EIA Phase is provided in Chapter 3 of this Scoping Report. As indicated, this will be expanded based on review comments on this Scoping Report from the Ghana EPA.

7.4. TOR FOR THE SPECIFIC STUDIES UNDER THE MAIN EIA

Members of the EIA Team are provided under Chapter 1 and these specialists are to continue their role in assessing the environmental impact and provide reports for input in the EIA Report. The TOR for the specific studies to be undertaken by these specialists will essentially consist of the generic assessment requirements and the specific issues identified for each discipline, discussed under Chapter 6 and summarised in Section 7.1. The TOR will be updated to include relevant comments received from I&APs and authorities during the review period of the Scoping Report. The following specific studies have been identified based on the issues identified to date, as well as potential impacts associated with the project (refer to Table *7-1*). The TOR for each specialist study is discussed in detail below. Additional specialist studies could possibly be commissioned because of issues raised during the Scoping Process.

Cumulative impacts from operation of project will need to be considered in relation to existing and proposed developments. Within the project area, the planned development of the Pwalugu Multipurpose Dam, with hydropower and irrigation components, could result in cumulative impacts on the solar component and are to be investigated as part of the EIA. Potential cumulative impacts associated with the development of the Project as well as other associated facilities such as institutional accommodation for the operational staff, resettlement programme and the upgrade of the Wulugu-Kurugu-Pwalugu Road are likely to be combined effects and induced growth and spatial and temporal crowding. As explained in Chapter 6 of this Scoping Report, it is important to note at the outset that cumulative impacts will be assessed by the specialist studies (as applicable).

7.4.1. Stakeholder Engagement

Stakeholder engagements activities undertaken till date has been described under Chapter 5. The following activities are to be undertaken as part of the next steps engagements:

- Public Disclosure of the Scoping / EIA Report and related documentations on the VRA Corporate website, www.vra.com.
- Public Hearing as part of the PMDP.
- Make available copies of the Scoping / Non-Technical Summary Report / EIA Reports to the West Mamprusi Municipal Chief Executive and the Kuru Naa.
- In collaboration with their caretakers, engage and perform all relevant pacification rites to relocate cultural properties from the project site.
- Engagement with state agencies for the acquisition of all relevant permits and licenses.
- Formal notification of the North East Regional Minister and the West Mamprusi Municipal Chief Executive on the period for project commencement. The letter should be copied to the traditional authorities.
- Provide platforms for the community leaders to provide information on concerns that needs to be considered during the project implementation and to agree on grievance redress mechanism in place, including the introduction of the Grievance Community members who shall directly address issues raised by the community during the construction phase of the

project. It is recommended that the engagement with traditional authorities should be used as one of such platforms.

- Engagement with representatives of the identified neighbouring facilities to notify them on project commencement and expected roles to safeguard the public.
- VRA / EPC Contractor must observe all necessary traditional requirements prior to project commencement.
- Continuation of stakeholder consultation and communications through project construction and implementation phases.
- Provide information releases to the community if new issues arise or if the community has specific concerns. Company representative contact information will be available to the public to address concerns and questions during construction as well as operations and maintenance.
- Personal consultations as requested or if warranted.
- Meetings with district and other local government authorities.
- Ongoing consultation and meetings with local communities and organizations.

In addition, VRA shall also monitor and report on the on-going stakeholder engagement efforts to ensure that the desired outcomes are being achieved, and to maintain a comprehensive record of engagement activities and issues raised. The stakeholder engagement activities should be periodically evaluated using the following indicators:

- Level of understanding of the project by stakeholders as determined through random surveys conducted in the affected communities on a bi-annual basis using a short questionnaire.
- Monthly review of grievances received and how they have been addressed, including analysis of the time taken to resolve the grievances; number of grievances resolved to the satisfaction of the original party; categorisation in themes of complaints identifying areas for improvements. This will include grievances submitted directly to VRA and those submitted to contractors; and
- Level of involvement of affected people in committees and joint activities and in the project, itself.

To measure these indicators, the following data are to be used:

- Issues and management responses linked to minutes of meetings.
- Feedback from primary stakeholder groups (through interviews with sample of affected people); and
- Grievance registers from VRA and contractors.

These evaluation reports will be presented to the Project Team, including that the EPC Contractor, on a quarterly basis. As has been done in this Scoping Report, the comments received during the review of the EIA Reports will be compiled into a Comments and Responses Trail for inclusion in an appendix to the EIA Reports that will be submitted to the EPA for decision-making. The Comments and Responses Trail will indicate the nature of the comment, as well as when and who raised the comment. The comments received will be considered by the EIA team and appropriate responses provided by the relevant member of the team and/or specialist. The response provided will indicate how the comment received has been considered in the EIA Reports for submission to

the EPA. As stated earlier, a "**Stakeholder Engagement Plan**" is under preparation as part of the EIA Study.

7.4.2. Land Acquisition & Resettlement

The total land coverage demarcated for the solar power project at Kurugu is 1.40 Km^2 and is intended to be acquired by the VRA via the compulsory land acquisition provisions of the 1992 Constitution of Ghana as part of the Pwalugu Multi-purpose Dam Project. The area of land has been surveyed and the processes for acquisition of land has been initiated. The process of valuation of the crops on the demarcated land for the solar hybrid project is ongoing. The EIA Study shall provide information on affected individual and community properties, and compensation packages that was required for the acquisition of the land and any impacts due to the project, and details of the process will be provided in the "**Land Acquisition & Resettlement Plan**" that is under preparation for the project.

7.4.3. Ecological Survey & Habitat Assessment Study

Detail assessment of the current ecological status of the project sites is ongoing. This is being performed in line with IFC P6 and World Bank ESS6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources. The study objectives are to:

- List the prominent plant species (trees, shrubs, grasses and other herbaceous species of special interest) present for vegetation unit and ecosystem delimitation.
- Identify plant and animal/faunal species of conservation importance; which could possibly occur at the site.
- Assess impacts of the proposed solar power development on terrestrial ecology, including loss of habitat and habitat fragmentation, potential risks for erosion, impacts on potential ecological corridors, loss of ecosystems services, etc.
- Make recommendation on suitability of site for the project regarding the extent of impacts on ecology.

7.4.4. Archaeological, Historical & Cultural Impact Assessment

The EIA Study will continue with a reconnaissance survey to identify available historical and cultural heritage resources, if any that are present in the proposed development area. This assessment shall aim at recommending appropriate mitigation measures that will assist VRA in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Museums Act, Act 387 of 1969.

7.4.5. Noise Impact Assessment

Background noise at the project site has been collated and will be provided in the Main EIA report. A noise impact assessment study will be undertaken to establish the relationship between the project development noise and the natural masking noise, and to assess anticipated noise levels against established standards (over Ghana/IFC a threshold levels). The baseline noise levels will be

assessed qualitatively.). It is intended to utilize the "Guidelines for Community Noise Impact Assessment and Mitigation", March 2011[2].

7.4.6. Air Quality Assessment

Analysis of the air quality at the project site to provide baseline information has been undertaken and details will be provided in the Main EIA report. Mitigation measures will be developed to minimise impacts and will include standard good practice techniques to minimise construction emissions. Thus, management actions for mitigation will be incorporated into the EIA Report.

7.4.7. Landscape & Visual Intrusion Assessment

A photographic survey will use results of the desktop analyses to provide the following:

- Photographic record of landscape elements within the study area.
- Photographic record of the visual baseline for views from principal viewpoints.
- The actual zone of visual influence by determining the effect of vegetation, buildings and topography on visibility in the study area.
- Identification of sensitive receptors (viewers and landscape elements that will be affected by the proposed development).

It is expected to utilise a recognised visual impact assessment methodology, such as "Guidelines for Landscape and Visual Impact Assessment Third edition, Landscaped Institute, Institute for Environmental Management & Assessment and Routeledge, 2013". The landscape baseline should incorporate results from the desktop review and field survey to provide a description of the existing character and condition of the landscape. Factors such as geology, topography, land cover and human settlements that combine ways to form the landscape should be described, as well as the ways they combine to create unique landscape types within the study area. The value attached to the landscape by residents and other sensitive receptors should also be determined.

7.4.8. Socio-economic Impact Assessment

The nature of the proposed project requires that both primary and secondary data source will be utilized. Secondary data source will be relied upon for the population of the catch communities involved. Various documentations have been assessed so far at this Scoping Stage. It is envisaged that the proposed solar power project has the potential of affecting communities, settlements, individuals, and business entities and activities in the catchments area, there is the need to undertake primary data collection through a compressive socio-cultural baseline survey.

[2] I-INCE Technical Study Group on Community Noise: Environmental Noise Impact Assessment and Mitigation (TSG 6)

The main objectives of the baseline survey will be to:

- Document the present socio-economic and socio-cultural situation prevailing within the project footprint before the commencement of the proposed project.
- Ascertain the potential project impacts on the PAPs,
- Recommend appropriate measures to mitigate the negative impacts, and to
- Solicit the views, concerns the expectations of the identified PAPs with respect to the implementation of the proposed project.

Three sets of approaches will be employed to collect primary data as follows:

a. An initial reconnaissance survey discussed earlier was a preliminary survey that was adopted to quickly gather first-hand background information about the catch area in terms of their socioeconomic background characteristics, beliefs and norms, archaeological resources and cultural heritage sites ahead of the detailed survey. This has helped to help pose relevant questions for the questionnaire.

b. All the communities, settlements/hamlets within an accepted range of project impact will be identified. Depending on the number of identified communities in the project catchment areas and on the number of identified households per community, all of these PAPs will be interviewed. If on the other hand the numbers are large, a simple random sampling will be employed to select a statistically representative sample of affected households (respondents) in every community. The household questions will solicit socio-economic, socio-cultural, demographic, information from the respondents, which will include the following, among others as required under the Ghana EIA process:
    - The land area taken up by the development, its location clearly shown on a map and geographical coordinates provided.
    - Human beings: (population composition and distribution, socio-economic conditions, cultural and ethnic diversity, population growth rate);
    - Land use: (agriculture, forests, industrial, commercial, residential, transportation routes such as roads, rail, water and air, utility corridors)
    - Social services: (electricity, telecommunication, water supply, hospitals, etc);
    - Cultural heritage: (unique features of the area or its people; cemetery, fetish grove, festivals etc).

c. Consultations with relevant stakeholder in the project footprint. This may take the form of focus group discussions and/ or individual consultations as has been described earlier under Chapter 5. The issues to be considered will include:
    - Knowledge of the project
    - Impact of the project
    - Compensation issues
    - Employment opportunities
    - Corporate social responsibility
    - Community expectations and concerns

The terms of reference for the socio-economic specialist study include:

- To collate the socio-economic baseline data
- Broad level review of the need and financial viability/risks associated with the project. This would be based primarily on information from the client. It is assumed that an adequate assessment of technical and financial feasibility of the project has been conducted to establish viability and justify further assessment of the project in the EIA phase. Feasibility considerations are assumed to include the generation of carbon credits as a potential income stream.
- Degree of fit with local, regional and national economic development visions and plans including renewable energy plans.
- Impacts on overall economic development potential in the area including impacts on commercial enterprises nearby the site (incl. tourism, agriculture, small businesses and others).
- Impacts associated with project expenditure on direct and indirect employment and household incomes. These impacts would be investigated through an examination of how the project and the spending injection associated with it may impact on the local, regional and national economy. Impacts associated with upstream and downstream economic linkages and spin-offs would also be assessed taking import content and other relevant factors into consideration. Experience from other similar projects and any suitable economic models for the area would be used to assess these impacts.
- Impacts associated with environmental impacts that cannot be mitigated and have economic implications. This would focus on potential negative impacts on neighbouring land owners should they be relevant.

7.5. APPROACH TO IMPACT ASSESSMENT

This section outlines the assessment methodology to be adopted for the EIA study.

7.6.1. Generic TOR for the Assessment of Potential Impacts

The identification of potential impacts should include impacts that may occur during the construction, operational and decommissioning phases of the development. The assessment of impacts is to include direct, indirect as well as cumulative impacts. To identify potential impacts (both positive and negative) it is important that the nature of the proposed projects is well understood so that the impacts associated with the projects can be assessed. The process of identification and assessment of impacts will include:

- Determining the current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- Determining future changes to the environment that will occur if the activity does not proceed;
- Develop an understanding of the activity in sufficient detail to understand its consequences; and
- The identification of significant impacts which are likely to occur if the activity is undertaken.

A simple, clearly defined method is used in order to accurately determine the significance of the predicted impact on, or benefit to, the surrounding natural and/or social environment. Nonetheless, an impact assessment will always contain a degree of subjectivity, as it is based on the value judgment of various specialists and Environmental Assessment Practitioners. The evaluation of significance is thus contingent upon values, professional judgement, and dependent upon the environmental and community context. Ultimately, impact significance involves a process of determining the acceptability of a predicted impact to society. The following methodology is to be applied to the predication and assessment of impacts:

- **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
- **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity.
- **Cumulative impacts** are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. The cumulative impacts will be assessed by identifying other applicable projects, such as construction and upgrade of electricity generation, and transmission or distribution facilities in the local area (i.e. within 20 km of the proposed WPP1 project) that have been approved (i.e. positive EP has been issued) or is currently underway. The proposed and existing developments that will be considered as part of the ESIA Phase is provided in Chapter 6 of this Scoping Report.
- **Nature of impact** - this review the type of effect that a proposed activity will have on the environment and should include "what will be affected and how?"

- **Potential Intensity**

Potential Intensity Description (negative)	Rating	Score
Potential to severely impact Human Health (morbidity/mortality); or to lead to Loss of species[3] (fauna and/or flora)	Very High/Fatal Flaw	16
Potential to reduce faunal/flora population or to lead to severe reduction/alteration of natural process, loss of livelihoods or sever impact on quality of life[4], individual economic loss	High	8

[3] *Note that a Loss of species is a global issue and is differentiated from a loss of "flora/fauna" population*
[4] *Note that a visual impact or air emissions for example could be considered as severely impacting on quality of life should it constitute more than a nuisance but not being life threatening*

Potential to reduce environmental quality – air, soil, water. Potential Loss of habitat, loss of heritage, reduced amenity	Medium	4
Nuisance	Medium-Low	2
Negative change – with no other consequence	Low	1
Potential Intensity Description (positive)	**Rating**	**Score**
Potential Net improvement in human welfare	High	8
Potential to improve environmental quality – air, soil, water. Improved individual livelihoods	Medium	4
Potential to lead to Economic Development	Medium-Low	2
Potential positive change – with no other consequence	Low	1

Note that the concept of "**irreplaceable loss of a resource**" is to be taken into account in the Potential Intensity score of an impact

- **Irreplaceability of resource** loss caused by impacts –
  - High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment. For example, if the project will destroy unique wetland systems, these may be irreplaceable);
  - Moderate irreplaceability of resources;
  - Low irreplaceability of resources; or
  - Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment).

- **Spatial extent** – The size of the area that will be affected by the risk/impact:

Extent Description	**Score**
Site specific	1
Local (<10 km from site)	2
Regional (within 100 km of site)	3
National	4
International/Global (e.g. Greenhouse Gas emissions or migrant birds).	5

- **Duration** – The timeframe during which the risk/impact will be experienced:

The concept of "reversibility" is reflected in the duration scoring. I.e. the longer the impact endures the less likely it will be reversible.

Duration Description	Score
Temporary (less than 2 year) or duration of the construction period. This impact is fully reversible. ***E.g. the construction noise temporary impact that is highly reversible as it will stop at the end of the construction period***	1
Short term (2 to 5 years). This impact is reversible.	2
Medium term (5 to 15 years). The impact is reversible with the implementation of appropriate mitigation and management actions.	3
Long term (> 15 years but where the impact will cease after the operational life of the activity). The impact is reversible with the implementation of appropriate mitigation and management actions. ***E.g. the noise impact caused by the desalination plant is a long term impact but can be considered to be highly reversible at the end of the project life, when the project is decommissioned***	4
Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient). This impact is irreversible. ***E.g. The loss of a palaeontological resource on site caused by construction activities is permanent and would be irreversible.***	5

- **Reversibility of impacts** -
  - High reversibility of impacts (impact is highly reversible at end of project life, i.e. this is the most favourable assessment for the environment. For example, the nuisance factor caused by noise impacts associated with the operational phase of an exporting terminal can be considered to be highly reversible at the end of the project life);
  - Moderate reversibility of impacts;
  - Low reversibility of impacts; or
  - Impacts are non-reversible (impact is permanent, i.e. this is the least favourable assessment for the environment. The impact is permanent. For example, the loss of a palaeontological resource on the site caused by building foundations could be non-reversible).

Using the criteria above, the impacts will further be assessed in terms of the following:

- **Probability** – The probability of the impact/risk occurring:

Probability Description	Score
Improbable (little or no chance of occurring <10%)	0.1
Low Probability (10 - 25% chance of occurring)	0.25
Probable (25 - 50% chance of occurring)	0.5
Highly probable (50 – 90% chance of occurring)	0.75
Definite (>90% chance of occurring).	1

- **Magnitude**–The anticipated severity of the impact (Intensity + Extent + Duration):
  - Extreme (extreme alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they permanently cease);
  - Severe (severe alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
  - Substantial (substantial alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
  - Moderate (notable alteration of natural systems, patterns or processes, i.e. where the environment continues to function but in a modified manner); or
  - Slight (negligible alteration of natural systems, patterns or processes, i.e. where no natural systems/environmental functions, patterns, or processes are affected).

- **Significance** – Will the impact cause a notable alteration of the environment? To determine the significance of an identified impact/risk, the consequence is multiplied by the probability (as shown below).

Significance rating = Impact magnitude * Probability

Impact Magnitude = Potential Intensity + duration + extent

Table 7-2: Guide to assessing risk/impact significance as a result of consequence and probability

Scoring	Significance rating	Description
18-26	**Fatally Flawed**	The project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating.
10 - < 18	**High**	The impacts will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making.
5 - <10	**Medium**	The impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures and will only have an influence on the decision-making if not mitigated.
2 - <5	**Low**	The impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures and will not have an influence on decision-making.
<2	**Very Low**	The impact may result in very minor alterations of the environment and can be avoided through the implementation of mitigation measures.

- **Status** - Whether the impact on the overall environment (social, biophysical and economic) will be:
  - Positive - environment overall will benefit from the impact;
  - Negative - environment overall will be adversely affected by the impact; or
  - Neutral - environment overall will not be affected.

- **Confidence** – The degree of confidence in predictions based on available information and specialist knowledge:
  - Low;
  - Medium; or
  - High.

Where appropriate, national standards will be used as a measure of the level of impact.

7.6.2. Mitigation and Assessing Residual Impacts

As specified in Section 12 of part II of the EIA Regulations, appropriate mitigation measures will be identified to eliminate, minimise or manage identified potential significant environmental effects. The following will be considered:

- Embedded or inherent mitigation - mitigation which is built in to the project during the design process.

- Mitigation of significant effects or key mitigation (pertinent measures that will be written into and enforced through the EMP for implementation to ensure that the significance of the associated impact is acceptable).
- Mitigation of non-significant effects or additional mitigation (management actions to be considered by proponent and authority).
- Enhancement measures.

Impacts will be described both before and after the implementation of the proposed mitigation and management measures. It is expected that for the identified significant impacts, the project team will work with the client in identifying suitable and practical mitigation measures that are implementable. Mitigation that can be incorporated into the Project design in order to avoid or reduce the negative impacts or enhance the positive impacts will be developed. A description of these mitigation measures will also be included within the Environmental Management Plan (EMP).

Residual impacts are those impacts which remain once the mitigation measures have been designed and applied. Following the identification of mitigation measures to address significant adverse effects, an assessment of the significance of any residual effects (i.e. those remaining after mitigation) will be completed. The result is a significance rating for the residual impact.

7.6.3. Proposed Monitoring

After the completion of the assessment, proposals for monitoring requirements will be put forward where relevant. Proposals for monitoring will be designed to evaluate the accuracy of the impact prediction and the success of any implemented mitigation measures.

7.6.4. Dealing with Uncertainty

Even with a final design and an unchanging environment, impacts are difficult to predict with certainty, but in projects such as the proposed project, where the design process is currently in progress, uncertainty stemming from on-going development of the Project design is inevitable, and the environment is typically variable from season to season and year to year. Where such uncertainties are material to the EIA findings, they are clearly stated and are approached conservatively ('the precautionary approach') in order to identify the broadest range of likely residual impacts and necessary mitigation measures.

Potential impacts may be assessed using tools ranging from quantitative techniques such as modelling to qualitative techniques based on expert judgment and historical information. The accuracy of these assessment tools depends on the quality of the input data and available information. Where assumptions have been made, the nature of any uncertainties associated with the assumption is discussed. For qualitative predictions/assessments, some uncertainty is removed through consultation. These uncertainties are reflected in the Confidence level scoring.

7.6. CONTENT OF ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT REPORT

The EIA Team will collate all the gathered and generated information and data into a EIA Report and submit same toward the acquisition of an environmental permit. The process and outputs of the

environmental assessment is intended to meet the formal requirements of Ghana's EPA and will be therefore structured in line with the revised format for EIA Reports released by the Ghana EPA in 2016 and shown in Table *7-3*. The EIA report will also include a Table of Contents, a Glossary of Terms and Abbreviations and a Reference List and Annexes. The EIA report will provide maps, figures and process diagrams to facilitate understanding of the descriptive elements of the report. The font style will be Size 12 of Times New Roman, with a 1.5 spacing and printed on both sides.

Table 7-3: Format for EIA Report

Title	Content to be Provided
Non-Technical Summary	▪ The scope, purpose and objectives of the project ▪ Brief project description ▪ The legal basis of the project ▪ Brief explanation of the methods by which information and data were obtained ▪ Brief on the baseline data ▪ Impacts identified and their mitigation ▪ Monitoring ▪ Any other critical matters
Chapter 1: Introduction	▪ The purpose and objectives of the undertaking ▪ The aims of the environmental assessment and how those aims are to be achieved. ▪ Methods by which information and data were obtained
Chapter 2: Policy, Legislative and Administrative Requirements	▪ Overview of relevant policy, legislative and regulatory framework and an indication of how each of these relate to the undertaking. This should include both national and international Climate Change and Gender related policies (e.g. GH-NDCs, National Gender policy, the SDGs, AU Agenda 2063, and the Paris Agreement etc.).
Chapter 3: Project Description & Alternatives	▪ The location (geo coordinates), land take, design, size and scale of the development, components of the project, the nature and duration of constructional and operational activities with diagrams, plans, charts and/or maps ▪ Description of adjoining land uses and land use requirement ▪ Description of constructional activities (proposed works; source and quantities of materials) ▪ Description of the physical characteristics, scale and design, quantities of material needed during construction and operation, description of the production processes. ▪ Description of operational phase (processes or activities; scope; facilities and utility services required; all outputs (products and wastes) ▪ Climate change related features/components of the project ▪ Description of other development (off-site areas or facilities affected by the project) ▪ Numbers of workers involved with the project during both construction and operation ▪ The types and quantities of waste generation including emissions, heat/noise/radiation discharges, deposits and residuals (where applicable) and the rate at which these will be produced, are adequately estimated. Uncertainties are acknowledged, and ranges or confidence limits given where possible.

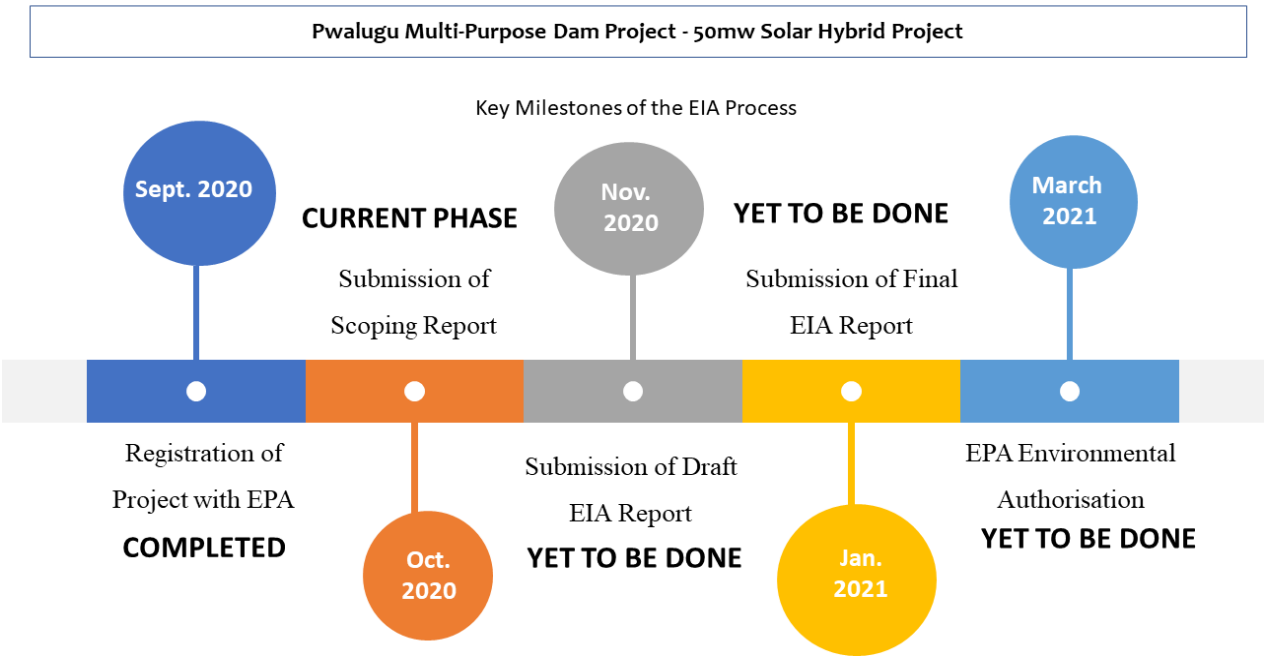
Title	Content to be Provided
	▪ Alternatives sites, processes, designs and operating conditions where these are practicable and available to the developer. The main socioeconomic and environmental advantages of these should be discussed and the reasons for final choice given. All the alternatives should consider Climate Change Mitigation and Adaptation issues and must be environmentally sustainable. ▪ Where alternatives are not considered, explain.
Chapter 4: Description of Existing Environment / Baseline Information	This chapter should discuss the biophysical and socio-cultural environment of the proposed undertaking (project) to include ▪ The land area taken up by the development, its location clearly shown on a map and geographical coordinates provided ▪ Climatic and atmospheric conditions / Geology / Hydrology/ Ecology Climate zone (refer to the GMet Climate Zones classification) within which the project is located ▪ Land use: ▪ Noise levels / Air quality ▪ Potential sources of Greenhouse Gases (GHGs) where applicable ▪ Human beings: (population composition and distribution, socio-economic conditions, cultural and ethnic diversity, population growth rate); ▪ Social services: (electricity, telecommunication, water supply, hospitals, etc.); ▪ Cultural heritage: (unique features of the area or its people; cemetery, fetish grove, festivals etc.).
Chapter 5: Stakeholder Consultations	▪ Identify all relevant stakeholders pertaining to the sector and project. ▪ Outline concerns of the stakeholders ▪ Provide evidence and outcomes of the consultation
Chapter 6: Impacts Identification & Significance	▪ It is important to set impact boundaries (geographical area of influence) to limit the amount of information to be gathered and analysed. ▪ Identify potential impacts for all phases of the project (i.e. pre-construction, construction, operation and decommissioning) ▪ The identified Impacts should be presented based on the following categories/attributes: nature, duration, spatial extent reversibility, direct and indirect impacts, short term and long term, positive or negative, cumulative, etc. ▪ Methodology for the identification of impacts should be well presented using the following (where applicable) matrices, checklists, expert opinion, modelling, GIS, Climate Change Vulnerability Assessment /Climate Trend Analysis among others. ▪ The assessment of significance should also be based on environmental guidelines, standards and thresholds, socio-cultural and economic values, health and safety, and ecological importance of the resource. The determination of significance must also take into consideration Climate Change issues. ▪ Climate change tools for profiling Climate Change Risk and emission foot prints as well as opportunities for building resilience and reducing emissions. ▪ Stakeholder (interested and affected) concerns should be accounted for in the identification of impacts.
Chapter 7:	▪ The mitigation of all significant impacts should be considered, and specific mitigation measures defined in practical terms (e.g. costs, equipment and technology needs, timing). Measures proposed for

Title	Content to be Provided
Mitigation & Enhancement Measures	enhancement of all beneficial impacts should be provided in practical terms. ▪ The mitigation exercise should address Climate Change issues and concerns. ▪ Proposed ways of handling and/or treating wastes and residuals where applicable should be indicated, together with the routes by which they will eventually be disposed of to the environment. ▪ The extent of the effectiveness of the mitigation measures should be presented and where the mitigation measure is uncertain or depends on assumptions about operating procedures, climatic conditions, etc. data should be provided to justify the acceptance of these assumptions
Chapter 8: Provisional Environmental Monitoring Plan	▪ Comprehensive listing of the mitigation measures (actions) that the Project will implement at all phases should be provided in a proposed action plan, ▪ Environmental quality parameters that will be monitored to track how effectively actions and mitigation would be implemented should be presented in a tabulated monitoring plan.
Chapter 9: Decommissioning	▪ Overview of mitigative measure during decommissioning
Chapter 10: Conclusion	▪ Consideration should be based on the pillars of sustainability (economic viability, socio-cultural acceptability, institutional arrangements and the environmentally friendly or benign) amongst others.

7.7. SCHEDULE FOR EIA STUDY

It is expected that the EIA Study will be completed latest by March 2021 for the issuance of an environmental authorisation. The key milestones for submission of relevant documentations are summarised in Figure 7-1. It should be noted that this schedule could be revised during the EIA Process, depending on factors such as the time required for decisions from authorities. It must be noted that it is an offense under LI 1652 to commence constructional activities without an Environmental Permit and VRA will endeavour to adhere to this legal requirement.

Figure 7-1: Key Milestones in the EIA Process



PWALUGU MULTIPURPOSE DAM PROJECT:

50MW SOLAR HYBRID PROJECT IN THE WEST MAMPRUSI MUNICIPAL OF THE NORTH EAST REGION, GHANA







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CHAPTER 8: REFERENCES

CHAPTER 8 REFERENCES

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APPENDIX

Appendix 1: EIA Study Team
Appendix 2: General Correspondences on EIA Study
Appendix 3: Energy Commission Siting Permit
Appendix 4: Pictures from Stakeholder Engagements
Appendix 5: Signed List of Stakeholders' Consulted

APPENDIX 1: MEMBERS OF EIA STUDY TEAM

Appendix 1: Members of EIA Study Team

Name	Contact Details	Qualification	Role
Ben A. Sackey	ben.sackey@vra.com 0243344779	• MPhil Food Science • PG Cert. OSHEM • Cert. in PPM • Certified Env. Auditor • Certified ISO 14001 EMS Implementor • Member, IAIA	EIA Team Leader
Kwaku Wiafe	kwaku.wiafe@vra.com 0244484315	• BSc Civil Engineering • MSc Public Policy	Project Manager / Civil Engineer
Lloyd Kofi Sutherland	lloyd.sutherland@vra.com 0241370926	• MSc in Env. Science; • NEBOSH-IGC • Member, IAIA	EIA Specialist
Baffo Blankson	baffo.blankson@vra.com 0200366511	• BSc Environment & Natural Resource Management	Natural Resource Management Specialist
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Afua Adwubi Thompson	afua.adwubi@vra.com 0540744247	• BSc Civil Engineering • MSc Water Resources Engineering and Management	Civil Engineer / Flood Risk Expert
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Petrina Odum Aggrey	petrina.aggrey@vra.com 0268362409	• BSc. Land Economy • Member-GhIS (Ongoing)	Resettlement Officer
Lawrence Addipa	lawrence.addipa@vra.com 0509180415	• MSc. In Geomatic Engineering • Diploma in Mine Surveying	Geodetic Surveyor

APPENDIX 2: GENERAL CORRESPONDENCES ON EIA STUDY

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Accra, Ghana
Website: http://www.epa.gov.gh

Our Ref: CE: 7398/01/02

September 15, 2020

The Chief Executive
Volta River Authority
P. O. Box MB 77
Accra-Ghana

Dear Sir,

RE: PWALUGU MULTIPURPOSE DAM PROJECT – 50MW SOLAR HYBRID PROJECT: SUBMISSION OF ENVIRONMENTAL ASSESSMENT REGISTRATION FORM EA2

We acknowledge receipt of your letter dated September 9, 2020 on the above proposal submitted to the Agency for the purpose of obtaining environmental approval, in accordance with the Environmental Assessment Regulations 1999 (LI 1652).

The proposal falls in the category of undertakings (Regulation 3) for which Environmental Impact Assessment (EIA) is required to help understand the likely implications of the proposal, the relevant alternatives and mitigations to consider in order to ensure, sound decision-making and sustainable development of the project.

In line with Regulation 11 of LI 1652, you are advised to carry out a scoping exercise to generate the relevant terms of reference (TOR) to guide satisfactory EIA study of the proposal.

Please note that scoping is meant to focus the EIA on the key issues, concerns and decision areas and solicit input and guidance of all relevant stakeholders on the TOR. Scoping notices must be served as appropriate to facilitate stakeholder involvement (see attached sample). Ten (10) hard copies of the scoping report must be submitted to the Agency for study and agreement on the TOR, prior to the EIA studies.

It is important to note that both the Scoping Report and Environmental Impact Statement contains information on the consultants who prepared the reports. This should include the names, address, email, telephone experience and their specific contribution to the study. Failure to provide this information would render the submission incomplete.

Do not hesitate to contact the Agency (Head Office Room 305) and the EPA North East Regional Office, Nalerigu for any further guidance you may require in this regard.

Yours faithfully,

KWABENA BADU-YEBOAH
AG. DIRECTOR/EA&MGT DEPARTMENT
FOR: EXECUTIVE DIRECTOR

cc: The Director, EPA, North East Region, Nalerigu

SCOPING NOTICE

..... Propose to establish a (Name of Company/Organization)

..... at ..... in the

(proposal/undertaking) location

..... of the .....

District Region

Notice of the proposed ..... is hereby served for public information as required under the procedure for the conduct of EIA in accordance with Regulation 15(1) of (LI 1652).

Any person(s) who has an interest, concern, or special knowledge relating to potential environmental effects of the proposed undertaking, may contact or send such concerns, etc to

..... and The Executive Director
..... Environmental Protection Agency
..... P. O. Box M 326
..... Accra
info@epa.gov.gh

APPENDIX 3: ENERGY COMMISSION SITING PERMIT

ENERGY COMMISSION

This is to certify that

VOLTA RIVER AUTHORITY

(EC/GWSL/11-19-133)

Has been granted a

SITING PERMIT

*For its proposed site to set up a Hybrid Hydro-Solar PV Plant to be sited at Pwalugu in the Talensi District of the Upper East Region, subject to the Conditions in the Schedule**

Permit Number: EC/HHS/SP/09-20-001

Permit valid until: 17TH SEPTEMBER, 2021

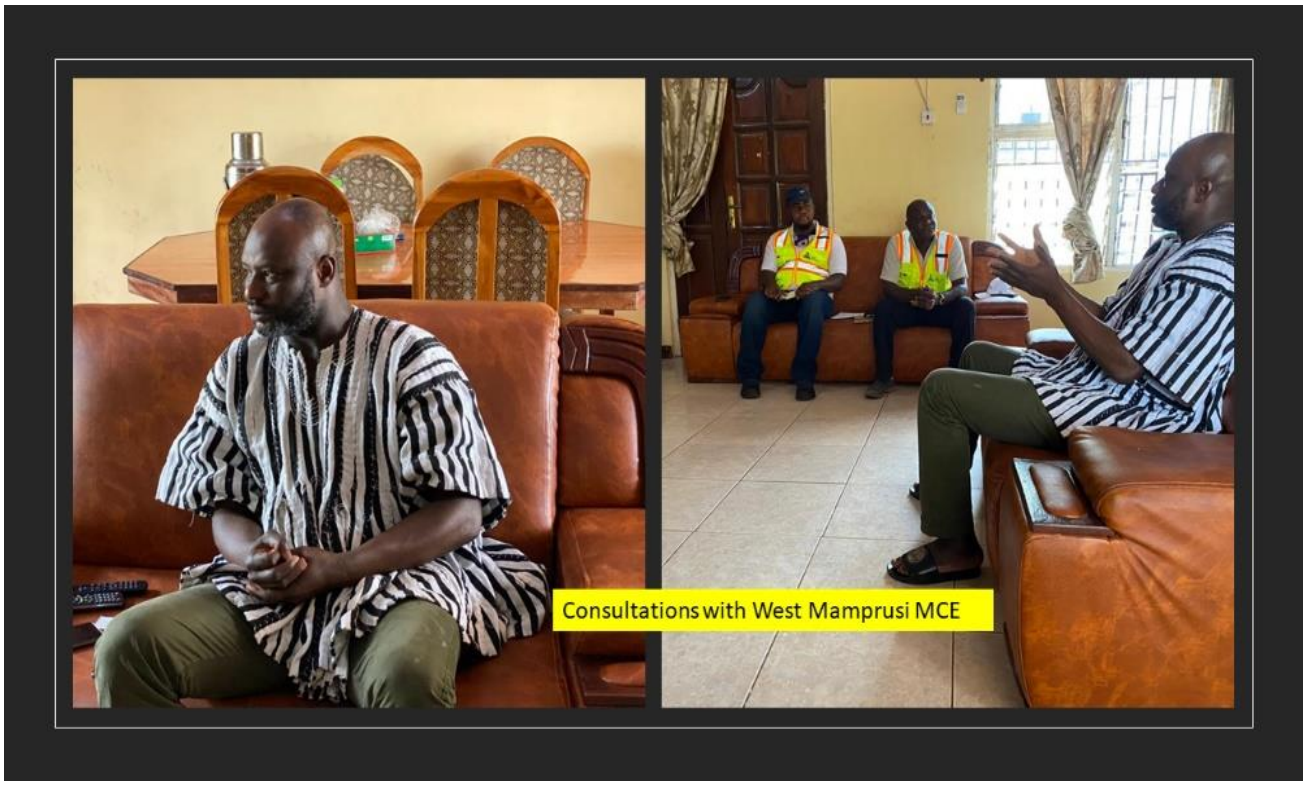
Oscar Amonoo-Neizer (Ing.)
Executive Secretary

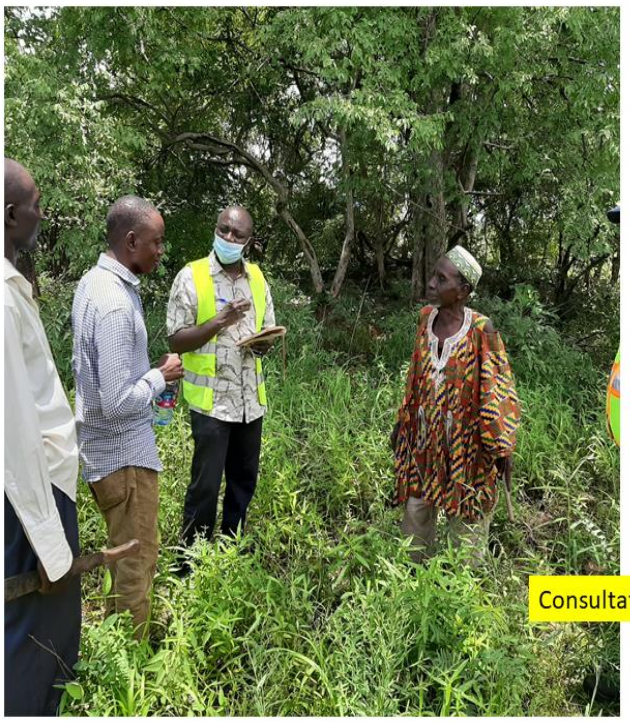
Date: 18TH SEPTEMBER, 2020

**See attached Schedule*

APPENDIX 4: PICTURES FROM STAKEHOLDER ENGAGEMENTS

Appendix 4: Pictures from Stakeholder Engagements





Consultations with Kpasurugu Shrine

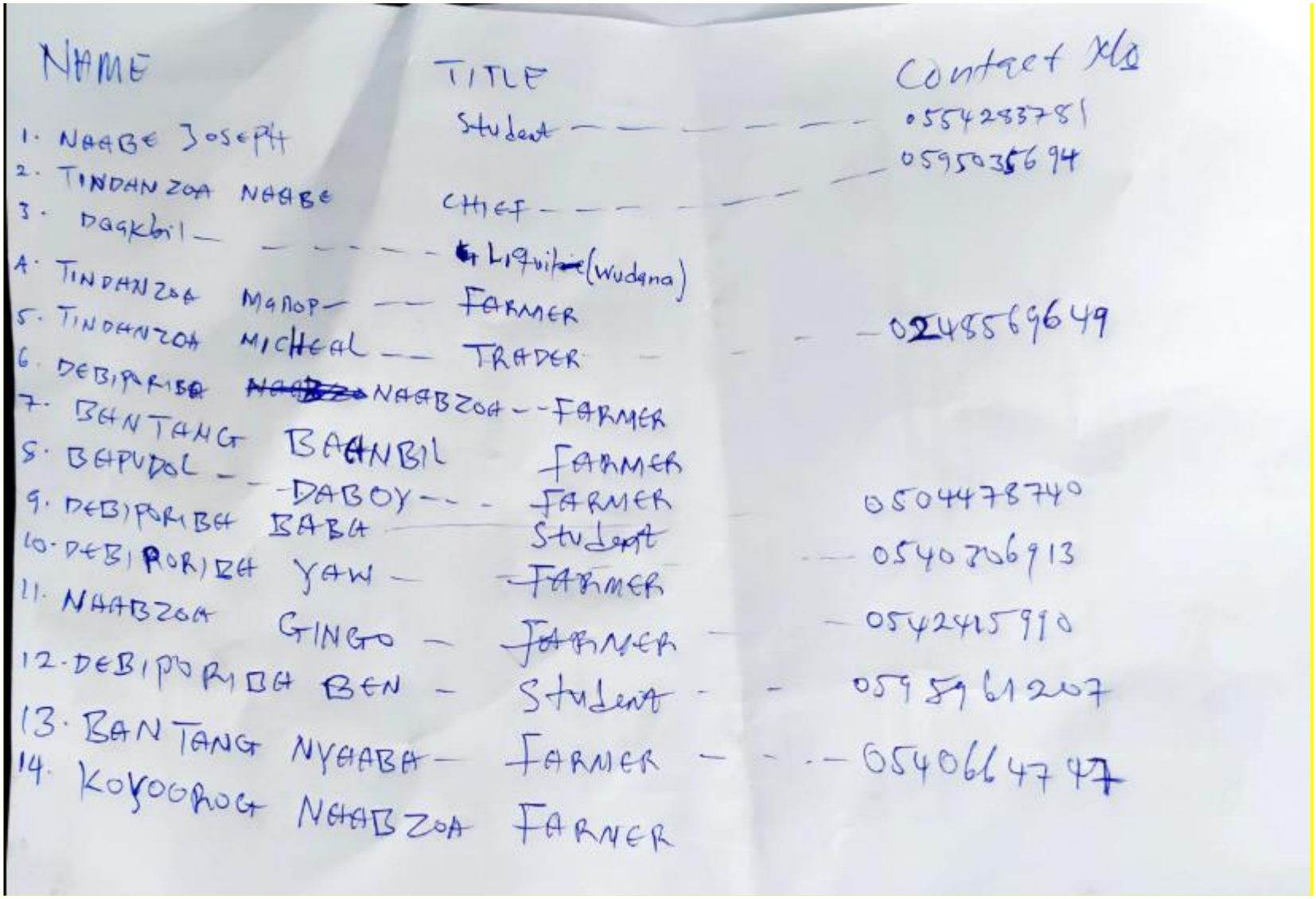
Consultations with GES Officials

Consultations with Planning Officer of West Mamprusi

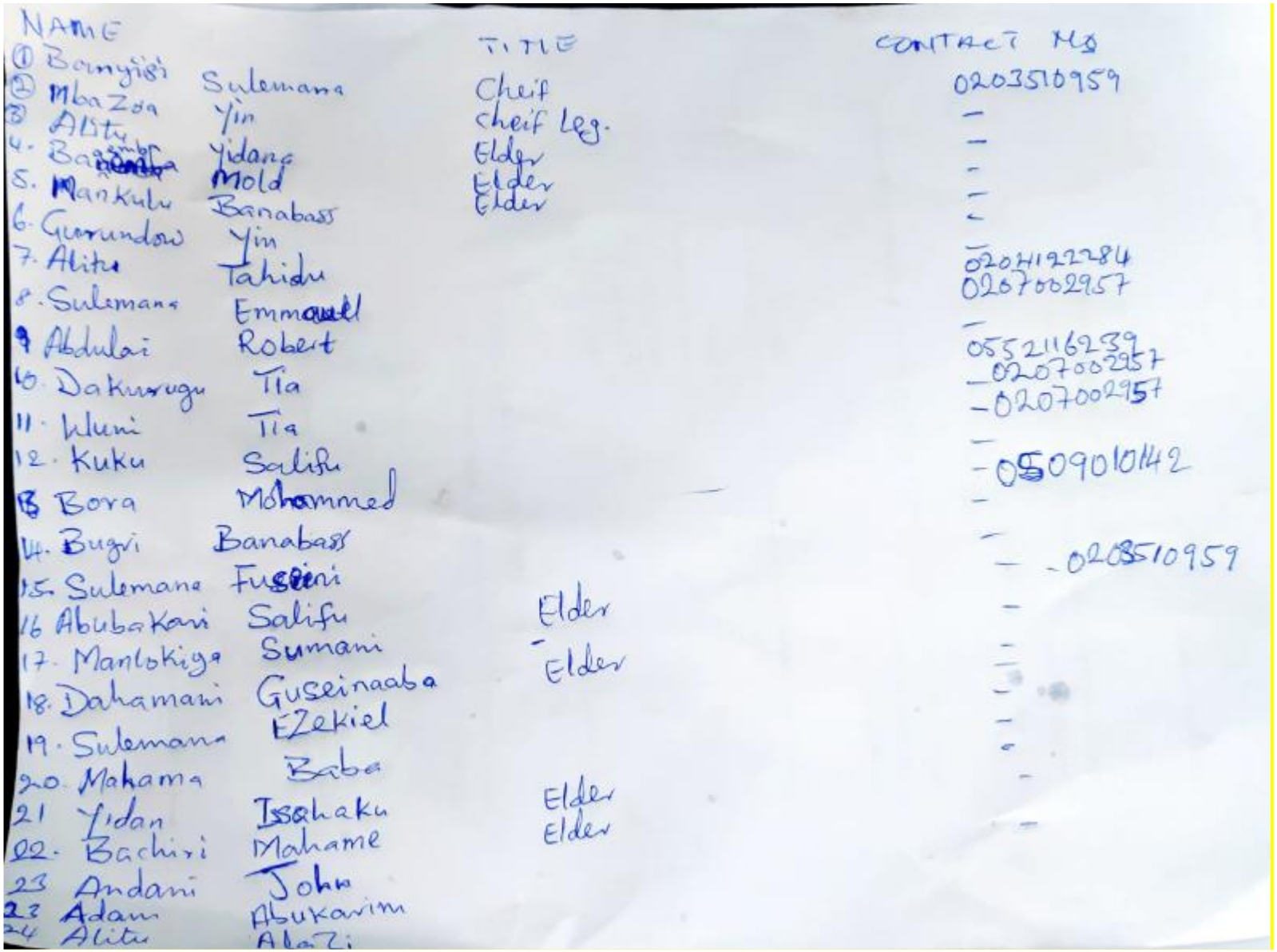
Consultations with Chief & Elders of Kpatusi

Consultations with FSD Officials, Walewale Office

APPENDIX 5: SIGNED LIST OF STAKEHOLDERS' CONSULTED



NAME	TITLE	Contact No
1. NAABE Joseph	Student	0554283781
2. TINDAN ZOA NAABE	CHIEF	0595035694
3. Dagkbil	~~Liquidator~~ (Wudana)	
4. TINDAN ZOA MANOP	~~FARMER~~	
5. TINDAN ZOA MICHEAL	TRADER	0248569649
6. DEBIPARIBA ~~NAABZOA~~		
7. BANTANG BANBIL	NAABZOA - FARMER	
8. BAPUDOL	FARMER	
9. DEBIPARIBA BABA	DABOY - FARMER	0504478740
10. DEBIPARIBA YAW	~~Student~~	0540706913
11. NAABZOA GINGO	~~FARMER~~	0542415910
12. DEBIPARIBA BEN	~~FARMER~~ Student	0595961207
13. BAN TANG NYAABA	FARMER	0540647477
14. KOYOORO NAABZOA	FARNER	



NAME		TITLE	CONTACT NO
① Bamyiri	Sulemana	Cheif	0203510959
② Mbazoa	Yin	cheif leg.	-
③ Alitu	Yidana	Elder	-
4. Ba[illegible]a	Mold	Elder	-
5. Mankulu	Banabass	Elder	-
6. Gurundow	Yin		-
7. Alitu	Tahidu		0204122284
8. Sulemana	Emmanuel		0207002957
9 Abdulai	Robert		-
10. Dakurugu	Tia		0552116239
11. Iluni	Tia		-0207002957
12. Kuku	Salifu		-0207002957
13 Bora	Mohammed		-
14. Bugri	Banabass		-0509010142
15. Sulemana	Fuseini		-
16 Abubakari	Salifu	Elder	- 0203510959
17. Manlokiya	Sumani	Elder	-
18. Dahamani	Guseinaaba		-
19. Sulemana	Ezekiel		-
20. Mahama	Baba		-
21 Yidan	Isahaku	Elder	-
22. Bachiri	Mahame	Elder	-
23 Andani	John		
23 Adam	Abukarim		
24 Alitu	Alazi		

PWALUGU MULTIPURPOSE DAM PROJECT - 50MW SOLAR HYBRID PROJECT

Date: 4th September, 2020 **Venue:**

Meeting: ENGAGEMENT WITH OFFICIALS OF THE WEST MAMPRUSI MUNICIPAL ASSEMBLY

No.	Name	Position/Title	Email	Mobile No.	Signature
01	Issahaku Arimeyaw Somo Lucky	MCE	arimeyaw somo@yahoo.com	0208477974	
02	Wuni Seidu Sahfu	MPO	wibnsaeed@yahoo.com	0208722438	
03	Wuni Millicent	ADPO	millicent.pared@gmail.com	0540408120	
04	Elijah Adam	ADPO	adamelija@yahoo.com	0243717007	
05.	Mahama Ramatu	Deputy Director	ramatumahama.vm@gmail.com	0208300966	
06	ISSIFU IDDRISU	C/S	issifuiddrisu590@gmail.com	0545192427	
07	David Awala	C/S	aniweawala@gmail.com	0245084547	

PWALUGU MULTIPURPOSE DAM PROJECT - 50MW SOLAR HYBRID PROJECT

Date: 4th September, 2020 **Venue:**

Meeting:

No.	Name	Position/Title	Email	Mobile No.	Signature
08	GERHADT SEDDOH	Stats Off.	gerhadts@gmail.com	0540525937	

PWALUGU MULTIPURPOSE DAM PROJECT - 50MW SOLAR HYBRID PROJECT

Date: 5th September, 2020 **Venue:** Kurugu Chief's Palace

Meeting: ENGAGEMENT WITH FARMERS

No.	Name	Community	Mobile No.	Signature
1	SULEMANA FUSEINI	KURUGU	0203510959	
2	MBAZOA CHARLES	KURUGU	0207724467	
3	ABUBAKARI IDDRISU	KURUGU	0541890766	
4	KUDUS TAHNI	KURUGU		
5	Bambil Bantanga	Kpatusi	0245789321	
6	Dambil Sandow	Kpatusi	0507889821	
7	Fulandow Abila	KPatusi	0544888606	

PWALUGU MULTIPURPOSE DAM PROJECT - 50MW SOLAR HYBRID PROJECT

Date: 5th September, 2020 Venue:

Meeting:

No.	Name	Community	Mobile No.	Signature
8.	Mumuni Rabi	Kurugu		
9	Bugri Alimatu	Kurugu		
10	Mahami Braimah	Kurugu	0247084246	
11	Basigi Kubu	Kurugu	0500977926	
12	Tia Dakurugu	Kurugu		
13	Mbazoa Yine	Kurugu		
14.	Chief. J. B. Sulemana	Kurugu		

PWALUGU MULTIPURPOSE DAM PROJECT - 50MW SOLAR HYBRID PROJECT

Date: 5th September, 2020 **Venue:**

Meeting:

No.	Name	Community	Mobile No.	Signature
15.	Abubakari Salifu	Kurugu	0508626310	
16	Abdul-Karim Salifu	Kurugu	0504923460	
17	Mahamadu Bora.	Kurugu		
18	Salifu Awal	Kurugu	0504857962	
19	Bantanga Yaaba	Kpatisi	0540664747	
20	Ibrahim Sulley	Kurugu	0507553357	
21	Adam Abdul-Karim	Kurugu		

PWALUGU MULTIPURPOSE DAM PROJECT - 50MW SOLAR HYBRID PROJECT

Date: 5th September, 2020 Venue:

Meeting:

No.	Name	Community	Mobile No.	Signature
22	Salifu AZIZI	Kurugu	0548884480	
23.	Abdulai Robert	Kurugu	0207002957	
24	Bukari Mazira	Kurugu		
25.	Bachili Mahami	Kurugu		
26.	Yidana Issahaku	Kurugu	0504744872	
27	Adam Sulemana	Kurugu		
28	Salifu Tibila	Kurugu		