

**Environmental Impact Assessment  
for 75MW Wind Power Project 2,  
situated at Wokumagbe and Goi  
in the Ada West District of the  
Greater Accra Region**



Prepared for:  
Volta River Authority, Ghana  
June 2016



**SCOPING  
REPORT**



**VOLTA  
RIVER  
AUTHORITY**

## VRA CORPORATE ENVIRONMENTAL POLICY STATEMENT

1. The Volta River Authority (VRA) is committed to ensuring continuous improvement of environmental performance that minimizes potential impacts of all its operations on the environment, in line with the principles of sustainable development, in addition to complying with national and international environmental protection regulations.
2. In respect of the above, VRA will:
  - a. Make environmental considerations a priority in all business planning and decision-making and comply with relevant national and international environmental protection regulations.
  - b. Take reasonable steps to mitigate the impact of its actions with regard to the development, operation and management of its assets.
3. 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.
4. 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.
5. 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.

SIGNED:.....

CHIEF EXECUTIVE

REVISED DATE:.....

16/09/13

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Project 2, situated at Wokumagbe and Goi in the Ada West  
District of the Greater Accra Region.**

**SCOPING REPORT**

June 2016

***Prepared for:***

Volta River Authority Ghana

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# report details

<b>Title:</b>	<b>Environmental Impact Assessment for 75MW Wind Power Project 2, situated at Wokumagbe and Goi in the Ada West District of the Greater Accra Region</b>
<b>Purpose of this report:</b>	<p>This Final Scoping Report forms part of a series of reports and information sources that are being provided during the Environmental Impact Assessment (EIA) process for the proposed WPP2, Ghana. In accordance with the EIA Regulations, the purpose of the Scoping Report is to:</p> <ul style="list-style-type: none"> <li>• Provide a description of the proposed project, including a sufficient level of detail to enable stakeholders to raise issues and concerns;</li> <li>• Describe the local planning context and environment within which the project is proposed, to assist further in identifying issues and concerns;</li> <li>• Provide an overview of the process being followed in the Scoping Phase, in particular the public participation process, as well as present the Plan of Study for ESIA that would be followed in the subsequent ESIA phase; and</li> <li>• Present the issues and concerns identified to date from the stakeholder engagement process, together with an explanation of how these issues will be addressed through the ESIA process.</li> </ul> <p>All stakeholders are invited to comment on the Scoping Report, with comments to reach the SELJEN by 31<sup>st</sup> July 2016</p>
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<b>Date:</b>	<b>June 2016</b>



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# executive summary

## Chapter 1 - Introduction

VRA proposes to construct and operate two wind energy facilities as follows:

- 75MW Wind Power Project 1 (Anloga Extension) located at Anloga, Anyanui & Srogbe communities in the Keta Municipal in the Volta Region (Site A)
- 75MW Wind Power Project 2 (Wokumagbe and Goi) located in Wokumagbe and Goi communities in the Ada West District in the Greater Accra Region (Site B)

Two separate Scoping Reports and two separate Environmental and Social Impact Assessment (ESIA) reports will be submitted to the Environmental Protection Agency (EPA) for decision-making. The contents of this Scoping Report refer to WPP2. In accordance with the requirements of the Environmental Assessment Regulations, 1999 (LI 1652) and as outlined in the Environmental Impact Assessment (EIA) Guidelines for the Energy Sector, Volume 1, dated August 2010, the construction of wind energy facilities exceeding 20 hectares or exceeding an installed capacity of 15MW falls into the category for which an ESIA Study is required. SELJEN Consult and the Council for Scientific & Industrial Research (CSIR), a South African research council, have been appointed to undertake the ESIA process for the proposed projects.

Since 1999, Ghana has been increasingly dependent on imported fossil fuels to meet its overall energy requirements. All grid-supplied electricity is generated using a mix of hydro and imported fossil fuel. In the 90s, the increasing demand for electricity coupled with the effects of bad inflows of water for hydro generation had resulted in load shedding. To meet this increasing demand and mitigate the effects of poor inflows, 1231.50 MW of thermal generation capacity has been installed by close of 2013 with more under construction. Currently, 43.8% of electricity in Ghana was being generated from fossil fuels whilst 56.1% from large hydro power. Only 0.1% is generated from renewable sources, specifically solar power. Ongoing studies for the development of energy from solar and wind resources are undertaken.

To contribute towards this target and towards socio-economic and environmentally sustainable growth, and kick start and stimulate the renewable energy industry in Ghana, the Government passed a RE law in November 2011 (Act 832) to provide the necessary legal and regulatory framework to promote the provision of energy, including electricity from renewable sources. The object of this law is to promote the sustainable development and utilization of RE resources for electricity and heat generation. The goals of the renewable energy sub-sector are to increase the proportion of renewable energy in the total national energy mix and ensure its efficient production and use.

The Volta River Authority (VRA), in line with the National Renewable Energy Law, has in-turn set a 5-10 years' Renewable Energy (RE) generation capacity target taking cognizance of the local and export demand and the system constraints. VRA's RE Development Programme Phase 1 (REDP1) aims at developing about 164 MW of installed renewable energy capacity and this program consists of three

components, specifically (a) 150 MW Wind Power Phase 1 (b) 14 MW Solar Power Phase 1 and (c) Renewable Energy Planning & Development Integration.

## Chapter 2 - Project Description

It is important to point out at the outset that the exact specifications of the proposed project components will be determined during the detailed engineering phase.

Linked to enhancing renewable energy production within Ghana, the proposed 75 MW Wind Power Project 2 will cover an area of approximately 193.31 ha. WPP2 is located within the Wokumagbe and Goi communities in the Ada West District of the Greater Accra Region. The electricity generated at the proposed Wind Power Project 2 will be evacuated via a newly constructed substation onsite and will be connected to the grid via a new dedicated High Voltage transmission line to the existing grid.

The 75MW Wind Power Project 2 (Wokumagbe and Goi) will consist of the main components listed below. The components and their dimensions will be discussed in the Scoping and the ESIA Reports that will be produced for each facility:

- Wind Energy Facilities
  - Wind turbines
  - Building infrastructure
  - Offices;
  - Operational control centre;
  - Warehouse/workshop;
  - Ablution facilities; and
  - Converter station.
- Associated Infrastructure
  - Electrical infrastructure (including transmission lines and substations);
  - Access roads;
  - Internal gravel roads;
  - Fencing;
  - Operation and Maintenance Area;
  - Laydown Area;
  - Stormwater channels; and
  - Water pipelines.

## Chapter 3 - Description of the Affected Environment

The proposed wind farm site is located in the Wokumagbe and Goi communities in the Ada West District. An overview of the receiving environment and the surrounding region has been provided. This includes the biophysical, socio-economic and heritage aspects which could be affected by the proposed development or which in turn might impact on the proposed development.



This information is provided to identify the potential issues and impacts of the proposed project on the environment. The information presented here has been sourced from:

- Scoping input from the specialists that form part of the project team;
- Review of available information.

It is important to note that this chapter intends to provide an overview and does not represent a detailed environmental study. Detailed studies focused on significant environmental aspects of this project will be provided during the ESIA Phase.

## Chapter 4 - Approach to ESIA Process and Public Participation

In accordance with the requirements of the Environmental Assessment Regulations, 1999 (LI 1652) and as outlined in the Environmental Impact Assessment (EIA) Guidelines for the Energy Sector, Volume 1, dated August 2010, the construction of wind energy facilities exceeding 20 hectares or exceeding an installed capacity of 15MW falls into the category for which an ESIA Study is required. The purpose of the ESIA is to identify, assess and report on any potential impacts the proposed project, if implemented, may have on the receiving environment. The Environmental Assessment therefore needs to show the Competent Authority, the EPA; and the project proponent, VRA, what the potential impacts of the project may be in terms of the biophysical and socio-economic environment and how such impacts can be, as far as possible, enhanced or mitigated and managed as the case may be.

The Scoping Phase of the ESIA refers to the process of determining the spatial and temporal boundaries for the ESIA. In broad terms, the objectives of the Scoping Process are to:

- Confirm the process to be followed and opportunities for stakeholder engagement;
- Clarify the project scope to be covered;
- Identify and confirm the preferred activity and technology alternative;
- Identify and confirm the preferred site for the preferred activity;
- Identify the key issues to be addressed in the impact assessment phase and the approach to be followed in addressing these issues; and
- Confirm the level of assessment to be undertaken during the impact assessment

This is achieved through parallel initiatives of consulting with:

- The lead authorities involved in the decision-making for this ESIA application;
- The public to ensure that local issues are well understood; and
- The ESIA specialist team to ensure that technical issues are identified.

The Scoping Process is supported by a review of relevant background literature on the local area. Through this comprehensive process, the environmental assessment can identify and focus on key issues requiring assessment.

The primary objective of the Scoping Report is to present key stakeholders (including affected organs of state) with an overview of the project and key issues that require assessment in the ESIA Phase and allow the opportunity for the identification of additional issues that may require assessment.

## Chapter 5 - Stakeholder Engagements

At this stage, the ESIA project team has conducted the scoping round of engagement with various stakeholders/bodies within the project area comprising of community members, comprising of traditional authorities, property affected person as well as representatives from state agencies and the details of the I&APS engaged so far provided in this report. Issues raised thus far during the Scoping Process have been captured in the Issues and Responses Trail in Chapter 5 of the Scoping Report. Issues raised in response to this Scoping Report (currently being released for a 60-day comment period) will be captured in an Issues and Responses Trail as an Appendix to the ESIA Report, which will be submitted to the EPA for decision-making.

## Chapter 6 - Project Alternatives

A description of the alternatives that will be assessed or considered during the ESIA Phase is provided in Chapter 6 of this Scoping Report and comprise of the following:

- **No-go Alternative:**
  - The no-go alternative assumes that the proposed project will not go ahead i.e. it is the option of not constructing the proposed WEF. This alternative would result in no environmental impacts on the site or surrounding local area, as a result of the facility. It will provide a baseline against which other alternatives will be compared and considered during the ESIA Phase.
- **Land Use Alternative:**
  - No other energy technologies were deemed to be appropriate for the site and therefore these technologies will not be further assessed during the ESIA Phase.
    - The wind resources available at the WPP1 site are the most favourable for wind energy.
    - The close proximity of the harbour facility, suggests that electricity generation-related land use/s are the most appropriate for the preferred site with regards to ease of transport of WEF components.
- **Location Alternatives within the Selected Site:**
  - The selection of the site is described in Chapter 6 of this Scoping Report. During the ESIA Phase, possible layout plans within the preferred WPP1 project site will be discussed (refer to Layout Alternatives).
- **Technology Alternatives:**
  - Applicable and relevant technology options related to wind energy will be described during the ESIA Phase.
- **Layout Alternatives:**
  - Layout alternatives for the project will be discussed following the input from the various specialists. The studies will aim to identify various environmental sensitivities present on the preferred site that should be avoided, which will be taken into account during the determination of the proposed layout of the wind power facility.

It is important to note that where alternatives are not feasible or will not be assessed, an explanation has been provided.

## Chapter 7 - Identification of Issues and Potential Impacts

A Background Information Document (BID) regarding the ESIA Process was given to key stakeholders during the various consultations. The Scoping Report includes the issues identified to date as part of the Scoping Process. A synthesis of these issues is provided in the Issues and Response Trail (Chapter 5, which includes an explanation of how the issues will be addressed in the ESIA Phase.

The list below indicates the main issues identified thus far during the Scoping Phase and to be addressed during the ESIA Process.

- Aviation Impact Assessment
- Avifauna
- Cultural Heritage Impact Assessment
- Noise and Flicker Impacts
- Socio-economic/ Property Valuation Impact Assessment
- Terrestrial Ecology Impact Assessment
- Visual Impact Assessment
- Wetland Impact Assessment

## Chapter 8 - Plan of Study for ESIA

The Plan of Study for ESIA (Chapter 8) presents the approach to the forthcoming ESIA Phase. This includes the Terms of Reference for the various specialist studies that are proposed to address the issues raised, where necessary.

## Chapter 9 – Provisional Environmental Management Programme

As required under the EIA Regulations 1999 (LI 1652), a detailed Provisional Environmental Management Programme (EMPr) with estimated costs shall be provided in the main ESIA Report. An overview of the content of the EMPr and the implementation mechanism to manage environmental and social issues and mitigation measures identified on screening potential environmental impacts and mitigation measures has been provided in this Scoping Report.

## Chapter 10 - References

References used in this Scoping Report is provided.



# glossary

BID	Background Information Document
CITES	Convention on International Trade in Endangered Species
CA	Competent Authority
CEB	Communauté Electrique du Benin
CESAP	Constructional Environmental & Social Action Plan
CO <sub>2</sub>	Carbon Dioxide
CoP	Conference of Parties
CSIR	Council for Scientific and Industrial Research
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DSR	Draft Scoping Report
EAP	Environmental Assessment Practitioner
EHS	Environmental health and Safety
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EMS	Environmental Management Services
EP	Environmental Permit
EPA	Environmental Permit Authority
EPFI	Equator Principle Financial Institutions
ESIA	Environmental & Social Impact Assessment
FSR	Final Scoping Report
GHG	greenhouse gases
GoG	Government of Ghana
Km	kilometer
I&AP	Interested and Affected Party
IFC	International Finance Corporation
	Intergovernmental Panel on Climate Change
IPP	Independent Power Produce
kWh	Kilowatt Hours
LNG	Liquefied Natural Gas
	MV
MW	Megawatts
NEDCo	Northern Electricity Distribution Company
NESRP	Northern Electrification & System Reinforcement Project
	National Renewable Energy Lab
OECD	Organisation for Economic Corporation & Development
OESAP	Operational Environmental & Social Action Plan
OHS	Occupational Health & Safety

O&M	Operation and Maintenance
OPs	Operational Policies
RE	Renewable Energy
REDPP1	Renewable Energy Development Programme Phase 1
PAP	Project-Affected Persons
PPP	Public Participation Process
PS	Performance Standards
PURC	Public Utilities Regulatory Commission
S&EIR	Scoping and Environmental Impact Reporting
ToR	Terms of Reference
TNC	Third National Communication
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
WAPP	West Africa Power Pool
WEF	Wind Energy Facility
WPP	Wind Power Project
WTG	Wind Turbine Generator
VRA	Volta River Authority



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# CHAPTER 1: Introduction

# SCOPING REPORT



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# 1. INTRODUCTION

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The Volta River Authority (VRA) is proposing to develop two 75 MW Wind Energy Facilities (WEF) and associated electrical infrastructure as follows:

- 75MW Wind Power Project 1 (Anloga Extension) located at Anloga, Anyanui & Srogbe communities in the Keta Municipal in the Volta Region and
- 75MW Wind Power Project 2 (Wokumagbe and Goi) located in Wokumagbe and Goi communities in the Ada West District in the Greater Accra Region

The proposed projects will be designed in such a way to ensure that the total generation capacity of the Wind Energy Facilities will be 150 MW. The contents of this scoping report will address WPP2 and a separate report has been compiled for WPP1. Figure 1.1 below show the overall locality of the proposed 75 MW Wind Energy Facilities (WPP2) and associated infrastructure.

In accordance with the requirements of the Environmental Assessment Regulations, 1999 (LI 1652) and as outlined in the Environmental Impact Assessment (EIA) Guidelines for the Energy Sector, Volume 1, dated August 2010, the construction of wind energy facilities exceeding 20 hectares or exceeding an installed capacity of 15MW falls into the category for which a full EIA Study is required. The Applicant, VRA, has appointed SELJEN Consult and the Council for Scientific & Industrial Research (CSIR), a South African research council, to undertake the ESIA study for the proposed projects in order to determine the biophysical, social and economic impacts associated with undertaking the proposed activity.

## 1.1. PROJECT APPLICANT AND PROJECT OVERVIEW

The Volta River Authority (VRA) is the main power generation company in Ghana, solely owned by the Government of Ghana (GoG) and established in 1961 by an Act of Parliament (Act 46). It forms the first arm of the recently restructured electricity generation, transmission and distribution chain in Ghana. VRA combines hydro, thermal and solar plants to generate electricity for supply to the local and export markets. The local market consists of the Electricity Company of Ghana (61% of market consumption), mines and industrial establishments (who purchase electricity directly from VRA). The export market comprises the Communauté Electrique du Bénin (CEB) (for the Republics of Togo and Benin) and SONABEL (Burkina Faso).

VRA reaches its customers and neighbouring countries through the Ghana Grid Company (GRIDCo) transmission system. This transmission system covers the entire country and is connected with the national electricity grids of Compagnie Ivoirienne d'Electricité (CIE) of La Cote d'Ivoire, Communauté Electrique du Bénin (CEB) of Togo and Benin and SONABEL of Burkina Faso. These interconnections now serve as part of the arrangement under the West Africa Power Pool (WAPP).

Northern Electricity Distribution Company (NEDCo), a subsidiary of VRA, undertakes the distribution function in northern Ghana covering the Upper East, the Upper West, Northern and Brong Ahafo regions, as well as parts of the Ashanti and Volta Regions. NEDCo was developed as an integral part of a larger scheme, designated the Northern Electrification & System Reinforcement Project (NESRP) to extend the national electricity grid to northern Ghana.

Historically, the Electricity Supply Industry in Ghana has been dominated by hydro power, which accounted for all generation until the late 1990s. That situation has now changed and since the end of 2010, Ghana's total installed thermal generating capacity has almost equalled the existing hydro generation capacity. VRA's hydroelectric power generation plants, the Akosombo Hydroelectric Power Plant and Kpong Hydroelectric Power Plant are situated in the Eastern region. The thermal plants are situated mainly in Tema and Takoradi. In addition to those owned by VRA, independent Power Producers (IPPs) support the electricity supply market. Thermal generation plants gained consistent prominence in VRA's power generation mix, since the mid 1990's when VRA commenced the diversification of its generation source beyond the Akosombo Hydro-electric plant. Crude oil and gas used in powering VRA's thermal plants are imported through various suppliers.

As at June 2016, the total installed capacity in Ghana from 15 power generation plants was 3644MW. VRA owns ten (10) of these power generation facilities in Ghana, as shown in Table 1-1 below, with a total installed generation capacity of 2434 MW, representing 66.8% of total installed capacity in the country, with a dependable capacity of 2195MW.

**Table 1-1: VRA Generation Plants (Source: [www.vra.com](http://www.vra.com) )**

VRA Plants	Installed Capacity (MW)	Installed Capacity (%)	Dependable Capacity (MW)
Akosombo Hydroelectric Power Plant	1020	41.9%	900
Kpong Hydroelectric Power Plant	160	6.6%	140
Takoradi Thermal Power Station (T1)	330	13.6%	300
Takoradi International Company (TICO/ T2)	330	13.6%	320
Takoradi 3 Thermal Power Station (T3)	132	5.4%	120
Tema Thermal 1 Power Station	110	4.5%	100
Tema Thermal 2 Power Station	49.5	2.0%	45
Mines Reserve Power Station	80	3.3%	70
Kpone Thermal Power Plant	220	9.0%	200
Navrongo Solar Power Plant	2.5	0.1%	0
<b>TOTAL VRA</b>	<b>2434</b>	<b>100.0%</b>	<b>2195</b>





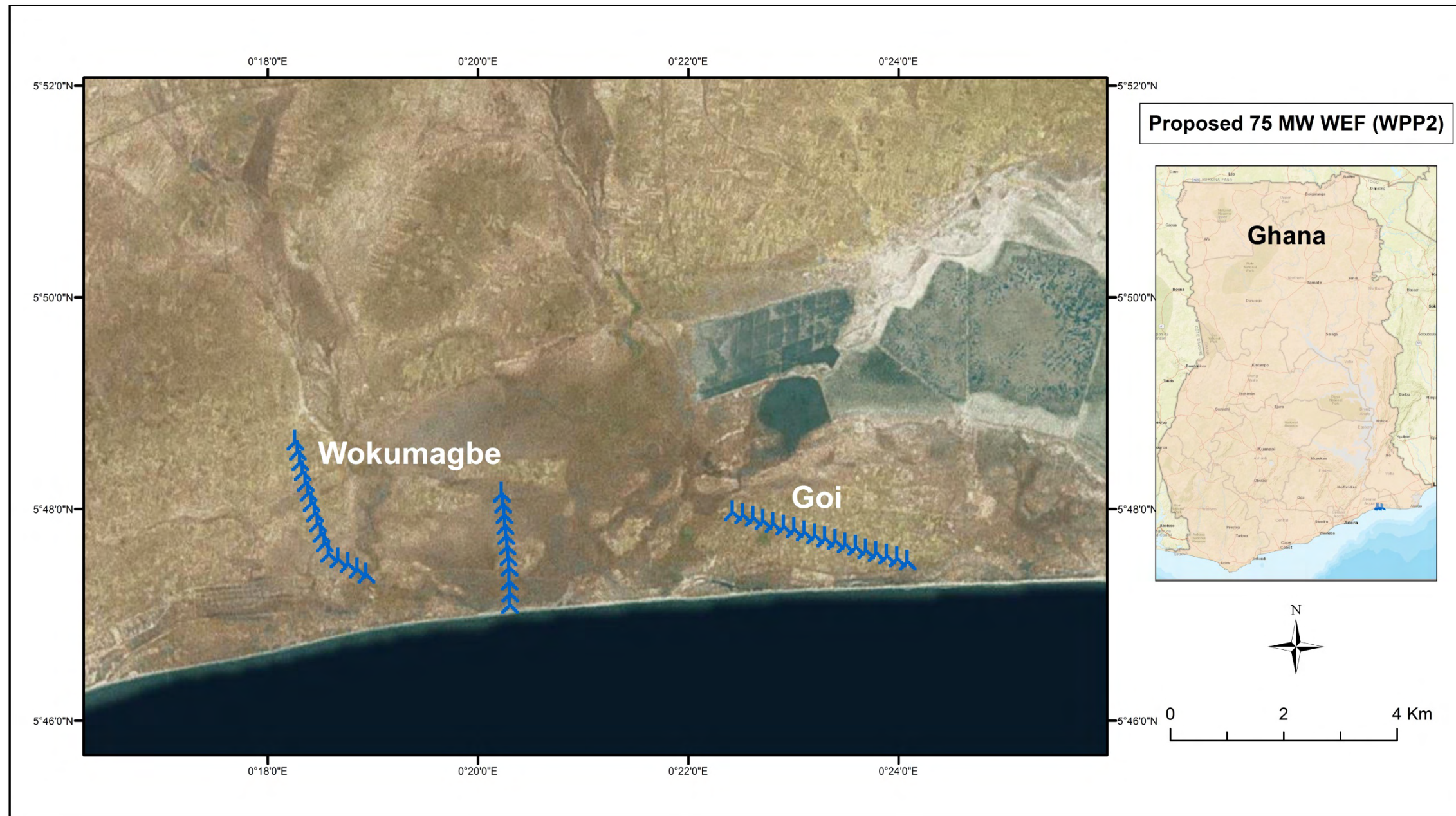


Figure 1-1: Locality Map for the Proposed Development of the 75 MW Wind Power Project 2 (WPP2) at Wokumagbe and Goi in the Ada West District, Ghana.

Based on VRA's capacity demand and supply balance (2013-2025), and in line with Ghana's power sector reform and major policy objectives, the country's current total installed generating capacity requires to be increased to 5175 MW by 2023 in order to address power shortages, to ensure an adequate supply of electricity, to meet the country's forecast growth in demand requirements and to improve the quality of service and reliability of the power system.

The projected shortfall in generation capacity is expected to be filled by both VRA and Independent Power Producer's (IPPs) who have both embarked on various activities to expand power supply and infrastructure. In this regard, VRA is focusing on a number of power expansion projects and new projects, designed to ensure electricity availability and accessibility in the short-to-medium term. These include renewable energy (wind, hydro and solar) and combined cycle power plants, as detailed below:

- Development of two wind projects with a total capacity of 150-200 MW;
- Development of 14 MW of solar energy;
- Commencement of feasibility studies for the development of 140 MW of hydro dams at Pwalugu and Juale in the Northern Region;
- Development of a 220MW Thermal Plant located at Kpone, near Tema, by close of 2016;
- Expansion of the existing VRA 110 MW single cycle Tema Thermal Power Plant (TT1PP) with that of 110 MW CENIT Power Plant (an Independent Power Producer) into a 330 MW combined cycle plant through a Joint Venture arrangement.

## **1.2. PROJECT MOTIVATION (INCLUDING NEED AND DESIRABILITY)**

Since 1999, Ghana has been increasingly dependent on imported fossil fuels to meet its overall energy requirements. All grid-supplied electricity is generated using a mix of hydro and imported fossil fuel. In the 90s, the increasing demand for electricity coupled with the effects of bad inflows of water for hydro generation had resulted in load shedding. To meet this increasing demand and mitigate the effects of poor inflows, 1231.50 MW of thermal generation capacity has been installed by close of 2013 with more under construction. Currently, 43.8% of electricity in Ghana is being generated from fossil fuels whilst 56.1% from large hydro power. Only 0.1% is generated from renewable sources, specifically solar power. Ongoing studies for the development of energy from solar and wind resources are being undertaken.

The increase in thermal generation capacity has led to an increasing exposure to the risk of fuel price escalations, fuel supply risks (in the case of pipeline gas), and an increase in carbon footprint. This has meant that the Ghanaian economy and electricity consumers have been exposed to high and volatile electricity prices linked to oil prices over the last ten years.

Between 2001 and 2004, the average price of crude oil increased by 60%, from around US\$25 per barrel to around US\$40 per barrel. In the next 4 years to 2008, the average price of crude more than doubled to a peak of around US\$100 per barrel. Late 2008, crude oil prices dropped and continued to fall until early 2009 averaging around US\$62 per barrel during 2009. From 2010 till 2013, annual average prices of crude oil ranged from between US\$ 71 to US\$ 89 per barrel. Gas and light crude oil prices tracked the price of crude oil and led to high electricity rates.

Crude oil/natural gas prices are expected to fluctuate over the years thus, developing electrical power facilities from renewable based projects will reduce Ghana's exposure to the fluctuating price of fuel,

decrease its carbon footprint and place the country as a leader in small-grid connected renewable solar generation.

In view of the limitations on national reserves of oil and gas besides the unpredictable flow of water to meet the energy demands, and in consideration of the urgent need to normalize the commercial, industrial and agricultural activities, it is considered essential to broaden the outlook on the energy mix. There is a need to increase the share of the renewable sources as alternative to crude oil and gas that presently form 49.3% of the source of fuel for the country's generating plants.

Within this context, the Government of Ghana (GoG) has launched an "energy economy" initiative with mandates to increase renewable energy production, with particular attention to electrification of rural communities by 2020. Rural areas cannot be covered only by grid extension but also by off-grid solutions. These underline the need for improved support policy, and for the private sector's involvement to foster sustainable and efficient energy generation. Subsequently, the GoG has formulated a Renewable Energy (RE) policy that projects that 10% of Ghana's electricity needs should come from RE by 2020.

To contribute towards this target and towards socio-economic and environmentally sustainable growth, and kick start and stimulate the renewable energy industry in Ghana, the Government passed an RE Law, Act 832 of 2011, to provide the necessary legal and regulatory framework to promote the provision of energy, including electricity from renewable sources. The object of this law is to promote the sustainable development and utilization of RE resources for electricity and heat generation. The goals of the renewable energy sub-sector are to increase the proportion of renewable energy in the total national energy mix and ensure its efficient production and use.

The support for this renewable energy policy is also 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 taken into account. The Ghana Renewable Energy Fund is to be created under the RE law to support renewable energy promotion, research and other activities. Besides, the fund will supply seed money for renewable energy companies, depending on how much will be demanded by the companies.

This law provides for a renewable energy purchase obligation for distribution companies and bulk customers as well as the integration of biofuel into petroleum so that those who produce biodiesel can have a market. It also provides for a feed-in tariff mechanism to encourage the adoption and use of renewable energy as well as creates a platform for the trading of renewable energy. An Executive Instrument was gazetted on November 12, 2014 by the Public Utilities Regulatory Commission (PURC) for the publication of feed-in-tariffs (FIT) for electricity generated from renewable energy sources in line with the electricity rate issuing guidelines. This is to ensure return on investment for independent power providers.

Against this background, a number of wind developers are already getting active in Ghana. The following projects are underway:

- a) A 140MW Amlakpo Wind Farm in Ada West District in the coastal region of Ghana about 80 - 85 km east of Accra. The Amlakpo Wind Farm will, once completely commissioned, have a

capacity of up to 140 MW and will supply around 300,000 MWh per year of clean, affordable and reliable electrical energy, which is produced locally, without need of any fuel or gas. It is scheduled that construction of the first phase of this project will commence in 2018.

- b) A 225MW Ayitepa Wind Farm in the Ningo-Prampram District, around 50 - 60 km east of Accra. The wind farm will be accompanied with two 20 MW solar parks, together forming the first *Hybrid Power Plant* in Africa. It is expected that the 225 MW wind project will be fully permitted in Q01/2016, so that financial close by [Lekela Power](#), who will construct and operate the wind farm and the solar parks, can be reached until mid-2016.
- c) A 100MW Koluedor Wind Farm in the coastal region of Ghana about 70 - 75 km east of Accra in the District of Ada West. The Koluedor Wind Farm will, once completely commissioned, have a capacity of up to 100 MW and will supply around 200,000 MWh of clean, affordable and reliable electrical energy per year, which is produced locally, without need of any fuel or gas. It is scheduled that construction of this project will commence in 2018.
- d) A 200MW Konikablo Wind Farm located in a very sparsely populated area in the Ningo-Prampram District, around 60 - 70 km east of Accra, between the Accra-Aflao-Road in the North and the Gulf of Guinea in the South. The Konikablo Wind Farm will, once completely commissioned, have a capacity of up to 200 MW and will supply more than 350,000 MWh of clean, affordable and reliable electrical energy per year, which is produced locally, without need of any fuel. It is scheduled that construction of the first phase of this project will commence in 2017.
- e) The 86MW Prampram Wind Farm project is located on the south coast of Ghana in the Ningo-Prampram District in the Greater Accra Region, about 30 km east of Accra. The Prampram Wind Farm will, once completely commissioned, supply up to 200,000 MWh of clean, affordable and reliable electrical energy per year, which is produced locally, without need of any fuel or gas. It is scheduled that construction of this project will commence in 2017.

The Volta River Authority (VRA), in line with the National Renewable Energy Law, has in-turn set a 5-10 years' Renewable Energy (RE) generation capacity target taking cognizance of the local and export demand and the system constraints. VRA's RE Development Programme Phase 1 (REDP1) aims at developing about 164 MW of installed renewable energy capacity and this program consists of three components, specifically (a) 150 MW Wind Power Phase 1 (b) 14 MW Solar Power Phase 1 and (c) Renewable Energy Planning & Development Integration.

There are several advantages of Wind Energy Facilities for Ghana:

- Respond to the national need to produce power from renewable energy sources that are alternative to thermal and hydro power production systems.
- Establish a wind power generation facility in accordance with Ghana's Renewable Energy (RE) Act, Act 832 of 2011.
- Utilize the potential of wind capacity identified by the VRA at the eastern corridor of the Ghana Coast and absorb the transferred technology of wind power generation to reduce the emission of Greenhouse gases including CO<sub>2</sub> in Ghana through net energy gain, and

- Utilize the hitherto unexploited wind energy potential which is the resource that will help bridging the gap in supply and demand of energy being faced in Ghana.

Additional information regarding the project contextualisation is provided in Chapters 2 and 5 of this Scoping Report.

### **1.3. REQUIREMENTS FOR AN ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT**

Under the provisions of the Ghana Environmental Assessment Regulations, 1999 (LI 1652), power generation and transmission projects are categorized under environmentally critical projects for which an Environmental Permit is required from the Environmental Protection Agency (EPA). It is an offence under Regulation 29 of the Environmental Assessment Regulations LI 1652 of 1999 to start a project without an Environmental Permit.

Section 2.3 of the Environmental Impact Assessment (EIA) Guidelines for the Energy Sector, Volume 1, dated August 2010, indicates that all wind farms exceeding 20 hectares or exceeding an installed capacity of 15MW falls into the category for which an EIA Study is required. The environmental assessment processes have been further outlined in the Volume 2 of the EIA Guidelines for the Energy Sector. It is therefore a legal requirement in Ghana that development projects such as “75 MW Wind Power Project 2 should be subjected to an ESIA.

Chapter 4 of this Scoping Report contains further details on the process to be followed in the ESIA phase. The purpose of the ESIA is to identify, assess and report on any potential impacts the proposed project, if implemented, may have on the receiving environment. The environmental assessment therefore needs to show the Competent Authority and the project proponent, VRA, what the potential impacts of the proposed activities in terms of impacts on the biophysical and socio-economic environment and how such impacts can be, as far as possible, enhanced or mitigated and managed as the case may be.

### **1.4. ESIA TEAM**

As previously noted, the SELJEN Consult Limited with CSIR South Africa, has been appointed by VRA to undertake the ESIA required for the proposed project. A public participation process (PPP) forms an integral part of the Environmental Assessment Process. SELJEN Consult Limited is undertaking the PPP for this ESIA. Details on the PPP are included in Chapter 5 of this Scoping Report.

The ESIA team which is involved in this Scoping and ESIA Process is listed in Table 1.2 below. This team includes a number of specialists which have either been involved to date, or are planned to provide inputs during the ESIA Process.



**Table 1-2: The ESIA Management Team**

NAME	ORGANISATION	ROLE/STUDY TO BE UNDERTAKEN
<b>Environmental Assessment Practitioners and Specialists</b>		
Kofi Gatu	ESIA Team Leader	<ul style="list-style-type: none"> <li>Design and implementation of social surveys as part of baseline study</li> <li>Sociologist for rapid socio-economic and environmental appraisal of project area</li> <li>Lead expert responsible for data collection and literature review of socio-economic data environment.</li> <li>Due diligence for quality project reporting</li> <li>Conduct of social impact assessment and as contribution to the ESIA</li> <li>Public Consultation</li> <li>Drafting Reports and Quality Assurance</li> </ul>
Paul Andrew Lochner	ESIA Specialist	<ul style="list-style-type: none"> <li>Environmental Management Expert / ESIA Specialist</li> <li>Execution of contract</li> <li>Develop project Background Information Document for distribution to stakeholders as part of the public consultation exercise</li> <li>Supervision and coordination for effective implementation of project activities</li> <li>Due diligence for quality project reporting</li> <li>Overall management of the wind power project</li> <li>Review and assure timely compilation and submission of all reports.</li> <li>Coordinate preparation of project Environmental Scoping as well as Detailed ESIA reports with support from his team</li> </ul>
Dr. James Kojo Adomako	Terrestrial Ecologist	<ul style="list-style-type: none"> <li>Responsible for supervision of data collection and literature review of biological environment</li> <li>Identify floral species in the area of environmental influences of the project</li> <li>Draw up a list of floral and faunal species in the study area and identifies environmental impacts.</li> <li>Lead in the preparation of the “Ecological Survey &amp; Habitat Assessment Study” Report.</li> </ul>
Dr. Erasmus Owusu	Ornithologist	<ul style="list-style-type: none"> <li>Undertake Birds Impact Assessment</li> <li>Rapid appraisal of avifaunal, including bats, in the project area to identify impact on these,</li> <li>Provide inputs in the preparation of the “Ecological Survey &amp; Habitat Assessment Study” Report.</li> </ul>
Dr. Wazi Apoh	Heritage Impact Assessment Specialist	<ul style="list-style-type: none"> <li>Assess the terrain to identify and map out prehistoric, Iron Age and historic archaeological and other heritage sites</li> <li>Conduct interviews and collect relevant oral accounts, including migration and settlement histories of descendant communities in the project areas</li> <li>Measure, describe and record vital ethnographic objects and surface archaeological materials in project areas</li> <li>Undertake video and photographic documentation of sites, objects, landscape, the built environment, craft production processes, sacred ceremonies, and other tangible lifeways in the project areas</li> <li>Lead in the preparation of the “Historical Resources &amp; Cultural Heritage Assessment Study” Report.</li> </ul>
Emmanuel Hayford	Aviation & Communication Impact Assessment	<ul style="list-style-type: none"> <li>Generate graphical overlays to determine proximity to key installations</li> <li>Undertake aeronautical study regarding the wind turbines and effects on safety of air navigation</li> </ul>

NAME	ORGANISATION	ROLE/STUDY TO BE UNDERTAKEN
		<ul style="list-style-type: none"> <li>Prepare “Aviation &amp; Communication Impact Analysis Study Report”</li> </ul>
Charles Amankwah	Wetland Impact Assessment Specialist	<ul style="list-style-type: none"> <li>Assist in the desktop aquatic biodiversity assessment of the study area.</li> <li>Provide inputs in the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of any ecological sensitive areas</li> <li>Recommend buffer zones and No-go areas around any delineated aquatic areas based on the relevant legislation or best practice</li> <li>Provide quality assurance in the wetlands impact assessment migratory measures development.</li> </ul>
Alex Whitehead	Wetland Impact Assessment Specialist	<ul style="list-style-type: none"> <li>Assist in the desktop aquatic biodiversity assessment of the study area.</li> <li>Provide inputs in the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of any ecological sensitive areas</li> <li>Recommend buffer zones and No-go areas around any delineated aquatic areas based on the relevant legislation or best practice</li> <li>Provide quality assurance in the wetlands impact assessment migratory measures development.</li> </ul>
Frank Cudjoe	Property Valuation Expert	<ul style="list-style-type: none"> <li>Valuation Expert responsible for valuation of all properties</li> <li>Partake in public education/stakeholder consultations.</li> <li>Lead in the preparation of the “Compensation Action Plan” Report.</li> </ul>
Scott Mason	Visual Impact Assessment	<ul style="list-style-type: none"> <li>Coordinate the preparation of the “Landscape and Visual Impact Assessment Report”</li> </ul>
Nicolette von Reiche	Noise and Flicker Impact Assessment	<ul style="list-style-type: none"> <li>Baseline ambient noise study</li> <li>Undertake noise impact evaluation</li> <li>Undertake noise dispersion model and develop a Noise Monitoring Programme.</li> <li>Shadow Flicker Modelling</li> </ul>
Annick Walsdorff	Physical Studies coordinator	<ul style="list-style-type: none"> <li>Assist the CSIR Team leader in coordinating the preparation of project Environmental Scoping as well as detailed ESIA reports.</li> <li>Environmental Management Expert</li> <li>ESIA Specialist</li> <li>Provide quality assurance in the preparation of project Environmental Scoping as well as detailed ESIA Reports.</li> </ul>
Lydia Cape	Physical Studies coordinator	<ul style="list-style-type: none"> <li>Assist the CSIR Team leader in coordinating the preparation of project Environmental Scoping as well as detailed ESIA reports.</li> <li>Environmental Management Expert</li> <li>ESIA Specialist</li> <li>Provide quality assurance in the preparation of project Environmental Scoping as well as detailed ESIA Reports.</li> </ul>
Abulele Adams	Project Manager	<ul style="list-style-type: none"> <li>Environmental Assessment Practitioner (Project Manager)</li> </ul>

## 1.5. DETAILS AND EXPERTISE OF THE EAP

### **SELJEN CONSULT (SC):**

SELJEN Consult (SC): is an Environmental Management Consultancy firm which was formed between 1997 and 1998 but was formerly registered on July 28, 2003. The main objective of SELJEN Consult is to offer Environmental Management Consultancy services in Social and Environmental Impact Assessment,

Environmental Management Plan, Preliminary Environmental Report, Annual Reports, and De-Commission Plans among others.

SELJEN Consult has conducted Environmental Impact Assessments and Strategic Environmental Assessments for a number of organizations and companies which have had to comply with the Environmental Regulations and the World Bank requirements including facilitating the processes of acquiring statutory permits for their proposed undertakings such as Environmental Protection Agency permits and certificates.

Since 1998 SELJEN Consult and its Associates have been contracted as Environmental Consultants by many National and International Companies and Bodies and have been responsible for obtaining the relevant environmental clearance, approval and permits for their projects Nation-wide. SELJEN Consult has gained considerable experience in the preparation of Environmental Impact Assessment and Environmental Management Plans in a wide range of infrastructural development, housing, industrial activities such as Real Estate development, fuel stations construction and solid and liquid waste management, Mining, Tank Farm Construction etc. Among our cherished clients are The World Bank, International Finance Corporation, GRIDCo, DANIDA Private Sector Development Programme, Volta River Authority, PW Ghana Ltd, Ghana Oil Company Limited, Ghana Telecom Ltd, Reime Ghana Ltd, Tema Oil Refinery, FMC Technologies, West Africa Power Pool, USTDA-Funded Feasibility Studies and Rom Int Ltd among others.

#### **CSIR:**

Over the past 30 years the CSIR has been involved in a multitude of projects across Africa and South Africa, with experience in 32 sub-Saharan African and Indian Ocean Island countries. The Environmental Management Services (EMS) group within the CSIR has been involved in the management and execution of numerous environmental assessment and management studies in more than 15 countries in Africa, as well as the Middle East, South America and Russia. These studies have included both public and private sector clients. Consequently, the CSIR EMS team offers a wealth of experience and appreciation of the environmental and social priorities and national policies and regulations in South Africa.

The CSIR's consulting expertise in environmental assessment and management is housed within the Environmental Management Services (EMS) business unit. This group has over 20 years' experience in environmental management practices and research methodologies, as well as in conducting environmental assessment and management studies in more than 17 countries in Africa, in particular in southern and West Africa, and elsewhere in the world.

## **1.6. OBJECTIVES OF THE SCOPING REPORT**

The Scoping Phase of the ESIA refers to the process of determining the spatial and temporal boundaries for the ESIA. In broad terms, the objectives of the Scoping Process:

- Confirm the process to be followed and opportunities for stakeholder engagement;
- Clarify the project scope to be covered;
- Identify and confirm the preferred activity;
- Identify and confirm the preferred site for the preferred activity;
- Identify the key issues to be addressed in the impact assessment phase and the approach to be followed in addressing these issues; and

- Confirm the level of assessment to be undertaken during the impact assessment

This is achieved through parallel initiatives of consulting with:

- The lead authorities involved in the decision-making for this ESIA application;
- The public to ensure that local issues are well understood; and
- The ESIA specialist team to ensure that technical issues are identified.

The Scoping Process is supported by a review of relevant background literature on the local area. Through this comprehensive process, the environmental and social impact assessment can identify and focus on key issues. The primary objective of the Scoping Report is to present key stakeholders (including affected organs of state) with an overview of the project and key issues that require assessment in the ESIA Phase and allow the opportunity for the identification of additional issues that may require assessment.

Issues raised in response to the review of the Scoping Report (currently being released for a 60-day comment period) will again be captured in an Issues and Responses Trail and will be included in the Plan of Study for ESIA and the Draft ESIA Report, which will be submitted to the EPA for decision-making (i.e. approval to continue to ESIA phase or rejection) in line with provisions of the Ghana Environmental Assessment Regulations, 1999 (LI 1652).

As part of the Scoping and ESIA phase, the following content will be submitted to the EPA for decision making:

**Table 1-3: Structure & Content of Scoping Report for the proposed 75 MW WPP2**

Content contained in the Scoping Report to be submitted to EPA	Location in this Scoping Report
An Introduction which analysis the need for the undertaking	Chapter 1
A description of the undertaking	Chapter 2
An identification of existing environmental conditions including social, economic and other aspects of major environmental concern	Chapter 3
An indication whether any area outside Ghana is likely to be affected by the activities of the undertaking	
Approach to the ESIA Process including the legal context and Public participation	Chapter 4
Consultation with members of the public likely to be affected by the operations of the undertaking	Chapter 5
Alternatives to the undertaking including alternative situations where the undertaking is not proceeded with;	Chapter 6
Matters on site selection including a statement of the reasons for the choice of the proposed site and whether any other alternative site was considered	
Information on potential, positive and negative impacts of the proposed undertaking from the environmental, social, economic and cultural aspect in relation to the different phases of development of the undertaking	Chapter 7
The potential impact on the health of people	
Proposals to mitigate any potential negative socio-economic, cultural and public health impacts on the environment	
Proposals for payment of compensation for possible damage to land or property arising from the operation of the undertaking; and	Chapter 8
Proposals to be developed to monitor predictable environmental impact and proposed mitigating measures	

Content contained in the Scoping Report to be submitted to EPA	Location in this Scoping Report
Contingency plans existing or to be evolved to address any unpredicted negative environmental impact and proposed mitigating measures	
A Provisional Environmental Management Programme (EMPr)	Chapter 9
Reference List	Chapter 10
Maps, plans, tables, graphs, diagrams and other illustrative material that will assist with comprehension of the contents of the environmental impact statement	Chapter 1, Chapter 2, Chapter 3, Chapter 4, Chapter 5, Chapter 6, Chapter 7, Chapter 8,
Appendices	



Environmental Impact Assessment  
for 75MW Wind Power Project 2,  
situated at Wokumagbe and Goi  
in the Ada West District of the  
Greater Accra Region

# CHAPTER 2: Project Description

# SCOPING REPORT

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## 2 PROJECT DESCRIPTION

This chapter provides an overview of the conceptual project design and an overview of the site and technology selection process for the proposed Wind Energy Facility. The purpose of this chapter is to present sufficient project information to inform the ESIA Process in terms of design parameters applicable to the project. It is important to note that the project description details are preliminary at this stage and it is likely that some of the details presented herein may change during the detailed design phase and upon further investigations (including the findings and input of the specialist studies conducted during the EIA Phase of the proposed project).

### 2.1 PROJECT SITE LOCATION

The proposed 75 MW Wind Power Project 2 is located within the Wokumagbe and Goi communities in the Ada West District of the Greater Accra Region. The geographical coordinates for the proposed layout of the 3 Wind Energy Facilities are provided in Table 2.1 and Figure 2.1. WPP2 will cover an area of approximately 193.31 ha (refer to Table 2.2). VRA is in the process of acquiring and reaching land agreements with the relevant landowners to enable the development and operation of the proposed Wind Energy Facilities.

**Table 2-1: Geographical Coordinates for WPP2**

Site	Coordinates
Goi	5° 48' 02.35"N / 0° 22' 23.26"E 5° 47' 56.31"N / 0° 22' 20.24"E 5° 47' 32.96"N / 0° 24' 09.40"E 5° 47' 28.83"N / 0° 24' 07.82"E
Wokumagbe 1	5° 48' 12.48"N / 0° 20' 16.22"E 5° 48' 11.02"N / 0° 20' 09.46"E 5° 47' 05.88"N / 0° 20' 20.53"E 5° 47' 04.76"N / 0° 20' 14.72"E
Wokumagbe 2	5° 47' 24.20"N / 0° 19' 01.30"E 5° 47' 19.57"N / 0° 18' 56.32"E 5° 48' 42.75"N / 0° 18' 13.30"E 5° 47' 34.07"N / 0° 18' 31.21"E 5° 48' 42.75"N / 0° 18' 17.61"E 5° 48' 42.04"N / 0° 18' 13.30"E

**Table 2-2: Land Requirements for WPP2**

Site	Land Required	
Wokumagbe 1	2.153km x 0.2km 0.879km x 0.2km	60.64 Ha
Wokumagbe 2	2.083km x 0.2km	41.66 Ha
Internal Grid	3.555km x 0.06km	21.33Ha
Substation	0.2km x 0.1km	2Ha
Goi	3.384km x 0.2km	67.68 Ha
<b>Total</b>		<b>193.31 Ha</b>



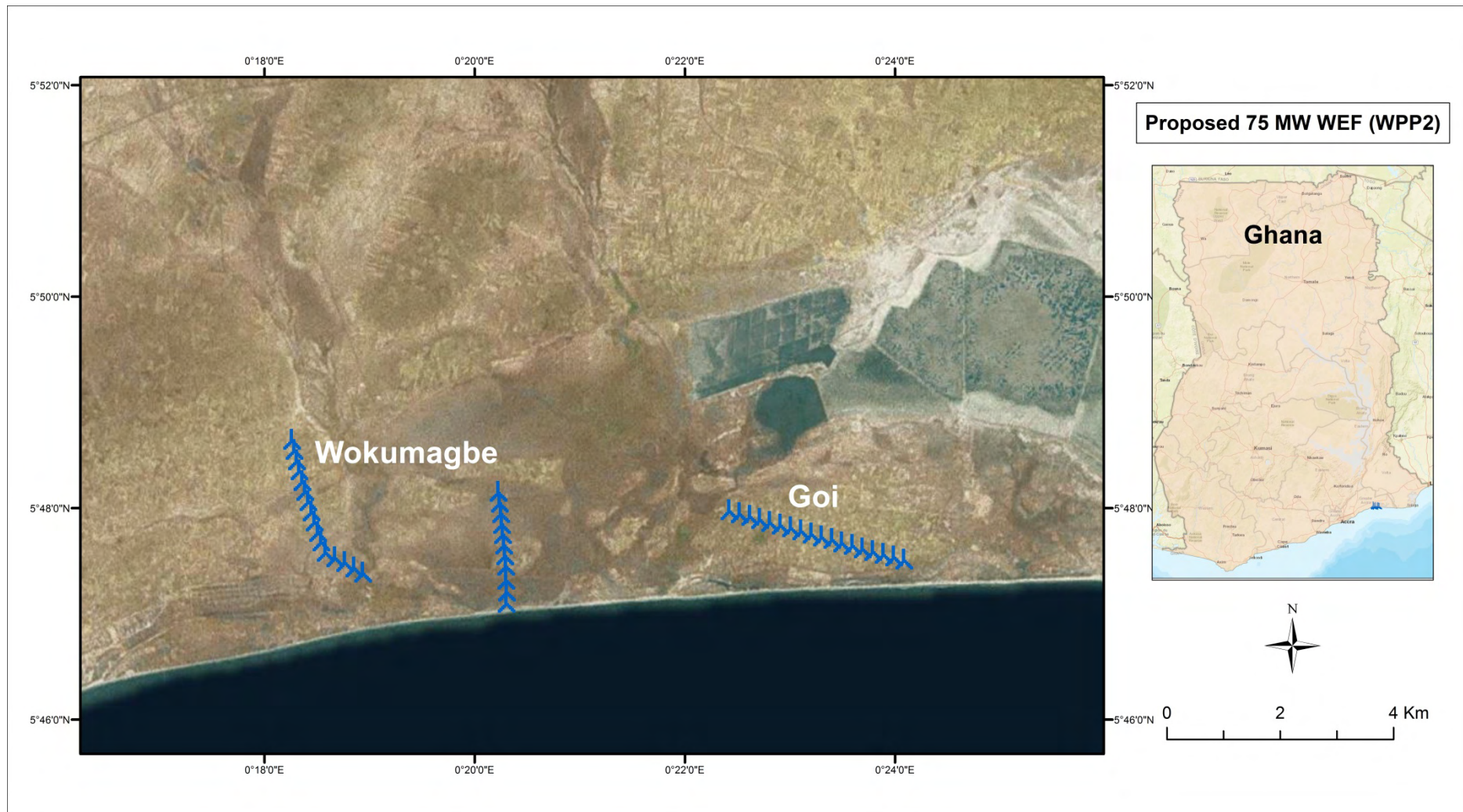


Figure 2-1: Locality Map for the Proposed Development of 75 MW Wind Power Project 2 at Wokumagbe and Goi (WPP2) in the Ada West District, Ghana.



## 2.2 KEY COMPONENTS OF A WIND ENERGY FACILITY

The key components of the proposed wind power project (WPP2) are briefly described in sections below.

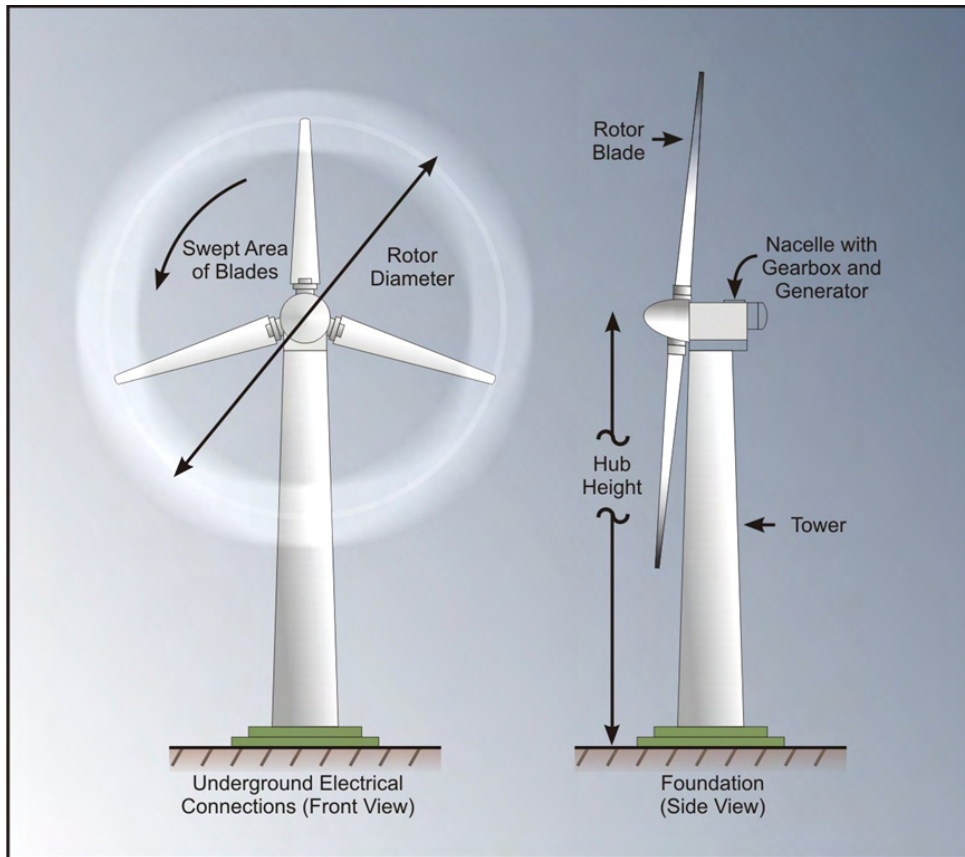
### 2.2.1 *Wind turbines and associated infrastructures*

Wind turbines generate electricity by converting movement or kinetic energy produced by the wind into electricity. A typical horizontal-axis wind turbine consists of a number of components, which work together to generate electricity as depicted in Figure 2.2 below. In conventional/g geared wind turbines the kinetic energy of the wind rotates the rotor blades of the wind turbine around a horizontal hub, which is connected to a shaft, gearbox and generator located in the nacelle (turbine housing). External rotor blades rotate the low speed shaft situated inside the hub, at a speed of about 7 - 19 rpm, and in doing so the low speed shaft turns the gearbox. Direct drive turbines however do not use a gearbox, and as a result their alternators are able to generate electricity at a low speed by making use of a larger stator/rotor diameter when compared to conventional/g geared wind turbines.

Due to the small alternator size in comparison to the external rotor blades in geared wind turbine systems, the gearbox turns at a much faster speed than the external rotor blades. The gearbox is in turn connected to the high speed shaft which turns at a speed of about 1000 – 1800 rpm. This high speed shaft is connected to an electrical generator at its other end, which is an assembly of permanent magnets that surrounds a coil of wire. When the rotor spins the shaft, the shaft spins the assembly of magnets, which generate voltage in the coil of wire. This voltage provides alternating electrical current which can then be distributed through power lines. The wind turbine tower supports the rotor and nacelle and provides the height for the rotor blades to clear the ground safely, and to capitalise on atmospheric wind resources which occur approximately 100 m above the earth's surface.

The energy output of a wind turbine ultimately depends on the velocity of the wind, the height of the hub, and the length of the rotor blades. The turbines envisaged for the proposed Wind Energy Facility will have an installed power generation capacity of 1.7 MW.

Wind turbines can operate at a range of wind speeds but are designed to deliver peak efficiency at a specific wind speed. Turbine manufacturers therefore provide power curves that show how output varies with wind speed. Turbines have a start-up speed, which is the speed at which the blades and rotor start to rotate, and a cut-in speed, which reflects the minimum wind speed at which usable power is generated. This is typically about 3 - 4 m/s with full power output occurring at higher wind speeds of approximately 10 to 12 m/s. The rated speed is the minimum wind speed at which the turbine delivers peak efficiency to generate its designated rated power. The rated speed of the 3.3 MW turbines is approximately 10 to 12 m/s. Power output from a wind turbine increases as the wind increases, and usually levels off above the rated speed. This is the furling speed, which is the amount of wind required to produce the maximum power that a turbine is capable of generating; any wind in excess of that speed will not generate more than this maximum power generation capacity. Wind turbines are also equipped with a cut-out speed as a safety feature to prevent mechanical damage. The cut-out speed is therefore the highest wind speed at which a wind turbine will stop producing power. This is typically between 25 and 28 m/s depending on the manufacturer and type of turbine selected for implementation. Once the wind drops below the cut-out speed back to a safe level, the turbine can resume normal operation.



**Figure 2-2: Generic design for a horizontal axis wind turbine (Source: Encyclopaedia of Renewable Energy and Sustainable Living)**

### **Turbine technology**

The implementation of the proposed project will result in the establishment of 45 individual wind turbines with an approximate generation capacity of between 1.7 MW each for the proposed sites. At this stage of the project planning, the turbine technology has been selected by VRA. The preferred technology provider will be General Electric. The GE 1.7 is a WTG following one of the main concepts in wind industry, based on the initial simple “Danish” type of the 1980s, featuring a three bladed, upwind positioned, horizontal-axis rotor and using a distributed drive train design with the major drive train components (main shaft, bearings, gearbox, generator) as also auxiliary components (yaw drives and control panel) attached to a bedplate.

### **Hard Standing Areas**

A hard standing area of up to 45 m x 25 m will be established next to each wind turbine. These hard standing areas will be utilised by cranes during the construction (and also possible maintenance) processes. Hard standing areas will be maintained and utilised for maintenance works during the operational phase. In the event that the turbine technology selected for implementation does not incorporate transformers into the turbine tower or nacelle, each wind turbine may also require that a transformer of up to 5 m x 5 m be installed within the hard standing area.

A number of additional laydown areas of approximately 150 m x 60 m will be required during the construction phase. These areas will be compacted and levelled to be used as blade lay down areas and for the initial storage of wind turbine components. These laydown areas will also accommodate cranes

required for tower/turbine assembly. Foundations would comprise a 17 m diameter reinforced concrete slab buried at a depth of approximately 1.8 m. Topsoil and vegetation will be stripped for construction of the foundations, stored and reinstated once Wind Turbine Generator (WTG) construction is completed. Material won from foundation excavations will, if suitable, be utilised in the construction of site infrastructure. For the construction of the WTG foundations and for further civil works (O&M and administration building, sub-station foundations and building, etc.) big quantities (>500m<sup>3</sup> per foundation) of high quality concrete are needed. Quality management according to international standards - such as for instance EUROCODE - is strongly recommended to avoid doubts on the quality of the concrete during installation. It has to be expected that any international turbine supplier will also insist on such quality procedures for the production and use of concrete at the wind farm site.

### 2.2.2 Substation

The electricity generated at the proposed Wind Power Project 2 will be evacuated via a newly constructed substation onsite and will be connected to the grid via a new 40 km dedicated High Voltage transmission line to the existing grid. The new 161/33 kV substation is will be constructed in the north-west area of the Wokumagbe. For the transmission of the maximum wind farm capacity of 74.25 MW in principle a single transformer could be used. However, in order to increase the reliability of wind farm operation and to allow maintenance on the transformer, a two transformer setup is more plausible. So two 50 MVA Oil Natural Air Forced (ONAF) 161/33 kV power transformers, operating in parallel, are considered for stepping up the internal wind farm voltage to the external voltage of 161 kV. The main reason for using two transformers in parallel operation, for this case, is to increase the reliability of the system. In case a fault occurs in one of the transformers, the other transformer will continue with the transmission of the power. Under the dominating wind conditions (at wind speeds below 13 m/s the wind farm will not reach its rated power), one transformer might even be able to transmit all the power generated by the wind farm. Additionally, the costs related to maintenance and spare parts are typically lower for smaller transformers than for a single bigger transformer of equivalent capacity.

The proposed wind farm substation will be a gas insulated substation (GIS) indoor substation foreseen to be located almost at the middle part of the wind farm. Compared to an air-insulated system the proposed gas-insulation is resulting in higher costs, but is giving also higher reliability. Considering that the wind farm substation is located quite close to the sea, the air at the site will be salty and requires to be taken into account suitably for the substation design. However, again the GIS layout is just a preliminary assumption and may be modified in the further planning of the wind farm.

The substation will include the following main components:

- a. Power Transformers
- b. High voltage switchgear
- c. Medium voltage switchgear
- d. Low voltage equipment
- e. Metering / Protection system
- f. Auxiliary systems
- g. SCADA / communication systems

The high and medium voltage equipment will be installed in separate areas / rooms with lockable doors. A suitable air ventilation system with the option for dust filters, pressure discharge openings and waterproof cable inlets to avoid problems with insects and small animals shall be installed in the station. For grounding issues, all metal parts, steel structures, doors and the reinforcement of the concrete will be connected by copper cables. The final design and layout shall comply with common engineering practice and the latest edition of the relevant IEC Standards or Ghanaian standards as applicable.

The position of the substation will be informed by the final micro-siting/positioning of the wind turbines. Currently, this new substation is preliminary assumed to be constructed in the centre section of the wind farm. The final design and layout shall comply with common engineering practice and the latest edition of the relevant IEC Standards or Ghanaian standards as applicable.

The proposed substation would be constructed in the following simplified sequence:

- Step 1: Survey of the site
- Step 2: Site clearing and levelling, and construction of access road/s to substation site (where required)
- Step 3: Construction of terrace and foundations
- Step 4: Assembly, erection and installation of equipment (including transformers)
- Step 5: Connection of conductors to equipment
- Step 6: Rehabilitation of any disturbed areas and protection of erosion sensitive areas.

#### **Auxiliary Power Supply**

One of the necessary components in the HV/MV substation is the auxiliary power supply station. The auxiliary power supply should be rated 400/230 V. It will be supplied via auxiliary transformers and a backup uninterruptible power source (UPS) via batteries or eventually an additional emergency diesel generator may be included as alternative supply. The auxiliary power supply equipment will provide power to the control system, protection system, SCADA system, station illuminating system, socket outlets and other consumers situated in the station.

#### **Telecommunication and SCADA**

As a standard today, wind farms are equipped with SCADA systems for the continuous supervision of the operation. Typically, they consist of 2 systems, which are frequently interconnected. One system is dedicated to the WTGs (related to all operational data of the WTGs) and the other to the substation (related to all relevant data for the operation of the substation and for the grid dispatch). An interconnection between both systems can be realized by standard protocols (for example according to IEC 60870-5-101 and via OPC) with the substation SCADA being at higher hierarchical level.

Via this interconnection the grid dispatch can have access to WTG related data, which may be of interest for the grid operation (like wind speed or availability/faults of WTGs). The substation SCADA system will connect all installed main components in the substation in order to ensure proper communication and monitoring of these components. These components are in particular the main transformers, protection and switches on the HV side and metering systems.

The system for the surveillance and control of the wind farm and its components is normally supplied by the WTG manufacturer and its functionality is varying a bit from one manufacturer to the other. Within the wind farm the necessary data connections are today usually done via optical fiber (F/O) cables between all

the turbines and up to the substation and control building. A central computer SCADA system shall be installed in the substation building.

The necessary cables can run in the wind farm in parallel to the underground power cabling in the same trenches. When parts of the MV grid are realised by overhead lines, also adequate F/O cables can be put on the same masts. For the data communication to the external grid and to the national dispatch center of GRIDCo, as well as to a central control room from VRA, it needs to be defined in a later stage of project development, if this can be done by power-line communication (PLC) over the external HV transmission-line to the existing grid or via OPGW (optical ground wire) on this line or as last alternative via radio frequency/GSM or satellite transmissions.

The choice of telecom type, depends on the availability of the necessary infrastructure on the existing grids and further strategic decision by VRA and GRIDCo. Anyway it has no impact on the general feasibility of the project and also the impact on costs of the wind farm construction (CAPEX) and operation (OPEX) is of a minor nature. In many cases, even two different channels (for example via PLC and as back-up by radio frequency) are being used for getting maximum reliability of the communication system.

As mentioned above, the wind turbine SCADA system can be integrated in the system of the grid operator. More detailed real-time information, including for example the positions of the main switches in each WTG as well as metering data can be remotely read out and automatically forwarded to the grid operator's system. It must, however, be agreed with the grid operator what protocols to use and what data to transmit. All this must be discussed and designed in the detailed planning phase of the wind farm, normally within the scope of the EPC Contractor(s).

### **2.2.3 Grid Connection**

As the wind farm is an electricity generation facility, its connection to consumers is essential for providing its function. Although no detailed grid study (load-flow, voltage and frequency management, etc.) has been done, it is obvious that with a distance to the Ghanaian load centre in Accra of around 60-100 km, the transport of the electricity to the customers is possible. The electricity generated at the proposed Wind Power Project 2 will be evacuated via a newly constructed substation onsite and will be connected to the grid via a new dedicated 161 kv transmission line to the existing grid at the Tema substation, which is located approximately 40 km southwest from the wind farm site.

### **2.2.4 Access road**

Access to the proposed WPP2 Wind Energy Facilities will be obtained via some number gravel roads. A gravel surface road will be required from the nearest public road onto the site and an internal site road network will also be required to provide access to each of the individual turbine locations. For this purpose, existing roads and access tracks will be made use of as far as possible.

During construction the majority of internal access roads will need to be up to 6 m wide, however, in some limited locations, they may need to be up to 9 m wide. Civil design studies have indicated that this additional width is required where internal access roads turn a corner. This is necessary to allow for the safe movement of vehicles on site during the construction process. By increasing the width of the road on



corners damage to storm drains and road-side vegetation is avoided and health and safety risks are reduced.

During operation the internal access roads can be reduced to 3 – 4 m in width. The layout of the internal road network will only be finalised once the final turbine layout has been confirmed. This will be informed by the findings of the EIA as well as the botany and heritage specialist studies. Routing will occur in such a way to minimize the number of watercourse crossings as far as possible.

### **2.3 PRELIMINARY SITE LAYOUT**

The selected layout designed by Lahmeyer International GmbH, 2015, intends to optimize the siting for maximum yield, minimum load and harm for the WTG and minimum disturbance to residence, environment and visual intrusion.

Figure 2.1 above indicates the preliminary location of the proposed wind turbines. This preliminary layout is iterative in nature and has already undergone a number of revisions to date. The layout presented in this Scoping Report therefore represents an updated layout from that which was contained in the feasibility studies. Due to its iterative nature, the site layout will continue to evolve throughout the remainder of the EIA process and subsequent detailed project design and planning processes as additional information becomes available. Furthermore, it is expected that following the completion of the EIA process, during the detail design phase and upon completion of additional technical studies (e.g. geotechnical investigations), additional changes to the site layout will occur.

The site layout plan is dependent on a number of environmental and technical factors and will be largely influenced by both the findings of the independent specialist studies to be completed during the Impact Assessment phase of ESIA, and the turbine technology selected for implementation. There are various factors which may influence the placement of wind turbines within a wind energy facility. Different turbine suppliers and turbine technologies have differing requirements with regards to the placement of wind turbines. For example, the tower height and rotor blade length associated with different turbine models may impact on the separation distances required between individual turbines. While some turbine suppliers may provide taller turbines these would require greater separation distances between individual turbines. Separation distances therefore have the ability to influence the location, spacing and overall number of individual wind turbines which may be implemented, thus impacting on the overall project layout. The separation distances required between individual wind turbines would therefore be dependent on the final turbine technology selected for implementation, and this would have an impact on the total number of turbines which may “fit” within a particular development area.

Similarly, the generation capacity of different wind turbines has an influence on the total number of turbines which may be installed. For WPP2, VRA has selected the use of 45 General Electric GE1.7-103 each with 1.7 MW and on a hub height of 80 m above ground level. The high number of turbines and the relatively small areas has resulted in splitting the turbines into the three sub sites.

The routing of onsite infrastructure such as roads and electrical reticulation would also be ultimately dependent on the final turbine placement, and as such this infrastructure has been omitted from the provisional site layout. The proposed layout provided in this Scoping Report is therefore only indicative for the purposes of the Scoping and ESIA process.

The independent specialist studies to be completed as part of the Environmental and Social Impact Assessment phase will therefore assess the total number of turbines proposed, while the findings and recommendations provided by the specialist studies may influence the final project layout through a reduction in the number of turbines or modifications in the micro siting of the turbines.

A final site layout plan depicting the location of the individual turbines and associated infrastructure will be developed during the micro-siting process, and this would need to be approved by the relevant authorities prior to any construction commencing on site.

## 2.4 OVERVIEW OF THE WPP2 DEVELOPMENT CYCLE

Various aspects of the planning and design phase of the WPP2 still need to be finalised pending the result of the ESIA. Most notably, the micro-siting of each individual turbine needs to be determined as well as the subsequent routes of the proposed access roads and servitudes. The following activities have/will need to be undertaken in the various phases of the proposed project.

### 2.4.1 *Pre-construction phase*

#### **Wind Resources Measurement**

Several preliminary project activities have already been carried out. Having identified the most feasible locations based on national data, one of the first priorities of the VRA was to undertake wind measurements to assess the wind resource and determine its economic viability. Subsequently, VRA in December 2013, commenced a qualitative high level wind measurement at the eight sites in Ghana. The measurement campaign was carried out under Barlovento Company supervision, following MEASNET [13] standard and indications.

Under this project, the wind measurement systems studied consisted of two-time series of about one year collected by two measurement systems named Met System Lekpogonu for the Wokumagbe site and Met system Akplabanya for the Goi site. Both masts are 80 m height and equipped with 4 anemometers and 2 wind vanes. Table 2 3.



**Table 2-3: Mast Specifications for Wind Measurements (Source: Source: Draft Feasibility Study for Wokumagbe and Goi, August 2015)**

Mast Name	Lekpogonu	Akplabanya
Mast Type	Lattice	Lattice
Mast height (m)	80m	80m
Projection	UTM	UTM
Reference Ellipsoid	WGS84	WGS84
Zone	31N	31N
E / Longitude	0204 847	0211 339
W / Longitude	0640 693	0641 190
Z a.s.l [m]	3	8
Reference of directions in Logger and Installation Report	Magnetic / True	Magnetic / True
Duration of Measurement Campaign for feasibility study	Nov. 06, 2013 to November 3, 2013	Oct. 13, 2013 to December 1, 2013
Model	CR 3000	CR 3000
Manufacturer	Campbell Scien	Campbell Scien
Serial Number	7106	7107
Firmware	LoggerNet	LoggerNet
Time Zone Offset	UTC + 0 hours	UTC + 0 hours
Sampling Interval	1s	1s
Averaging Interval	10 min	10 min

### Technical & Economic Feasibility Studies

The feasibility studies undertaken for the proposed sites (Lahmeyer International GmbH, 2015) will assist the VRA in defining the requirements for the project for the necessary funding and for EPC Contracting. Lahmeyer International GmbH of Germany is therefore also responsible for providing architectural and engineering services for the works. Site survey and relevant maps and initial drawings for the project are to be developed by Lahmeyer. The schematic drawings are to be endorsed and finalised by the Contractor for approval by the relevant agencies prior to commencement of constructional activities.

### Route Survey Study

In addition, a route survey has been undertaken by Laso Transportes of Portugal to evaluate access to the project sites from the Tema harbor, where the equipment for the wind power projects are expected to be delivered in Ghana and transported to the project sites. Reports on this assignment, dated March 2015 are also available.

### Geotechnical Survey

The ground and soil conditions at the project site have not yet been analysed. However, the first visual impression of the sites shows in general stable grounds and for the overall feasibility of executing the civil works at the site no major obstacles are seen. A geotechnical survey inclusive drillings at each Wind Turbine Generator location is necessary to determine details of foundations, roads, crane pads, etc. However, in the current feasibility stage of the project, flat foundations are assumed to be acceptable for buoyancy conditions; additional costs for pile foundations will then be proposed to be included in contingencies.

### **Land Acquisition/Compensation Issues**

The project requires the acquisition of land for the development of the wind power projects in the various areas. For the project under study, a total of 193.31 Hectares land is required for the 3 identified subsites and associated overhead internal grid connection as indicated in Table 2.3 above. There is therefore the need to consult with project-affected persons (PAPs) in a meaningful manner, and to provide opportunity for their participation in the planning and execution of resettlement programs. In view of this, VRA has considered involuntary compensation as an integral part of the project design, and subsequently it is planned to deal with resettlement issues from the earliest stages of the project preparation.

VRA therefore intends to develop and implement a “Compensation Action Plan Report” for the project. Consultations are now ongoing with identified affected persons to obtain information on affected individual and community properties, and compensation packages that may be required for the acquisition of the land and any impacts due to the project. The land acquisition procedures are therefore to be carried out in accordance with national regulations.

### **Acquisition of Approvals**

VRA obtained a Provisional License, dated 27 July 2015, from the Energy Commission to allow the company to generate and Supply Electricity from wind energy at Anloga and Anyanui in the Keta Municipal of the Volta Region. Power generated is to feed into the national grid which is being operated by the Ghana Grid Company.

The VRA has now embarked on relevant activities to ensure all required permits will be obtained.

The acquisition of an Environmental Permit (EP) is mandatory to allow for the commencement of the physical construction for such a project. As such, the VRA has registered the project with the EPA and the preparation of this Scoping Report is the first step towards Environmental approval by the EPA and the issuance of an Environmental permit. The Permit, if granted, will outline various conditions that must be adhered to in the project implementation. The VRA will be responsible for implementing the conditions of the EP.

It must also be noted that a Developmental permit is required from the Local Government Administration, in this case the Ada West District for infrastructural development, whilst the Ghana Highway Department / Department of Urban Roads will need to be consulted for approval for crossing of highways and roads and public property with the heavy plant equipment.

The wind turbines would be at the hub height of above 80 m (to be confirmed at final design stage), which would necessitate adequate provision of warning lights and signals necessary for elevated structures. This would require obtaining clearance from the Ghana Civil Aviation Authority and the National Communication Authority, which are yet to be obtained.

### **Micro-siting**

Micro-siting would be undertaken to minimise potential environmental and social impacts following findings and recommendations of specialist studies, for example to reflect findings of pre-construction survey works or to further refine the site layout to avoid areas of deep peat prior to construction. No micro-siting will be undertaken that would increase the potential level of effect on sensitive receptors. In

addition, micro-siting would only be undertaken where achievable within the application boundary taking into account blade over-sail.

### **Stakeholder Engagement**

The following state agencies to be taken on-board before commencement of associated physical works for the project:

- Ghana Wildlife Division of the Forestry Commission, for working close or within the Songor Ramsar site in Ghana.
- Ghana Highway Authority for associated impacts in the transportation of equipment on the Accra-Aflao NI Highway.
- Department of Urban Roads for any access road development or road diversion within the project sites in line with the “Road Reservation Management: Manual for Coordination” (June 2001).
- Ghana Police Service to assist in safeguarding the transportation of project equipment from the Tema Harbour and along the NI Highway to the project site.
- Ghana Water Company, to identify water pipelines in order to avoid destruction of such infrastructure.
- Electricity Company of Ghana, to identify if any distribution electric lines would be impacted and to arrange for smooth disconnections and connections as appropriate in order to avoid destruction of such infrastructure.
- Ghana Civil Aviation Authority on aviation impacts issues.
- Telecommunication Companies, if their communication mast is identified within the project sites.
- National Communications Authority, if the project is identified to have a direct impact on national communications.
- Ghana National Fire & Rescue Service for the issuance of a fire permit for the project.
- Ghana Ports & Harbours Authority for modalities for the clearing of heavy equipment from the Tema Port.
- Town & Country Planning Department of the Ada West for Developmental permit for the WEF.

#### **2.4.2 Construction phase**

The duration of the construction phase for the proposed Wind Energy Facility (WPP2) is ultimately dependent on the total number of turbines to be erected; however, this process is expected to take between 15 and 24 months to complete. The first stages of construction are anticipated to be the establishment of site access and the construction of access roads. Following this, vegetation and site clearance would need to occur at the footprint of each individual turbine. Excavations will then be dug for turbine foundations, followed by the construction of concrete foundations and the establishment of laydown areas adjacent to each turbine location. When the Project is completed, the areas surrounding this new installation will be reinstated to their former state.

General Electric which has been selected for the construction of the turbines would be responsible for the transportation of wind turbine components, including the wind turbine towers. This will be done by making use of flatbed trucks. Construction and lifting equipment such as cranes, as well as components of onsite infrastructure including substation transformers will also be transported to site by road.

Each wind turbine will take approximately 2 days to erect, however this will be dependent on local weather conditions.

Wind turbines will be connected to the optimally positioned onsite substation by means of electrical cables which will typically have a rating of 33 kV. Where practical and where site conditions allow, these electrical cables will be routed underground. The installation of any underground cabling will require the excavation of trenches, approximately 1 m in depth within which the cables can then be laid. Where possible; underground cabling will follow the routing of internal access roads to be constructed on site in order to as far as possible confine the project footprint.

The Contractor shall implement all measures necessary to restore the sites to acceptable standards and abide by environmental performance indicators specified in the Project's EIS/EMP to measure progress towards achieving objectives during execution or upon completion of any works. Furthermore, VRA will undertake environmental monitoring programs during the various stages of the project to assess the effectiveness of the mitigation measures. Further details shall be contained the ESIA - Environmental & Social Management Plan.

#### **Staff Requirement during Construction Phase**

This project will bring in employment opportunities for the local inhabitants. It is expected that the project will create approximately 50 direct construction employment opportunities over this period (i.e. 8 skilled, 18 semi-skilled, and 24 low skilled). About 10 VRA support staff will be present in addition to the above. About 5 expatriate workers are expected to be on site. No on-site labour camps are envisaged as construction workers will be accommodated in the nearby communities of Wokumagbe and Goi and transported to and from site on a daily basis. Thus, no employees will reside on the site at any time during the construction phase. Overnight on-site worker presence would be limited to security staff.

It is expected that there will be between 6 and 15 people in a construction crew, depending on the construction phase of project and the nature of activities being undertaken. There may be more than one crew operating on the site at any one time. Construction crews will constitute mainly skilled and semi-skilled workers. Unskilled jobs will be offered mainly to the local people particularly during the construction phase.

#### **Logistics**

Equipment, supplies and personnel will move in and out from the site using the access road and the Accra – Aflao NI Highway. Heavy vehicles carrying the wind turbines and necessary equipment will operate from the Tema Port and take the link road to the NI Highway for onward journey to project sites site by the dirt road which will be upgraded to take the heavy load of towers (~162 tons), rotor blades (~60 tons), turbines (Nacelle ~82 tons), machinery and equipment.

Concrete plant and some material (cabling, cement etc.) will be transported to the site via normal articulated heavy goods vehicles. WTG components will require delivery via specialised heavy goods vehicles which would be escorted along the public highway and upgraded access tracks. Aggregate for tracks and foundations will be sourced from off-site quarries in proximity to the Project therefore no borrow pits are proposed.



**Access Road**

The shipping port would be Tema and from there the transport distance to the sites would be around 70 km to the Goi and Wokumagbe sites. The main part of the route is on the N1 (Accra - Aflao road). The routes are shown in Figure 2.3. The existing road network reaches close to the selected sites and only very few kilometres of access roads have to be built new for reaching the selected sites. A 1km x 0.03km (3Ha) road access will be required and subsequently developed.

Where required, existing public roads may need to be upgraded along the proposed equipment transport route to allow for the transportation and delivery of wind turbine components and other associated infrastructure components (refer to Figures 2.4 to 2.6). Laso Transportes of Portugal conducted a road survey (Laso Transportes, 2015) to evaluate access to the project sites from the Tema harbor, where the equipment for the wind power projects are expected to be delivered in Ghana. As recommended by Laso Transportes, the terrain of the area under consideration would require a number of road works for the establishment of a wind energy facility.



**Figure 2-3: Project Transport Route (Source: Source: Draft Feasibility Study for Wokumagbe and Goi Wind Farm, August 2015)**

The access to the project sites along the N1 shows no major obstacles, only small works are necessary at roundabouts and turnings to assure sufficient space without electricity poles, traffic signs, etc. Furthermore, there are small water passages that need to be upgraded or repaired at the final section of the transport route, quite close to the wind farm site.

A truck test is to be performed after the road works are done. All roads are to be reviewed 4 months before the start of the project. Due to local movements/traffic inside villages, the proposed roads are to be crossed during night time and all access roads within villages must be clear to allow the transports.

Work will commence with improvement of the access road connecting the site with the national Accra – Aflao Highway N1. Any dirt road to the identified sites will require widening, spreading gravel and compaction to upgrade/ build to a standard that is suitable for the 60-foot flat-bed trucks in good weather conditions. Lay-bys will be built at suitable points for ease of crossing. The roads within the project area shall be suitably compacted / strengthened to withstand the onset of torrential surface flow and land submergence/inundation. Since the entire project area is flat, road gradient will not be an issue.



**Figure 2-4: Transportation of a Tower section**



**Figure 2-5: Transportation of a Rotor blade.**



**Figure 2-6: Transportation of a Nacelle**

**Transport Vehicles and Requirements of New Roads**

The road specifications must be related to the wind turbine types, due to different length and weight of the components:

Turbine Type	generic
Minimum width	4.5m
Minimum radius	20m
Bearing capacity	180 nominal kN/m <sup>2</sup> (axle load 12 t)
Longitudinal radius	not less than 200 m
Maximum longitudinal slope	8 % (6 % in case of crawler crane) on drained roads consisting of crushed rock or similar with top layer of non-slippery gravel

The wind turbine, including tower, will be brought on site by the supplier in sections on flatbed trucks.

The Truck Drivers' Guide, 2013 requires that trucks weighing 3.5 MT or more must have reflective tape (yellow in color and 50 mm wide) on the side and back of the truck and trailer. Trailers carrying loads exceeding 2.5 m wide or 4.5 m high require a special permit from the Ghana Highway Authority. In addition to the specialised lifting equipment, the normal civil engineering construction equipment will need to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement mixers, etc.). The components required for the establishment of the substation (including transformers) as well as the powerlines (including towers and cabling) will also be transported to site as required. The dimensional requirements of the load during the construction phase (length/height) may require alterations to the existing road infrastructure (widening on corners, removal of traffic islands), accommodation of street furniture (electricity, street lighting, traffic signals, telephone lines, etc.) and protection of road-related structures (bridges, culverts, portal culverts, retaining walls, etc.) as a result of abnormal loading. The equipment will be transported to the site using appropriate national and urban routes, and the dedicated access/haul road to the site itself.



### 2.4.3 Operational Phase

The operational lifespan of the proposed Wind Energy Facility (WPP2) is expected to be approximately 20 to 30 years. Wind turbines will be operational for this entire period except under circumstances of mechanical breakdown, extreme weather conditions and/or maintenance activities. Wind turbines will be subject to regular maintenance and inspection to ensure the continued optimal functioning of the turbine components.

The Project will be operational 24 hours a day, seven days a week. There will be regular monitoring of the performance of the Wind Turbine Generators (WTGs) and minor maintenance carried out when required. Annual maintenance of the WTGs will also be carried out.

Operation and maintenance (O&M) of wind farms is different from O&M of conventional power plants. To run conventional power plants, the purchase of fuel (or coal or gas etc.) is necessary. In case of failures, the machines will stop and do not produce energy - but do also not consume fuel anymore; therefore, the loss of revenue is limited. It is different with wind farms. The “fuel” is the wind. It is free of charge, but is fluctuating; therefore, the aim is to run the WTG as much as the wind speed is in a meaningful level. Hence every stop of the WTG, especially in high wind season is a loss of revenue.

O&M presents different challenges for utilities, including decisions on conducting activities with existing utility staff or outsourcing these activities or a blend of the two scenarios. Operating costs are dependent upon many factors, but data indicate that operating costs for modern (<5-year old) wind projects run between \$7 and \$15/MWh of electricity produced. Wind turbines can provide large amounts of electricity, cleanly and reliably, at prices competitive with any other new electricity source, provided they are properly operated and maintained. Beside defects of WTG as reason to stop, WTG do need also standard maintenance of the components which can be schedule and called scheduled maintenance (SM). Also at SM the WTG have to be stopped when entering the tower.

There are three basic O&M concepts:

- a. Many turbine suppliers (TS) offer their clients a 100% full service contract. This can start from installation to almost for the whole lifetime of the wind turbines.

Concerning balance of plant (BOP) – although it is not common that all equipment other than the turbines such as civil devices (e.g. roads, foundations, crane pads) or electrical devices (e.g. cables, transformers, substation)– are taken care of by the TS, it has been practiced e.g. for smaller wind farms with only a few wind turbines. For larger wind farms this is a matter of negotiation with the TS, otherwise consequently the owner or another company have to be engaged for the O&M of BOP.

- b. The most common way of O&M is to share the tasks between the operator (owner) and the turbine supplier. Usually the first few years (in common 2 to 5 years, which is the usual warranty time) the TS will play the main role in monitoring, maintenance and repair of the wind turbines. The owner usually accompanies this process, having own devices for monitoring and setting up own maintenance teams time by time until the handover of the turbines, which is usually after the warranty period. It is also common practice that the

owner undertakes the task of O&M of BOP, especially in the case the owner has already experience with power plants.

- c. A seldom case is the complete own O&M by the owner right after installation and commissioning of the turbines. This is e.g. the case often found in China, where they sometimes follow other strategies driven by own policies. But also in this case a training of personnel is necessary and the accompanying support of an experienced consultant is recommended. The staffing is similar to the one mentioned under b).

For the long-term success of the wind farm project, assuring the optimal utilisation of the given wind potential and the optimal electricity generation, good operation and maintenance procedures have to be established. The expertise and experiences of the personal is the key property which is to be established and maintained.

The main aim of the periodical maintenance of the WTGs is to verify and assure the good state of all components. It includes amongst others visual inspections, greasing of moving parts and replacement of wear and tear parts. Furthermore, the repair and/or replacement of damaged components need to be done; this is also referred to with the term “unscheduled maintenance”.

With regards to the operation of the wind farm, the continuous control of electricity generation of the individual WTGs and the complete wind farm and commercial issues related to invoicing the generated electricity to the off-taker and paying received invoices are key activities. For the remote control of the wind farm the team should be capable to handle complex software and data bases of immense extension and information density. Incoming SCADA data demands monthly analyses of the production, income and costs as economic data set. Also deep analyses and elaborations of the SCADA data allow the indication of potential optimisation, pinpoint instruction of maintenance hot spots and/or arising defects (CMS). With meteorological input the target-performance comparison is to be performed.

As a general standard, the maintenance is done by the lead of the manufacturer of the WTGs for the first operational years and in particular during the defects liability or warranty period. Afterwards VRA may decide to do the maintenance (at least major share of these works) with its own staff. The staff should therefore be trained during the first operational years, amongst others by working jointly with the manufacturer’s staff. The VRA staff can take over more and more of the work until the manufactures staff effort is reduced to consultancy.

### ***Spare part storage***

One of the most essential tasks to ensure a smooth operation of a plant is the availability of spares. The usual manufacturing time for components is quite high and the lead-time for some of the spares is up to one year. VRA plant management should be aware of this fact and a fully computerized inventory management system should be developed right at the start, to eliminate shortages of spares.

Regarding small parts and components, the TS should deliver an inventory plan of spares. Regarding large components which have a high impact on the revenue and profit of the wind farm, it is advisable to have the following spares:

Sets of rotor blades	1 - 2
Generators	1 - 2
Gear boxes	1 - 2
Main converters	1 - 2
Transformers (step up from WEC to WF)	2 - 3

For rotor blades it is recommended using the transport cages for rotor blades as storage. These cages have to be covered by a roof to protect the blades from sun, dirt and rain. This system has the advantage that the blades can be transported safely according to the manufacturer’s instructions in case of a rotor blade change.

The instructions for the handling and storage of major components like gearboxes, generators and cabinets have to be followed carefully. Generally, protection against sun, rain, dust and small animals is recommended. For some equipment the storage should stay below a maximum temperatures e.g. specific pint.

The above mentioned large components sum up to an investment of approximately 1 to 1.5 wind turbine equivalents. These values are derived from the experience of the Consultant and are rather rough, but reliable values. With a broad basis of European wind farm data, it would be possible to prepare a more detailed evaluation, but the question is if this is possible and even sensible at present stage, lacking of data and experience of wind energy in Ghana.

Due to fact that repairing is always a challenge against time, the storage should be located at a place with sufficient infrastructure to transport spares and equipment to the wind farm.

**Employment**

Approximately 20 technical persons on shift basis shall be hired for the operation of the wind farm and during operational phase. This number will be in addition to those engaged at site for security and administrative duties expected.

**2.4.4 Decommissioning Phase**

Decommissioning refers to the planned shut down or removal of a facility, buildings and/or equipment from operation or use. It is anticipated that the WPP2 Wind Energy Facility will only be decommissioned once it has reached the end of its economic life span. Should it be deemed feasible at the time to continue the economic life of the project then wind turbines and associated infrastructure may be disassembled and replaced with more appropriate technology and infrastructure which may be available at the time, alternatively the disassembled turbines and infrastructure will be removed and not replaced. Various components of the proposed Wind Energy Facility which would be decommissioned can be reused, recycled or disposed of in accordance with the relevant regulatory requirements. All of the components of the wind turbines are considered to be reusable or recyclable except for the turbine blades.



Environmental Impact Assessment  
for 75MW Wind Power Project 2,  
situated at Wokumagbe and Goi  
in the Ada West District of the  
Greater Accra Region

# CHAPTER 3:

## Description of the Affected Environment

# SCOPING REPORT



**VOLTA  
RIVER  
AUTHORITY**

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## **3 DESCRIPTION OF THE AFFECTED ENVIRONMENT**

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This chapter of the Scoping Report provides an overview of the receiving environment and the surrounding region. The receiving environment is understood to include biophysical, socio-economic and heritage aspects which could be affected by the proposed development or which in turn might impact on the proposed development.

This information is provided to identify the potential issues and impacts of the proposed project on the environment. The information presented here has been sourced from:

- Scoping input from the specialists that form part of the project team;
- Review of available information.

It is important to note that this chapter intends to provide an overview and does not represent a detailed environmental study. Detailed studies focused on significant environmental aspects of this project will be provided during the ESIA Phase.

### **3.1 LOCATION**

The Wokumagbe and Goi WEF is located in the Ada West District. The District lies between Latitudes 5°45'S and 6°00'N and Longitude 0°20'W and 0°35'E. The total land area of the District is approximately 323.72km<sup>2</sup>, which is about 10% of the total land size of the Greater Accra Region. The District shares common boundary with the North Tongu District of the Volta Region to the North, Ada East to the East, Ningo Prampram District to the West and to the South by the Gulf of Guinea, which stretches over 45 Km (27.9 miles) from Wokumagbe through Goi to Kablevu. Sege is the District capital, and it lies about 80 Km from Accra on the Accra -Aflao road.





Figure 3-1: Regional Context of WPP2 site



## 3.2 BIOPHYSICAL ENVIRONMENT

### 3.2.1 *Climatic Conditions*

This section gives the general baseline conditions of the climate in the project area. Ghana has a typical tropical climate thanks to its proximity to the equator and low elevations – the entire country lies below 1 000m (3300ft). The climate is determined by the movement of air masses that differ in air moisture and relative stability rather than temperature. The two air masses, namely the Southwest Monsoon and the Northeast Trade Winds come into contact with each other along the Inter-Tropical Convergence Zone (ITCZ). The ITCZ, which passes over the area twice yearly, is responsible for the annual succession of seasons. The southern air masses coming from the South Atlantic bring relatively cool and moist weather.

The climate of Ghana is tropical, warm and comparatively dry along the southeast coast; hot and humid in the southwest of Ghana and hot and dry in the north, with temperatures varying with season and elevation. The mean annual temperature ranges from 25.9 °C to 29.7 °C due to the low latitude of Ghana and the absence of high-altitude areas. The average daily temperature of Tema, which is approximately 53km from Goi, is 27.7°C. The coolest time of the year is between June and September when the main rainfall occurs. Variations in temperature both annually and daily are quite small. In most areas the highest temperatures occur in March, the lowest in August.

Two rainy seasons occur from April to July and from September to November, except in the north, where the rainy season begins in April and lasts until September. Annual rainfall ranges from about 1,100 mm (about 43 in) in the north to about 2,100 mm (about 83 in) in the southeast. The driest area is a land strip extending eastward up to 40 km inland, where rainfall is about 750 mm.

The prevailing winds are from the west throughout the year. Generally, the winds are light to moderate with velocities of about 5.2 knots and gusts up to 49 knots. This influences the direction of associated point source emissions from KTPP and the outfall points.

A noteworthy climatic phenomenon in Ghana is the harmattan winds which blow in from the northeast from December to March, bringing dust from the Sahara and reducing visibility to as little as 1 km (0.6 miles). This dry desert wind lowers the humidity and creates hot days and cool nights in the north. In the south, the effects of this wind are felt in January.

In order to properly represent the climate spanning the project sites, data on relative humidity, temperature, rainfall and wind speed covering the period 2006-2015 was obtained from the nearest weather station which is the Ada Weather Station: 654750 (DGAT)<sup>1</sup>, located on Latitude: 5.78N, Longitude: 0.63E and Altitude: 5. above sea level. Data was supplemented with information obtained from the climatic measurements carried out by Barlovento Company for the project, using the MEASNET [13] standard and indications. The data is summarized in a climatic chart provided in Figure 3.2.

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<sup>1</sup> <http://www.tutiempo.net/en/Climate>

Wind turbines are designed for operation within a certain range of temperatures, called the operational or normal range. A wind turbine may survive temperatures beyond the operational range, but will cease operation in order to do so. If temperatures exceed the so-called extreme range or survival range, components within the wind turbine may suffer permanent damage.

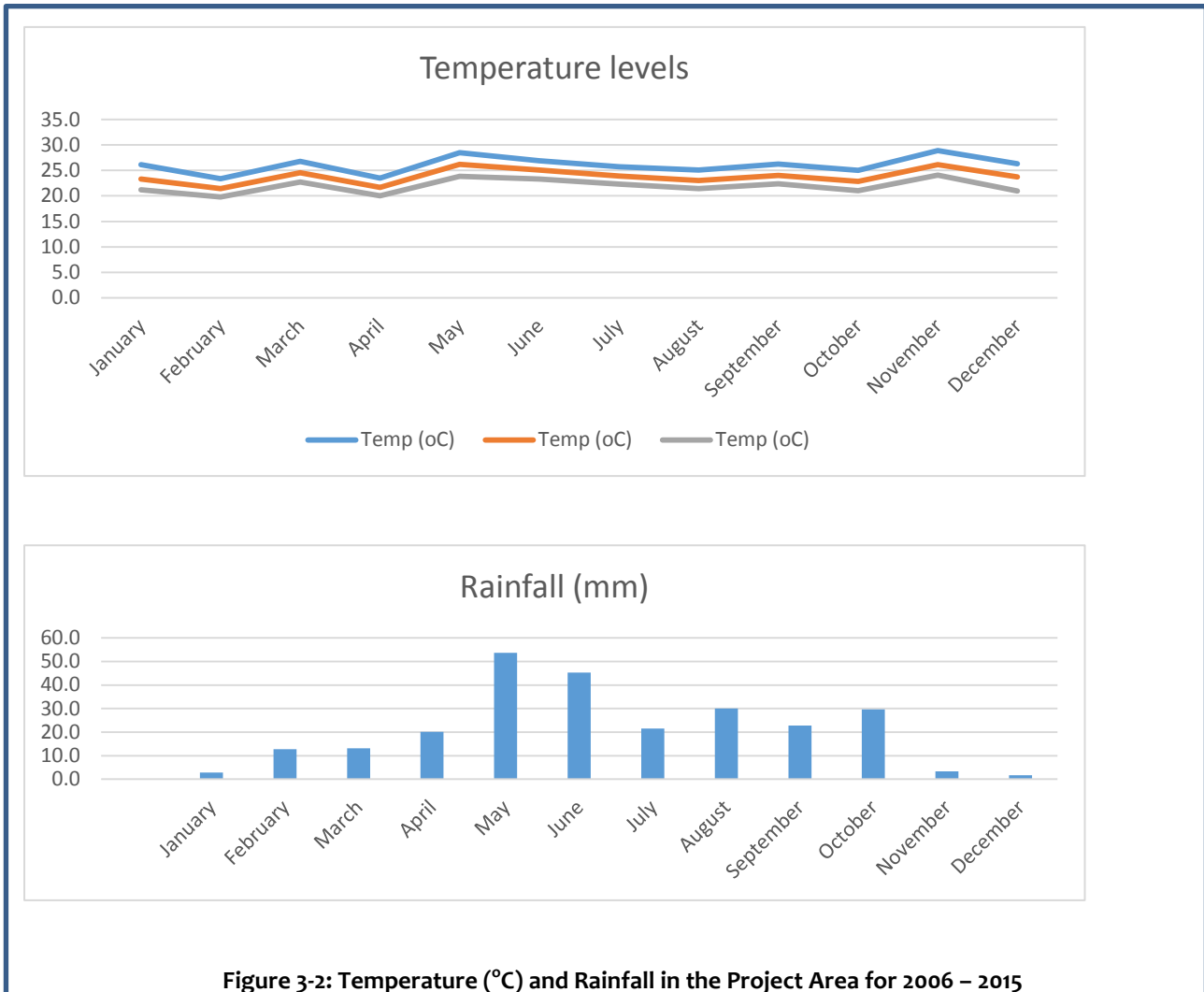


Figure 3-2: Temperature (°C) and Rainfall in the Project Area for 2006 – 2015

(Source: <http://en.tutiempo.net/climate/01-2009/ws-654620.html> )

### 3.2.2 Geology, seismicity and Minerals

About two thirds of the land surface of Ghana is covered by Birimian rocks that are of paleoproterozoic age. These rocks form the easternmost component of the Man Shield of West African craton that has remained stable since 1.7 Ga. The eastern portion of the country is predominantly underlain by middle to late Proterozoic rock units that are differently named as Dahomeyan, Togo, Buem and Voltain belts (Leube, et al., 1990).



Ghana is far from the world's major earthquake zones, but has been known to be seismically active for centuries. Earthquakes of magnitude greater than 6.0 have been recorded; however, current seismic activities have been confined to local tremors of 4.8 or less on the Richter Scale. The earthquakes have mostly occurred west of Accra in the area where the Coastal boundary fault and Akwapim fault zone meet. A recent review of geological and instrumental recordings by Amponsah (2002) shows that earthquakes are still liable to occur in this area. The Seismic activities of southern Ghana has been linked to the St. Paul's (Axim area earthquakes) and Romanche (Accra area earthquakes) transform-fracture zone systems offshore in the Gulf of Guinea to onshore. The St. Paul's has been inactive for some time but movement along the Romanche Transform fault and Fracture zone is active.

According to Bacon and Quaah (1981), most of the epicentres are located south of Weija suggesting that there is little activity north-eastward along the Akwapim range and westward along the Coastal boundary fault. It is evident from their results that there is a low level of seismic activity scattered along the Akwapim fault zone that could be due to normal faulting suggested by Burke (1969). In Quaah and Bacon's view, the epicentres of the located earthquakes are related to the level of activity of the faults. They allege that this is to be due to the existence of an old thrust zone, which has been reactivated. Burke (1971) associated the seismic activity of Ghana with the junction of the chain fracture zone and the African continental margin.

Microseismic studies in southern Ghana indicated that the seismicity is associated with active faulting (Essel, 1997) between the eastwest trending Coastal boundary fault and a northeast-southwest trending Akwapim fault zone, defined by a number of active faults. A geophysical study by Essel (1997) indicated that the seismic activity is related to deep-seated faults.

The project area in south eastern Ghana is not likely to be impacted by a major earthquake in the Accra region as per the Figure 3.3. It is important that all foundation structures adhere to the "Code for Seismic design for Concrete Structures" (Nov. 1990) as well as the National Building Regulations, 1996, LI 1630.

The IEC standard requires a site estimate of the peak ground acceleration (PGA) with a recurrence period of 475 years for the site area. This recurrence level is equivalent to an annual risk of exceedance of 0.2%. There is no explicit IEC limit for PGA, hence the general hazard levels have been adopted in "Low hazard" results in OK, "Moderate hazard" in Caution, and "High" and "Very high hazard" results in Critical, emphasizing the need for further and detailed investigation of seismic loads.

Environmental risks like earthquakes and landslides are not considered as major risks and have not to be taken into account. A report by Amponsah (2004) mentions that in 1862, 1906 and 1939 important earthquakes occurred, reaching up to level 6.5 on the Richter scale, but since then, the most important ones only reached rather moderate levels of 4.8 on the Richter scale. In July 2014, a seismic activity was reported in the media, however without details on the magnitude. The expected Peak Ground Acceleration (PGA) of  $0.7\text{m/s}^2$  is not regarded as critical.

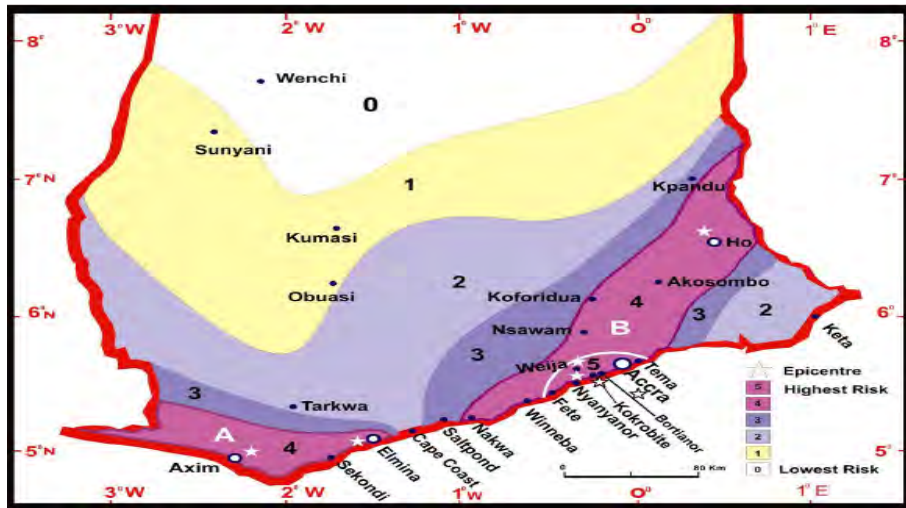


Figure 3-3: Earthquake Risk Zones in Southern Ghana (Source: [http\\_\\_\\_file.scirp.org\\_Html\\_2-2800611\\_41164](http___file.scirp.org_Html_2-2800611_41164))

### Geology

The geological formations of the Ghana coastal areas are said to be influenced by the processes of continental drift during the Cretaceous period of about 135 million years ago. The underlying basement formations consists of hard granites, granodiorites and metamorphosed lava and pyroclastics. Some coastal areas are covered by Ordovician and Devonian sandstone and shale. The area consists of the Cenozoic (Quaternary-Recent and Tertiary-Eocene) formations that include unconsolidated sands and clays of lagoon, delta and littoral area, partly consolidated red continental deposits of sandy clay and gravel. It consists of a thick section of marine sands, clay, shale, limestone, sandstone and some gravel which underlie more recent sediments in the coastal areas and dips towards the southeast.

The Volta River has a dominant influence on the geomorphology of this coast. The project sites are mostly sandy and characterized by the deltaic features of the Volta River. Fluvial sediments from the river, as well as, marine and fluvial-marine sediment make up the surface geology of the area. The beaches comprise medium to coarse sand and rise steeply (a slope of about 1:10) in elevation to about 2m above Mean Sea Level (MSL).

A large portion of the District is underlain by tertiary and recent alluvial deposits. A small section of the northern and eastern parts (between Afiadenyigba and Sege) fall under the Dahomeyan complex rocks of Precambrian age. The recent unconsolidated sand, clay and gravel occur in the deltaic areas surrounding the Songor Lagoon. The rock of the basement is unknown, but it is expected to be Dahomeyan, similar to that cropping to the north of the basin. The suitable soil formed from these soil associations is the Tojeh and Koloidaw series. These soil types vary from red to brown deep (120-150cm) to very deep (>150cm) well to moderately drained fine sandy clay loams to sandy clay. The soil formed under these rocks supports a variety of tropical crops which sustain the agricultural activities in the district.

### Minerals

The project area is well endowed with a large deposit of salt which is the main economic resource. Salt mining provides employment for a large number of the population particularly in areas where the

resource exists. The Ada West District Assembly generates about 70% - 75% of her internal revenue from the salt industry. The major company in the salt industry is the Songor Salt Project and is located on the Songor Lagoon which covers a total land area of about 12,500 acres. The Project employed a total labour force of about 300 and produces approximately 90,000 metric tonnes of salt annually to meet the demands of both the local and international markets in Togo, Burkina Faso, Mali and Nigeria. Under full production capacity, the project is expected to generate more than 1,500 employments to the youth. Feasibility studies and empirical evidence have adjudged the industry to have tremendous capabilities to support the proposed petro-chemical Industry including the production of Caustic soda, Chlorine and PVC Pipes etc.

### **3.2.3 *Agricultural Capability and Sensitivity***

Agriculture constitutes the main economic activity and a major source of livelihood for the majority of the rural dwellers. According to the 2010 Population and Housing Census, the agriculture sector provides employment for about 42.5% of household head in the District. This include livelihood for the people through direct farming, distribution and marketing of farm produce and other service to the agricultural sector. It forms the basis of successful operation of the thriving market in the district and other sister districts.

The main agricultural activities considered here include crop farming (48.1%) livestock rearing (36.5%), and fishing and agro-forestry. Agriculture in the district contributes to food security, provides raw materials for local industries, generates foreign exchange, and provide employment and incomes for most of the population (especially those living in the rural areas), thereby contributing to poverty reduction. In the rural localities, it is 63.5 percent compared to 43.4 percent in urban localities. The dominant agricultural activities of households engage in agriculture is crop farming (48.1%). Over half (57.4%) of agricultural households engage in crop farming.

The Ada West District is noted for the cultivation of cassava, maize, legumes, fruits and varieties of vegetables. With the exception of maize and cassava, the District account for more than 50% of the regional output for these crops. Livestock rearing is another important agricultural activity in the district. The livestock identified in the district are cattle, sheep and goats, pig, poultry (fowls, turkey, duck, and guinea fowl.). The Ada West is noted for marine fishing activities. The major fishes harvested are King Fish, Anchovy, Mackerel, Tuna Spp, Shrimp, Herrings and Baracuda. Most of the fish catches were smoked, dried and packaged to Kasseh, Denu, Agbogbloshe, Mamprobi, and Techiman markets for wholesale. The fishing gears commonly used are beach seine, set net, Nifa Nifa, Ali, Poli, and Watsa. The Agro-forestry sub-sector of the Agriculture sector is quite negligible since majority of the farmers do not have the necessary dexterity to engage in the sector.

### **3.2.4 *Soil Types and Soil Potential***

The ground and soil conditions at the project site have not been analysed. However, the first visual impression of the sites shows in general stable grounds and for the overall feasibility of executing the civil works at the site no major obstacles are seen. For determining details of foundations, roads, crane pads, etc. a geotechnical survey inclusive drillings at each Wind Turbine Generator location is necessary. However, in the actual feasibility stage of the project analysis, an assumption will be taken under consideration of flat foundations for buoyancy conditions; additional costs for pile foundations will then be proposed to be included in contingencies.

A geotechnical survey, including drillings at each WTG location will be necessary to determine details of foundations, roads, crane pads, etc. However, in the actual feasibility stage of the project analysis, flat foundations for buoyancy conditions are assumed acceptable; additional costs for pile foundations will then be proposed to be included in contingencies. The following results are expected from the borehole investigation - medium dense fine beach sand type below the existing natural ground surface, which becomes coarser with depth. This sand deposit could be intercalated by different layers of dark greyish to brownish grey silty clay.

### **3.2.5 Flood Risk**

Coastal erosion, flooding and shoreline retreat are serious problems along the coast of Ghana. Past human impacts, inappropriate management interventions, climate change and sea-level rise have been identified as major contributory factors.

Several consequences could be expected from sea level rise in Ghana. In particular, low-lying sandy coastal areas at the eastern coast such as the Volta Delta and Keta lagoon could be profoundly affected. The expected impacts of sea-level rise are: direct inundation (or submergence) of low-lying wetland and dry land areas; erosion of soft shores by increasing offshore loss of sediment; increasing salinity of estuaries and aquifers; raised water tables; and exacerbated coastal flooding and storm damage. These impacts have in turn influence coastal habitats, bio-diversity and socio-economic activities.

The flat nature of the topography of Ada West District exposes it to serious threat of flood accounting for majority of cases of disasters. In all about 70 people were afflicted with flooding in 2013. The most affected areas of flooding in the district are Akplabanya, Wokumagbe, Goi, Matsekope and Addokope. The effects of flooding are devastating as it affects crop farms, outbreak of waterborne diseases, etc.

The project area consists of approximately 15 km of coastline located west of the Volta Estuary. The stretch is fast eroding posing a great threat to property, infrastructure, tourism and sea turtle nesting sites. This has led to modification and subsequent incipient loss of ecotones and ecosystems and coastal infrastructure. A recent beach profile study shows that the beaches experience uneven erosive dynamics. For example, accretion in sections of beaches at Ada between January and March 2015 was 3.53m with a cliff height of 0.69m. An average erosion of 5.89m was recorded between the month April - June of the same year with a corresponding cliff height of 0.89m. Communities such as Totope, Anyamam and Wokumagbe near one of the proposed project site at Akplabanya were severely affected.

### **3.2.6 Terrestrial Environment**

#### **3.2.6.1 *Protected and environmentally sensitive areas***

There is increasing recognition of and attention in decision-making to the significance of wetlands for reasons of biodiversity conservation, water supply, coastal protection, integrated coastal zone management, flood defense, climate change mitigation and/or adaptation, food security, poverty eradication, tourism, cultural heritage, and scientific research.

The Songor Ramsar site is situated to the west of the Volta River Estuary- 05°49' N, 00° 28' E. It shares common boundaries with the West Bank of the Lower Volta River Estuary and the Songor Lagoon. The Ramsar site is the second largest wetland along the coast of Ghana and was listed as a Ramsar site in 1992.

It covers an estimated area of 53,333.3 hectares (representing 5.6 km<sup>2</sup>, almost 0.5 per cent of the total land size of the district) and lies in the south-eastern coastal plains. Songor Ramsar Site has the only natural point where the Volta River enters the Sea. The open water covers an area of 115km and extends 20km along the coast and 8km inland behind a narrow sand dune on which fishing communities like Pute, Totope, Lolonya, Kablevu, Goi, Anyamam are situated. The coast is generally smooth without cliff.

The vegetation of the Songor wetland may be classified into five main types:

- a) Saline marshes in the mud and salt flats, depicted by *Sesuvium portulacastrum*, *Sporobolus virgatus*, *Paspalum vaginatum*, *Ipomoea pescaprae*; *Sesbania sesban* and *Opuntia* species. Many *Hyphaene thebaica* (Dum Palm, a branching palm) occur along the shore, but probably due to salt spray or other turbance the palms never developed into big trees.
- b) Waterlogged grassland dominated by *Vetiveria fulvibarbis*, *Andropogon gayanus*, *Brachiaria yalcifera*, *Imperata cylindrica* (Lalang grass), *Sporobolus pyramidalis*, *Fimbristylis pilosa*, with a few dicots like *Cassia mimosoides* and *Polygala arenaria*.
- c) Scattered thickets of shrubs, climbers and small trees on higher ground. The thicket population being composed principally of *Allophylus africanus*, *Flacourtia indica*, *Griffonia simplicifolia*, *Grewia carpinifolia*, *G. mollis*, *Capparis grythrocarpos*, *Securinega virosa*, *Uvaria globosa*, *U. chamae*, and *Zanthoxylum xanthoxyloides* with emergent of *Elaeophorbia drupifera* and *Diospyros mespiliformis* and succulent-leaved herbs *Sansevieria liberica* (African Bowstring hemp) and *Aloe buettneri*.
- d) Riverain woodland along the streams where *Baphia nitida* Camwood, *Lonchocarpus cyanescens* (west African or Yoruba Indigo), *Pithecellobium guineense* (Velvet Tamarind) and *Millettia thonningii* are found;
- e) Low mangroves along the margins of the lagoon characterised by *Avicinnia africana*. The plants growing in or around the water are *Cyperus articulatus* (sometimes cultivated for matting and for the aromatic rhizomes), *Borreria* species, *Lemna purpusilla*, *Nymphaea lotus*, *N. micrantha* (both called water Lily), *Ludwigia* species, *Ipomoea aquatica* and *Abutilon mauritianum*.

On the whole, there has been considerable damage to the vegetation, resulting in vast areas of depleted farmlands, abandoned farms, wastelands and eroded terrain. Generally, one can see as far as the horizon in all directions only isolated trees-like *Borassus aethiopicum* (Fan Palm), *Mangifera indica* (Mango), *Ceiba pentandra* (Silk cotton Tree) and *Adansonia digitata* (Baobab) were seen. The causes of this degradation may be attributed to the traditional slash and burn farming method, cultivation and cutting for fuelwood and charcoal

The Songor wetland supports spectacular concentrations of seashore birds comprising terns, waders, herons and ducks. There is evidence that the area serves as a stop-over point and has a high rate of shorebird population turn over. The Songor wetland supports internationally important populations of species of waders: spotted redshank, greenshank, ringed curlew sandpiper, little stint, avocet and black-tailed godit. The site has the highest total tern count on Ghana coast and supports nationally important populations 10% of the total coastal count) of at least 32 species of birds.

Over 80% of the total number of species recorded in Songor are Palaearctic migrants. Migrant birds begin to arrive on the site late August, and their numbers peak in September-November. The birds start to leave the area at the onset of the season, when large sections of the lagoon dry up and by the bird population is less than 5% of the autumn peak.

### 3.2.6.2 Vegetation

The project area lies in the coastal guinea savanna zone, which stretches from the east of Accra to the Western tip of Nigeria. This coastal guinea savanna zone interrupts the Upper Guinea forest ecosystem which occupies the coastal region of West Africa. The extent and quality of the Upper Guinea forest have declined considerably in response to human influences, notably growth of cities and agriculture. The existing natural vegetation of the project area is a mosaic of Coastal Thicket and Grassland as well as Lagoon margin and Estuarine Mangrove. The sand bar above the high water mark has a narrow stretch of Coastal Strand Vegetation

The existing vegetation at Wokumagbe (Omankope) is seasonally flooded grassland vegetation which is heavily grazed, farm re-growth and isolated thicket clumps. The seasonally flooded grassland is dominated by *Cyperus articulatus*, *Typha domingensis*, *Chloris pilosa*, *Eluesine indica*, *Sporobolus pyramidalis* and *Cynodon dactylon*. The farm re-growths and thickets have species such as *Hygrophila auriculata*, *Dichrostachys cinerea*, *Croton lobatus*, *Securinega virosa*, *Capparis erythrocarpos*, *Zanthoxylum xanthoxyloides* and *Elaeis guineensis*.

The existing vegetation at Goi is composed of stunted *Avicennia germinans*, *Sesuvium portulacastrum*, *Cyperus maritimus*, *Opuntia vulgaris* and *Cocos nucifera*. The Thicket vegetation has largely been cultivated, the main crop being Cassava (*Manihot esculenta*). It occurs in a mosaic with farms and farm re-growths. Some of the common species of the thicket are *Azadirachta indica*, *Chassalia kholly*, *Millettia thonningii*, *Paullinia pinnata*, *Schrankia leptocarpa*, and *indigofera hirsuta*.

### 3.2.6.3 Fauna

The coastal savannah vegetation is known to support a diversity of animals including birds, small mammals and reptiles. These animals are not restricted to specific areas within the proposed area. There seems to be a fair distribution of the fauna over the entire corridor.

The Togo hare (*Lepus zechi*) and the common rat (*Rattus rattus*) are the most common mammals occurring widely in the area. Reptiles that are very well represented in the proposed project area include the Agama lizard (*Agama agama*), the Nile monitor (*Varanus niloticus*), Orange flanked skink (*Matugu perotteltii*) and the Puff adder (*Bitis arietans*) all perform functions vital to the maintenance of the ecological set-up of this type of vegetation. Studies by experts are currently being undertaken and detailed reports on the types of fauna in the project area will be outlined in the main ESIA.

### 3.2.6.4 Avifauna

Ornithological monitoring is vital towards ascertaining the likely impacts of the proposed wind farms on avifauna within the project site. The avifauna may either be resident or migratory in movement but utilize the airspace within which the proposed wind farm would be developed. The development will potentially pose a risk to avifauna hence such monitoring is in line with best practices of the industry as prescribed by Birdlife International, IFC Performance standards and the Equator Principles.

The analysis focused on the species diversity, abundance and any seasonality. Notes on behaviour and biology of observed species formed the basis of highlighting birds that may be at risk during and post construction of the proposed Wind farm. The conservation status of observed species was also assessed as well as the movement of migrants near and within the study site due to the proximity of Songor Ramsar site. Assessment of the conservation status of species recorded focused on the various IUCN threat categories whereas protection status focused on Schedule I of the Wildlife Conservation Regulation. All



animal species listed under Schedule I of the Wildlife Conservation Regulation, are Wholly Protected in Ghana from any form of hunting and capture. Key reference guide used was Birds of Ghana, which was actually co-authored by the specialist consultant.

A total of 101 bird species were recorded at the three sites during the study. The ten (10) most abundant species recorded were the Common Bulbul, Vinaceous dove, Laughing dove, Village weaver and the Yellow-crowned Gonolek Black-crowned Tchagra, Zitting Cisticola, Black billed Wood-dove, Yellow-billed Kite, Tawny-flanked Prinia and Western Grey Plantain-eater. All the species recorded are categorised as 'Least Concern' based on the IUCN Red list. This suggests that all the species recorded may not be of any conservation concern however, there might be some localized effects with the construction of the proposed wind farm. Full list of species recorded and their resident and conservation statuses shall be provided in the Main ESIA Report.

With the exception of 13 migrants (Palearctic and intra-African) constituting 13% of all species, all the other species observed were endemic to the area. Of the observed species no migrant species was found to be part of the top 10 abundant species. Also the Yellow-billed Kite was the only raptor species found in the top 10 of the total species recorded.

Raptors are a group of species of concern with regards to wind farms in that they fly at heights that potentially put them at collision risk with the wind mills. Only five (5) raptor species were observed during the study. These were the African Hobby, Black Shouldered Kite, Grey Kestrel, Gabar Goshawk and the Yellow-billed kite. All of which are listed under Schedule I of the Wildlife Conservation Regulation as wholly protected in Ghana. The Yellow-billed Kite was only raptor found among the top 10 most abundant species recorded at all the sites.

Special attention has been paid to the Goi site which is in close proximity to the Songor Ramsar site, an area of high concentration of migrant waterfowls. This was to ascertain the potential risks with regard to flight over the study area. Because of the importance of the interphase between the lagoon and Goi site some effort was put into assessing the waterfowls occurring at the Songor Lagoon and how their flight path could be impacted on by any future development. Few waterfowls, which are also migrants, were recorded at the lagoon. However, the most abundant migrants observed within the study area is the Barn Swallow which is not under threat.

### **3.2.6.5 Bats**

The team also studied bat species occurring in the area from 6pm-8pm, but this did not yield any records. The local residents confirmed that some bat species had been seen at the sites but not on regular basis. They were also unable to confirm which species come to the sites as they never paid attention to them. To be able to ascertain the bat species occurring in the area, the study Team will continue the monitoring exercise to confirm or otherwise, the presence of bats by using night trapping which is likely to yield mega and micro chiropterans.

## **3.2.7 Heritage Profile**

### **3.2.7.1 Archaeological, Heritage & Cultural Structure**

The people of Ada West have a very rich and old age culture. The celebration of Asafotufiami is one of the prominent festivals celebrated every year. Asafotufiami simple connotes “the firing of musketeers”. In real terms, it is celebrated once a year in the month of August in commemoration of the death of freedom fighters and as form of recognition to the war heroes who defended the land of Adas during the wars

against the Asante. The celebration of this festival is very symbolic featuring the carrying of Chiefs and Queen mothers in palanquins in remembrance of their predecessors and to make them realize that much is dependent upon them. Among the activities in the celebration is the trip to Okorwhem. The purpose of the visitation is to give an official announcement to the ancestors. It is usually led by four chief priests from the Adibiawe clan called the Lалуworny. These priests are also expected to notify the ancestors following the death or entombment of a Chief.

The land at Wokumangbe belongs to the Kuogbo clan. 'Osuola' is the deity of the land and the shrine of the 'Buokumaa' deity (See figure 3.4.) is also situated on their land. The deity forbids chaos and murder hence its isolation from the community. A reconnaissance survey conducted over the Wokumagbe project area did not reveal any archaeological site of significance. It is mainly flood zone and grazing fields. A reconnaissance survey was conducted over the Goi project area. An abandoned local building and associated cultural remains were identified on the site (See Figure 3.5). This archaeological site will need further archaeological testing to salvage heritage remains from the site in the next phase of work.

Archeological, heritage and cultural studies are ongoing by experts from the Department of Archeology & Heritage studies from the University of Ghana and this has shown various sites of importance that needs to be considered during project implementation. It is expected that requirements for various pacifications will be outlined in the Compensation Action Plan for the project.



**Figure 3-4: The Shrine of Buokumaa deity at Wokumagbe Source: Cultural Heritage Impact Assessment at VRA Wind Mill Sites, Ghana (Wokumagbe & Goi Sites), March 2016**



**Figure 3-5: Possible archaeological site in the Goi project area**

### **3.2.8 Socio-Economic Environment**

According to oral history, the Adas are believed to have migrated from Israel with a long stopover in Benin under King Agokoli then to Tagologo near Shai-Osodoku in the former Dangme West District. The people of Ada are called Dangmeli and they speak Dangme as their local dialect. It is estimated that, several hundred years ago, the Ada initially settled at a place called Okorwhem, a few meters away from the Anyamam in the south-western part of the District.

The indigenes of Ada West are part of the sub-group of people within the patrilineal society governed by hierarchical, centralized authority. The Ada state was originally made up of eight clans namely; Adibiawe, Lomobiawe, Tekperbiawe, Dangmebiawe, Kabiawe, Ohuwem, Korgbor and Kudjragbe. Later, the Kabiawe was divided into three separate clans, i.e. Kabiawe-tsu, Kabiawe-yumu and Kabiawe-Kponor. Each member belongs to a clan in which they are believed to have descended along the male line.

The project area is traditionally the home of the Ningo people in the west and the Ada people in the east. These groups belong to the larger group of the Dangbes who migrated from the east in the past. Land is owned by kinship groups or families and is administered by the elders of the group. Traditionally, use rights of members of the group are permanent, where, for example, land once farmed by a member of the family cannot be taken away from him without his permission.

The Wokumagbe site is located along the Workumagbe - Akplabanya road. Wokumagbe means the “land of buffalos”. According to the oral history, one of their ancestor who was a hunter called Nene Tei Sowu discovered the place on one of his usual hunting adventures. After conquering and mastering the



environment, he settled there and named the place Wokumagbe. The people of Wokumagbe are Adas. They share boundaries with Akplabanya and Omankofe. Wokumangbe is ruled by two brothers who are both chiefs namely Nene Appedo Charwe-Narh II who is the youngest and Nene Tei Sowu II, the eldest, all still alive. The indigenes are into fishing and farming.

Land ownership of the project area is being contested by both the Kabiawe Clan of Omankope and Sowu & Tsawena clan from Workumagbe. According to the Wokumagbe elders, the project site land is owned by the Sowu and Charwe-Narh families. The land at Wokumangbe belongs to the Kuogbo cla and the administration and transfer of land is done by the Chief, Stool Father, and the elders of their clans. According to Nene Kano Ateipa (V) of Omakopee, lands in the community belong to the clans (e.g.Kabiawe) in the community but not owned by individuals. He also pointed out that Wokumagbe is under Omankofe so he is in charge of the land.

The project site at Goi is located along the road linking Akplabanya to the Goi township. It is a farm land with crop and vegetable cultivations. The name Goi came about as a result of the abundance of the *Borassus sp* (Emaa kube) on the land. This plant is called 'Agor' in Ga Adangbe. Since it was in abundance in the area it was called Goi. Nene Osibli Sebi is the paramount chief of the land and he hails from the Tekpebiawe clan. The Tekpebiawe clan are the land owners in Goi. Lolonya, Amanyakorpe and Dawa share boundaries with Goi. The Goi indigenes are fisherfolks, farmers and fishmongers. The land is owned by the Tekpebiawe Clan although sections have been given out to some individuals within the clan. The chief and elders of the clan are responsible for administration and transfer of the clan land while those that have been acquired by the individuals are handled by the individuals.

**- Demographic Profile**

The population of Ada West District according to the 2010 Population and Housing Census is 59,124 representing 1.5 percent of the region's total population. Males constitute 48.3 percent and females represent 51.7 percent (See Table 3-1). About 70 percent (70.3 %) of the population reside in rural localities. The district has a sex ratio (number males per 100 females) of 93.6. The youth population (population less than 15 years) in the district account for 42.8% of the population depicting a broad base population pyramid which tapers off with a small number of elderly persons (population aged 60 years and older) 6.7 percent. The total age dependency ratio (dependent population to population in the working age) for the District is 90.6, the age dependency ratio for males is higher (95.4) than that of females (86.3).

**Table 3-1: Population By Cohort By Sex (Source: Ghana Statistical Service, 2010 Population and Housing Census)**

Age Cohort	Both Sexes		Sex				Type by locality	
	Total	%	Male	%	Female	%	Urban	Rural
0-14	25,298	42.8	12,868	45.0	12,430	40.7	30.3%	69.7%
15-64	31,016	52.4	14,622	51.8	16,392	53.7	29.8%	70.2%
65 and above	2,810	4.8	1,089	3.8	1,723	5.6	23.5%	76.5%
Total	59,124	100	28,579	100	30,545	100	29.7%	70.3%

The age structure of the district shows a broad base pattern that gradually tapers off with increasing age. The broad base of the population pyramid indicates that the population of the district is very young. This

means that many resources will be needed for the provision of schools, health care facilities and employment opportunities for the youth.

The population dynamics of the Municipality may be determined largely by fertility and mortality processes. Persons of Ghanaian parentage constitute a large percentage of the population in the Keta Municipality. There are Ghanaians with dual citizenship in the Municipality, though the proportion is small. Households in the Municipality are predominantly male-headed. The extended family living arrangements dominates in the Municipality.

#### - **Education**

The District is divided into four circuits for proper management and supervision. Sege circuit has the highest number of teachers for the primary level as well as for the JHs while Afiadenyigba circuit has the least number of teachers for both primary and JHS level.

The public and private sectors continue to collaborate to provide educational services in the District. The private sector contributes about 39.2% of the total school facilities while the public sector contributes 60.8%. At the Kindergarten, of all the total schools, the Private sector accounts for 43.1% while the public sector accounts for 56.9%. Similar trend can be observed for the primary level where the private sector accounts 42.1% while the public sector provides 57.9%. It is only at the Junior High School where the contribution of the private sector is far lower (28.1%) than the public sector (71.9%)

The Ada West District has a total of 438 teachers supporting teaching and learning activities. Out of this number, 406 teachers representing 92.7 % constitutes the total number of trained teachers in the entire district (with 156 being females and 250 constituting males) while 32 are untrained representing 7.3 % who are currently assisting the trained teachers. There are also 11 Community Education Trained Assistance (CETA) under the National Youth Employment who are supplementing the teaching staff. The number of teachers in the public schools at all levels had witnessed considerable increase from 2012/2013 to 2013/2014.

While significant efforts have been made by central government and other agencies to improve access through the provision of infrastructure and facilities, issues of financing quality education and management remain big concerns in the District. Universal enrolment in basic schools has not been achieved and adult literacy is estimated at 68.5% of the population (11 years and above) but varies considerably between men and women, with their respective rates being 54.1% and 45.9%.

Of the population 11 years and above, 68.5 percent are literate and 31.5 percent are non-literate. The proportion of literate males is higher (78.6 %) than that of females (59.5 %). About five out of ten people (58.6%) indicated they could read and write both English and a Ghanaian language (s). Of the population aged 3 years and above (23,354) in the district, 29.9 percent have never attended school, 40.3 percent are currently attending and 29.7 percent have attended in the past.

#### - **Employment and Income Profile**

Of the population 15 years and older, 60.5 percent are self-employed without employees, 14.2% are contributing family workers and employees respectively. 1.8% is apprentice and 4.4% are casual workers. Overall, men constitute the highest proportion in each employment category except for self - employed without employee(s) and contributing family worker as well as apprentices. The private informal sector is

the largest employer in the district, employing 89.6 percent of the population followed by the private formal with 5.7 percent.

Of the employed population, about 42.1 percent are engaged as skilled agricultural, forestry and fishery workers, 18.6 percent in craft and related trade. 17.4 percent are engaged as service and sales workers while 8.3 percent are engaged as assemblers. One remarkable feature of the district economy is that it is dominated by the private informal sector. The private informal sector employed 89.6% of person aged 15 years and above, while the private formal sector accounts for only 5.7% and the public (government) sector 4.1%. Less than 1% of employees are in semi-public/parastatal (0.2%), Non-Governmental Organization (NGOs) (0.4%) or other international organization (0.1). The employment status and sector in the project communities of Wokumagbe and Goi is shown in

Table 3-2.

**Table 3-2: Employment status of persons 15 years and older by sex Wokumagbe and Goi**  
(Source: Ghana Statistical Service, 2010)

Employment status	Wokumagbe			Goi		
	Male	Female	Total	Male	Female	Total
Employee	110	42	152	272	129	401
Self-employed without employee(s)	101	204	305	197	453	650
Self-employed with employee(s)	21	20	41	78	51	129
Casual worker	25	18	43	64	39	103
Contributing family worker	15	24	39	63	96	159
Apprentice	2	3	5	11	29	40
Domestic employee (Househelp)				10	22	32
Other				5	6	11
<b>Total</b>	<b>274</b>	<b>311</b>	<b>585</b>	<b>700</b>	<b>825</b>	<b>1,525</b>



Environmental Impact Assessment  
for 75MW Wind Power Project 2,  
situated at Wokumagbe and Goi  
in the Ada West District of the  
Greater Accra Region

# CHAPTER 4:

## Approach to ESIA Process and Public Participation

# SCOPING REPORT



**VOLTA  
RIVER  
AUTHORITY**

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## 4 APPROACH TO ESIA PROCESS AND PUBLIC PARTICIPATION

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This chapter presents the ESIA Process to be conducted for the proposed development and gives particular attention to the legal context and guidelines that apply to this ESIA, the steps in the Scoping and Public Participation component of the ESIA and the schedule for the ESIA Process.

The VRA is committed to providing exemplary levels of care and safety for employees on this project, the local populations and the environment in general. Subsequently, VRA has adopted the policy objective of conducting its operations in such a way and manner that the safety, health and welfare of its workers and the integrity of the environment will be safeguarded at all times. To achieve these, VRA has also developed corporate policies for the protection of the environment.

Again, in addition to the applicable regulations and norms of the Government of Ghana and the corporate policies, the proposed project has committed to align as far as possible with the requirements of the IFC, Equator Principles and World Bank. These require that the policy, legal, and administrative framework within which the ESIA is carried out is discussed. Within this context, the ESIA is to explain the environmental requirements of any co-financiers and is to identify relevant international environmental agreements to which the country is a party.

### 4.1 LEGAL CONTEXT FOR THIS ESIA

The Environmental Protection Agency has issued formal guidance on regulatory requirements and the ESIA process. The following documents are relevant to the ESIA process and the project.

a) Environmental Impact Assessment Guidelines for the Energy Sector (2010), Volume 1 has been prepared to ensure the sustainable use of energy resources and also contribute towards sound environmental management in the energy sector. Volume 2 of the Guidelines provides systematic procedures on EIS preparations for the energy sector as well as guidelines on common potential impacts and mitigation measures. The implementation of the environmental assessment of WPP2, as a wind power project, has been guided by this guidelines document.

b) Environmental Assessment in Ghana, A Guide (1996) produced by the EPA provides detailed guidance on the procedures to be adhered to when undertaking an ESIA.

c) Environmental Impact Assessment Guidelines for the General Construction and Services Sector (2011), has been prepared to ensure the sustainable development of the general construction and services sector and also contribute towards sound environmental management in the general construction and services sector.

d) The EPA has published guidelines for industrial or facility effluents, air quality and noise levels. Relevant guidelines are outlined below and their permissible values would be indicated where relevant data is collected or are to be used in environmental quality monitoring.

- Schedule 1: Ghana's EPA Guidelines for discharges into natural water bodies provide maximum permissible concentrations for a number of parameters. Sector specific guidelines for discharge into water bodies have also been developed.
- Schedule 2: Waste Discharges into Air
- Schedule 3: Ghana EPA Environmental Quality Guidelines for Ambient Air

- Schedule 4: Environmental Quality Guidelines for Ambient Noise (EPA)

## 4.2 LEGISLATION AND GUIDELINES PERTINENT TO THIS ESIA

The scope and content of this Scoping Report has been informed by the following legislation, guidelines and information series documents:

### 4.2.1 National Legislation

Key national policy and legal frameworks of relevance to the project relate to environmental protection, including resource protection and biodiversity, electric power developments, occupational health and safety, Labour as well as property acquisition and compensation. Detailed discussions on their application to the project will be outlined in the main ESIA Report.

#### **Environmental Protection**

- National Environmental Action Plan, 1988
- National Environmental Policy, 2012
- Environmental Protection Agency Act, 1994 (Act 490)
- Pesticides Control and Management Act (1996) Act 528
- Ghana Meteorological Agency Act, 2004 (Act 682)
- Environmental Assessment Regulations 1999, LI 1652
- Environmental Assessment Fees and Charges (Amendment) Instrument 2015 (LI 2228)
- Environmental Sanitation Policy, Revised 2010
- National Climate Change Policy, 2013

#### **Electric Power Developments**

- Renewable Energy (RE) Act, Act 832 of 2011
- Volta River Authority (Transmission Line Protection) Regulations, 1967 (LI 542)
- Volta River Authority (Transmission Line Protection) (Amendment) Regulation, 2004
- LI 1816: Electricity Supply And Distribution (Technical And Operational) Rules, 2005
- L.I. 1934: Electricity Transmission (Technical, Operational And Standards Of Performance) Rules, 2008
- LI 1935: Electricity Supply And Distribution (Standards Of Performance) Regulations, 2008,
- L.I. 1937: Electricity Regulations, 2008
- Layout-Designs (Topographies) of Integrated Circuits Act, 2004 (Act 667)
- National Electricity Grid Code, 2009
- Guidelines for electricity rate-setting in Ghana, 1999
- Public Utilities (Termination of Service) Regulations, 1999 L.I. 1651
- Public Utilities (Complaints Procedure) Regulations 1999
- Public Utilities (Consumer Service Committee) Regulations 2002, LI 1704A
- National Energy Policy, 2012
- Renewable Energy Sub-Code for NITS connected Variable Renewable Energy Power Plants in Ghana, January 2015

- Renewable Energy Sub-Code for Distribution Network connected Variable Renewable Energy Power Plants in Ghana, January 2015

### **Occupational Health & Safety**

- Factories, Offices and Shops Act (1970) Act 328
- Ghana National Fire Service Act of 1997 (Act 537)
- Fire Precaution (Premises) Regulations, 2003, LI 1724
- Workmen's Compensation Law, 1986
- Persons with Disability Act, 2006, Act 715
- Control and Prevention of Bushfires Act, 1990, PNDCL 229
- The Ghana Civil Aviation Act 678, 2004
- Road Traffic Acts, 2004, Act 683
- National Road Safety Commission Act 567 of 1999
- Road Traffic Offences Regulations, 1974 (LI 952).
- Ghana Civil Aviation Regulations (GCAR) Part 1, LI 1818
- National Building Code, 2006
- Ghana National Building Regulations, 1996 LI 1630
- Ghana National Environmental Sanitation Policy, 2010
- Guidelines for the Deployment of Communications Towers, 2010
- Ghana Seismic Code, November 1990,
- Health Care Waste Management Policy & Guidelines, 2006
- The National HIV & AIDS STI Policy of 2004, and revised in Feb. 2013
- National Health Policy, September 2007
- Environmental Sanitation Policy, 2010
- Road Reservation Management: Manual for Coordination" (June 2001)
- The Truck Driver's Guide - Ghana, 2010
- Guidelines for The Preparation of A "Plan of Construction Operations" Ghana Civil Aviation Authority, January 2009 (First Edition)
- Guidance On Lighting and Marking of Obstacles"; Ghana Civil Aviation Authority
- Evaluating Aeronautical Effects of Proposed Construction On Air Navigation & Airspace Permit Procedure, Ghana Civil Aviation Authority

### **Labour**

- Labour Act No (2003) Act 651
- Children's Act No. 560 of 1998
- Commission on Human Rights and Administrative Justice Act (Act No. 456 of 1993)
- National Vocational Training Act (Act No. 351 of 1970)
- Ghana Investment Code, PNDC Law 116 (1985)
- Labour Regulations, 2007 (LI 1833)
- Criminal Code, 1960 (Act 29)
- Ghana Business Code, 2006
- National Pension's Act, 2008

### **Property Acquisition & Compensation**

- The Constitution of the Republic of Ghana, 1992
- Local Government Act, 1993 Act 462
- Lands Commission Act, (1994), Act 483
- New Lands Commission Act (2008) Act 767
- Immovable Property Rate Regulations (1975) LI 1049
- Lands Statutory Way leaves Act, (1963) Act 186
- Lands (Statutory Way leaves) Regulations, 1964 (LI334)
- State Lands Act (1962) Act 125
- State Lands Regulations (1962) LI 230
- National Museums Decree (1969) NLCD 387
- Resettlement Policy Framework (RPF), 2011

### **Resource Protection**

- Ghana Water And Sewerage Corporation Act - Act 1965 Act 310
- Water Resources Commission Act, 1996, Act 552
- Water use Regulations, 2001, LI 1962
- Ghana Water Policy, 2007
- National Land Policy, 1999
- Drilling License And Groundwater Development Regulations, 2006, LI 1827

### **Biodiversity**

- Wild Animals Preservation Act, 1962 (Act 43)
- Forest Protection (Amendment) Act 2002, Act 624
- Fisheries Act 2002, Act 625
- Wildlife Conservation Regulations, 1971, L.I. 685
- Wetland Management (Ramsar Sites) Regulations 1999 (L.I.1659)
- National Wildlife Management Policy, 2006
- Wildlife Division Policy for Collaborative Community Based Wildlife Management, September 2000
- Forest and Wildlife Policy, 2012;
- National Biodiversity Strategy for Ghana, 2002
- The National Wetlands Conservation Strategy and Action Plan, (2007 - 2016)

#### **4.2.2 International Finance Corporation Performance Standards**

The World Bank projects and activities are governed by Operational Policies, which are designed to ensure that the projects are economically, financially, socially and environmentally sound. The Bank's Operational Manual spells them out, and provides guidance on how to comply with them ("Bank Procedures" and "Good Practices"). The policies/procedures are to ensure the safe development of projects it is funding. That is to prevent and mitigate unintended adverse effects on third parties and the environment in the development process. The policies of relevance to this project are the safeguard policies.



The World Bank’s Environmental & Social Safeguards Policies covering ten (10) key categories in the form of Operational Policies (OPs) are operationalised when triggered by the proposed project’s scope. The Safeguard policies, which include the Environmental Assessment policy, are designed to prevent unintended adverse effects on third parties and the environment. Specific safeguard policies address natural habitats, pest management, cultural property, involuntary resettlement, indigenous peoples, safety of dams, projects on international waterways and projects in disputed areas as outlined in Table 4-1: .

**Table 4-1: World Bank’s Environmental & Social Safeguards Policies (Source: <http://web.worldbank.org> )**

OP	Safeguard	Revision date
OP 4.01	Environmental Assessment (Jan 1999)	April 2013
OP 4.04	Natural Habitats (June 2001)	April 2013
OP 4.09	Pest Management (December 1998)	
OP 4.10	Indigenous Peoples (July 2005)	April 2013
OP 4.11	Physical Cultural Resources (July 2006)	April 2013
OP 4.12	Involuntary Resettlement (December 2001)	April 2013
OP 4.36	Forests (November 2002)	April 2013
OP 4.37	Safety of Dams (October 2001)	April 2013
OP 7.50	Projects on International Waterways (June 2001)	March 2012
OP 7.60	Projects in Disputed Areas (June 2001)	March 2012

These Environmental and Social Safeguard Policies shall be discussed briefly in the Main ESIA Report and an indication of whether the WB policy is triggered by the project will be included as well as a brief statement indicating the overall project compliance with each policy.

World Bank Policy on Access to Information took effect from July 2013, and has since June 30, 2015 been revised. The Policy governs the public accessibility of information in the Bank’s possession and describes how the World Bank makes information available to the public. Underlying the new policy is the principle that the World will disclose any information in its possession that is not on a list of exceptions. The Access to Information Policy is based on the following five principles: 1) maximizing access to information; 2) setting out a clear list of exceptions; 3) safeguarding then deliberative process; 4) providing clear procedures for making information available; and 5) recognizing requesters' right to an appeals process. The disclosure, review and approval process of the project will meet specific requirements of the Bank through a process that is integrated with the Ghana ESIA process.

#### **World Bank Group EHS Guidelines**

The EHS Guidelines produced by the World Bank Group are technical reference documents on cross-cutting environmental, health, and safety issues applicable to all industry sectors. They cover general and industry-specific examples of Good International Industry Practice, as defined in IFC's Performance Standard 3 on Pollution Prevention and Abatement.

The General EHS Guidelines (April 2007) contain the performance levels and measures that are normally acceptable to the IFC and are generally considered to be achievable in new facilities at reasonable costs by existing technology.

When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment. This justification should

demonstrate that the choice for any alternate performance levels is protective of human health and the environment.

Specific industry EHS Sector guidelines relevant to the Project are:

- a) Environmental, Health, and Safety Guidelines for IFC Environmental, Health, and Safety Guidelines for Wind Energy (April 2007);
- b) Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution (April 2007);
- c) Environmental, Health, and Safety Guidelines for Waste Management Facilities (December 2007)
- d) Environmental, Health, and Safety Guidelines for Water and Sanitation, (December 2007)

The EHS Guidelines for wind energy include information relevant to environmental, health, and safety aspects of onshore and offshore wind energy facilities. Construction activities for wind energy projects typically include land clearing for site preparation and access routes; excavation, blasting, and filling; transportation of supply materials and fuels; construction of foundations involving excavations and placement of concrete; operating cranes for unloading and installation of equipment; and commissioning of new equipment. Decommissioning activities may include removal of project infrastructure and site rehabilitation.

Environmental issues associated with the construction and decommissioning activities may include, among others, noise and vibration, soil erosion, and threats to biodiversity, including habitat alteration and impacts to wildlife. Due to the typically remote location of wind energy conversion facilities, the transport of equipment and materials during construction and decommissioning may present logistical challenges.

Environmental issues specific to the operation of wind energy projects and facilities include the following:

- a) Visual impacts
- b) Noise
- c) Species mortality or injury and disturbance
- d) Light and illumination issues
- e) Habitat alteration
- f) Water quality
- g) Electric Power Transmission and Distribution

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

- a) Construction site waste generation;
- b) Soil erosion and sediment control from materials sourcing areas and site preparation activities;
- c) Fugitive dust and other emissions (e.g. from vehicle traffic, land clearing activities, and materials stockpiles);
- d) Noise from heavy equipment and truck traffic;
- e) Potential for hazardous materials and oil spills associated with heavy equipment operation and fuelling activities.

Environmental issues during the construction phase of power transmission and distribution projects specific to this industry sector include the following:

- a) Terrestrial habitat alteration.
- b) Aquatic habitat alteration.
- c) Electric and magnetic fields.
- d) Hazardous materials.

### **IFC Performance Standards**

To manage the social and environmental risks and impacts of IFC projects, the IFC has developed a number of environmental and social performance standards (PS). The IFC PS indicate that the party responsible for implementing and operating the project must comply with the applicable national laws, including those laws implementing host country obligations under international law. The project operator is also required to meet the requirements of the standards throughout the life of an investment by IFC or other relevant financial institution. These are as follows:

- a) Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
- b) Performance Standard 2: Labour and Working Conditions
- c) Performance Standard 3: Resource Efficiency and Pollution Prevention
- d) Performance Standard 4: Community Health, Safety, and Security
- e) Performance Standard 5: Land Acquisition and Involuntary Resettlement
- f) Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- g) Performance Standard 7: Indigenous Peoples
- h) Performance Standard 8: Cultural Heritage

All the above Performance Standards are applicable for this Project other than PS 7 - Indigenous Peoples.

The IFC produces a number of Guidance Notes and other reference documents providing advice on undertaking ESIA. Specific guidance is contained in the Guidance Notes to the WB/IFC Performance Standards. The IFC's set of Guidance Notes provide guidance on the requirements contained in the WB/IFC Performance Standards, including reference materials on good sustainability practices to improve project performance. Those of relevance to this project include:

- Guidance Note A - Checklist of potential issues for an Environmental Assessment.
- Guidance Note B - Content of an ESIA Report
- Guidance Note C - Outline of an Environmental Action Plan.
- 

The following IFC handbooks are also relevant to the Project:

- a) Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets.
- b) Strategic Community Investment: A Good Practice Handbook for Companies Doing Business in Emerging Markets.
- c) Good Practice Handbook - Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets.
- d) Good Practice Note: Addressing Grievances from Project-Affected Communities.

### **Resettlement**

There are no physical settlements located directly on the land required for the project and therefore it is anticipated that there will be no physical displacement. However, transportation of project materials and equipment could result in the removal of certain physical structures and people along the target roads. The land is being used for agricultural purposes and there will therefore be some economic displacement. It is required that a separate Compensation Action Plan Report is to be prepared and presented as an Appendix to the Main ESIA report and impacts are expected to be addressed in the relevant sections of the Report.

For social aspects of the Project, VRA shall take into consideration certain basic documents of the World Bank Group Policies and Guidelines. These reference documents are as follows:

- a) The Operational Policy 4.12 Involuntary Resettlement issued on December 2001,
- b) The IFC Performance Standard 5: Land Acquisition and Involuntary Resettlement
- c) The IFC Guidance Note 5: Land Acquisition and Involuntary Resettlement which was lastly issued in 2007 but revised and updated in January 2012,
- d) IFC's Handbook on Preparing a Resettlement Action Plan.

The main objective of these documents is to ensure that potential adverse impacts on the community are mitigated through planning and undertaking appropriate measures and that people displaced as a result of a specific project financed by the World Bank Group receive benefits from the project. Considering these core issues, the following policy objectives of OP 4.12 are taken into account:

- a) Involuntary resettlement should be avoided when feasible, or minimized, exploring all viable alternative project designs.
- b) Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits. Displaced persons should be meaningfully consulted and should have opportunities to participate in the planning and implementing of resettlement programs.
- c) Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.”  
(WB, OP 4.12, p.1)

In agreement with these principles, involuntary resettlement could be avoidable for the wind power project. Thus, no physical displacement will be required for the local communities due to the land acquisition needed for the project. Rather, local people would only be subjected to economic displacement as a result of the project. As such and in line with the updated IFC PS 5 document, VRA would be required to prepare a Livelihood Restoration Plan (LRP) which will aim at compensating the Project-rooted losses and restoring livelihood of the project-affected persons only if economic displacement exists. Considering this change, it is proposed that an LRP for the Wind Power Project 2 be prepared.

### Equator Principles

The Equator Principles, revised in June 2013, are a set of voluntary principles for financial institutions to ensure that the projects financed are developed in an environmentally and socially responsible manner. The financial institutions that have signed up the Equator Principles are called Equator Principle Financial Institutions (EPFIs). The principles (see Table 4-2) are intended to serve as a common baseline and framework for the implementation by each EPFI. The Principles apply to all new EPFI project financings globally with total project capital costs of US\$10 million or more, and across all industry sectors.

**Table 4-2: Summary of Equator Principles**

Principle	Description
Principle 1: Review and Categorisation	Relates to the categorisation of projects based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the IFC.
Principle 2: Social and Environmental Assessment	Requires a Social and Environmental Assessment. The Assessment should propose mitigation and management measures relevant and appropriate to the nature and scale of the Project.
Principle 3: Applicable Social and Environmental Standards	Establishes the IFC PS and EHS Guidelines to complement the host country legislation as the basis for social and environmental performance.
Principle 4: Action Plan and Management System	Requires preparation of an Action Plan which should describe and prioritise the actions needed to implement mitigation measures, corrective actions and monitoring measures.
Principle 5: Consultation and Disclosure	Requires consultation with project affected communities in a structured and culturally appropriate manner, ensuring free, prior and informed consultation and facilitate informed participation.
Principle 6: Grievance Mechanism	Requires the establishment of a grievance mechanism as part of the management system which addresses concerns promptly and transparently, in a culturally appropriate manner, and is readily accessible to all segments of the affected communities.
Principle 7: Independent Review	Requires an independent social or environmental review of the Assessment.
Principle 8: Covenants	Requires compliance with all relevant host country social and environmental laws, regulations and permits, Action Plan implementation commitments, periodic reviews of reports, and facility decommissioning in accordance with an agreed decommissioning plan.
Principle 9: Independent Monitoring and Reporting	Requires ongoing monitoring and reporting over the life of the loan through the appointment of an independent environmental and / or social expert.
Principle 10: EPFI Reporting	Commits the EPFIs to report publicly at least annually about its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations.

The Equator Principles are based on the IFC PS on social and environmental sustainability and on the World Bank Group EHS Guidelines. These principles are relevant for the purposes of this Project as they represent industry best practice.

In accordance to Equator Principles, potential social and environmental issues to be addressed in Social and Environmental Assessment documentation include the following:

- Assessment of the baseline social and environmental conditions;
- Consideration of the feasible environmentally and socially preferable alternatives;
- Requirement under the host country laws and regulations, applicable international treaties and agreements;
- Protection of human rights and community health, safety and security (including risks, impacts and management of project's use of security personnel);
- Protection of cultural property and heritage;

- Protection and conservation of biodiversity, including endangered species and sensitive ecosystems in modified, natural and critical habitats, and identification of legally protected areas;
- Sustainable management and use of renewable natural resources (including sustainable resource management through appropriate independent certification systems);
- Use and management of dangerous substances;
- Major hazards assessment and management;
- Labour issues and occupational health and safety;
- Socio-economic impacts;
- Fire prevention and life safety;
- Land acquisition and involuntary resettlement;
- Impacts on affected communities, and disadvantaged or vulnerable groups;
- Impacts on indigenous peoples, and their unique cultural systems and values;
- Cumulative impacts of existing projects, the proposed project, and anticipated future projects;
- Consultation and participation of affected parties in the design, review and implementation of the project;
- Efficient production, delivery and use of energy; and
- Pollution and prevention and waste minimisation, pollution controls (liquid effluents and air emissions) and solid and chemical waste management.

#### **Organisation for Economic Corporation & Development**

The Organisation for Economic Corporation & development (OECD) recommends that Members, before taking decisions on officially supported export credits, apply the “Common Approaches” for addressing environmental and social issues relating to exports of capital goods and/or services and the locations to which these are destined.

Under “The Common Approaches”, the proposed WPP2 falls under the Category A listed projects requiring ESIA, as it is located near Songor Ramsar Site. ESIA are to be undertaken for “Projects which are planned to be carried out in sensitive locations or are likely to have a perceptible impact on such locations, even if the project category does not appear in the above list. Such sensitive locations include National Parks and other protected areas identified by national or international law, and other sensitive locations of international, national or regional importance, such as wetlands, forests with high biodiversity value, areas of archaeological or cultural significance, and areas of importance for indigenous peoples or other vulnerable groups”.

The defined safeguard instruments under the Common Approaches that needs to be adhered to are the “World Bank Safeguard Policies” and “IFC Performance Standards” and these have been discussed in detail in previous sections in this report.

#### **4.2.3 International Protocols & Conventions**

In addition to national policies and laws, there are also statutory provisions with broad requirements for conservation and protection of certain species and habitats and prevention of pollution emanating from international conventions and agreements. The Republic of Ghana is a signatory to a number of



international conventions on environmental protection and conservation as shown in Table 4-3, and those relevant to this project described in the subsequent sections:

**Table 4-3: Treaties & Conventions**

<b>Treaties and Conventions</b>	<b>Year Ratified</b>
African Convention on the Conservation of Nature and Natural Resources	1968
African Charter on Human and Peoples' Rights	1989
Convention on Biological Diversity	1992
The Convention on Wetlands of International Importance Especially Waterfowl Habitat (RAMSAR Convention)	1971
The Convention Concerning the Protection of World Cultural and Natural Heritage	1972
The Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matters, London	1972
The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington	1973
International Convention on Civil Liability for Oil Pollution Damage	1969
International Convention for the Conservation of Atlantic Tunas	1966
The United National Convention on Law of the Sea, Montego Bay	1982
The Convention on the Prevention of Marine Pollution from Ships (MARPOL)	1973
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (Intervention Convention)	1969
Convention on the International Regulations for Preventing Collisions at Sea (COLREGs)	1972
International Convention for the Safety of Life at Sea (SOLAS)	1974
Convention on Limitation of Liability for Maritime Claims (LLMC)	1976
International Convention on Standards of Training, Certification, and Watch keeping for Seafarers (STCW)	1978
International Convention of Oil Preparedness, Response and Co-operation (ORPC)	1990
International Convention on Civil Liability for Oil Pollution Damage	1969
International Convention on the Establishment of an International Fund for Compensation of Oil Pollution Damage	1971
International Covenant on Civil and Political Rights	2000
Montreal Protocol on Substances that Deplete the Ozone Layer	1993
International Covenant on Economic, Social and Cultural Rights	2000
Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movements of Hazardous Wastes within Africa	1990
The Vienna Convention on the Protection of Ozone Layer	1993
The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	2003
International Convention for the Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region-the Abidjan Convention	1981

***Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)***

This Convention on International Trade in Endangered Species (CITES) was adopted on 3<sup>rd</sup> March 1973 and came into force on 1st July 1975. The purpose of the Convention is to regulate the international trade in wild plants and animals that are at risk of extinction as a result of trade. The Convention seeks to control trade not only in live species but also in dead specimen and their derivatives.

### ***African Convention on the Conservation of Nature and Natural Resources ("African Convention")***

The African Convention on the Conservation of Nature and Natural Resources reaffirms the importance of natural resources both renewable and non-renewable, particularly the soil, water, flora and fauna. The main objective is to facilitate sustainable use the above resources. The above Convention was adopted in Algiers on 15th September, 1968 and came into force on 16th June 1969.

The convention was signed by Ghana in 1968. It obligates signatories to: "manage aquatic environments, whether in fresh, brackish, or coastal water, with a view to minimizing deleterious effects of any water and land use practice which might adversely affect aquatic habitats." (Art. VII, Sect. 1a)

"In the formulation of all development plans, full consideration shall be given to ecological, as well as economic and social factors." (Art. XIX, Sect. 3). "The Contracting States recognize that it is important and urgent to accord a special protection to those animal and plant species that are threatened with extinction, or which may become so, and to the habitat necessary to their survival." (Art. VIII, Sect. 1).

### ***Convention on the Conservation of Migratory Species of Wild Animals ("Bonn Convention")***

The convention was signed by Ghana in 1988. "The Parties acknowledge the need to take action to avoid and migratory species becoming endangered." (Art.11, Sect.2). "Parties that are Range States of a migratory species listed in Appendix I [endangered] shall endeavor: (a) to conserve and where feasible and appropriate, restore those habitats of the species which are of importance in removing the species from danger of extinction." (Art. III, Sect. 4).

### ***Ramsar Convention, 1971 (formerly Wetlands of International Importance, especially Waterfowl Habitats)***

The Convention on Wetlands of International Importance as Waterfowl Habitats is also referred to as Ramsar Convention. Its main objective is to promote conservation and wise use of wetlands by national action and international cooperation as a means to achieving sustainable development throughout the world. The Convention defines wetlands as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.

Member countries are to designate suitable wetlands within its territory for inclusion in a List of Wetlands of International Importance, hereinafter referred to as "the List" which is maintained by the bureau established under Article 8. The boundaries of each wetland shall be precisely described and also delimited on a map and they may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands, especially where these have importance as waterfowl habitat. The convention was signed by Ghana on March 1981 and ratified by Ghana on July 1989.

Ghana's coastal wetlands form an ecologically important unit, providing feeding, roosting and nesting sites for thousands of migratory and resident birds. Right of the coastal wetlands: Keta lagoon, Songor lagoon, Sakumo lagoon, Korle lagoon, Densu delta, Huni lagoon, Bimins Salt Pans and Busia beach, qualify as internationally important wetlands under the Ramsar\* criteria of supporting 20,000 waterfowls or 1% of the population of a waterfowl species. Keta and songor each holds over 100,000 seashore birds, and supports

internationally important numbers of seven species of waders. Sakumo, Densu delta, Korle and Huni each holds 23,000 -35,000 birds and supports internationally important populations of up to 6 wader species.

The Ghana coast is also important for marine turtles, providing nesting grounds for at least three species of turtles, all of which are listed in the IUCN Red Data list of Threatened Animals. Coastal wetlands provide nutrient rich habitats which are used for spawning and as nursery grounds by many species of fish. These wetlands therefore form a vital link for the survival of Ghana's declining marine fishery resource.

More importantly, Ghana's coastal wetlands provide resources such as, shell, salt, thatch and wood, which are major sources of income and play a significant role in the socio-economic and cultural life of the coastal communities. All the important coastal wetlands are threatened by pollution from both solid and liquid wastes from domestic and industrial sources and/or proposed urban/industrial developments. All the wetlands are situated in densely populated areas, and as human population in the country increases, the demands for wetland resources and the threats

#### ***United Nations Convention on Biological Diversity***

The three goals of the Convention are to promote the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising out of the utilization of genetic resources. Ghana being a signatory of this convention, it is supposed to work towards the achievement of the three goals. The convention calls for the adoption of national strategies, plans and programmes for the conservation and sustainable use of biological diversity into their relevant sectoral and cross-sectional plans, programmes and policies. One of the tools that are prescribed for the management of biodiversity is environmental assessment. Article 14 of the convention deals with impact assessment and minimization of adverse impacts. The convention was signed by Ghana on June 1992 and ratified on 1994.

As indicated, the WPP2 is to be located close to the Songor Ramsar Site, an environmentally sensitive area, and comprising of a large expanse of open lagoon, floodplain, marsh land and extensive mangrove stands, stretching for about 40 km along the coast, was also noted. There is therefore the likelihood of possible impact on marine and wetland's biodiversity during construction and operation of the project.

#### ***United Nations Framework Convention on Climate Change***

The primary purpose of the Convention is to establish methods to minimize global warming and in particular the emission of the greenhouse gases (GHG). The United Nations Framework Convention on Climate Change (UNFCCC) was adopted on 9th May 1992 and came into force on 21st March 1994. The Convention has been ratified by 189 states. The UNFCCC provides the basis for global action to protect the climate system for present and future generations. The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention enjoys near universal membership, with 189 countries having ratified.

The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not

threatened and to enable economic development to proceed in a sustainable manner. Under the Convention, governments:

- a) Gather and share information on greenhouse gas emissions, national policies and best practices.
- b) Launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and
- c) Cooperate in preparing for adaptation to the impacts of climate change.

Ghana became a party to the United Nations Framework Convention on Climate Change (UNFCCC, hereinafter referred to as the Convention) after ratification in September 1995. Upon ratification, Ghana had committed itself to pursue coordinated actions to reduce greenhouse gas (GHG) emissions and climate change impacts on the most vulnerable people, while continuing to advance national economic development. As a party to the Convention, Ghana has an obligation under Article 4, paragraph 1, and Article 12, paragraph 1 of the Convention to regularly prepare, publish and report its national communication to the Conference of Parties (COP) to the UNFCCC.

In 2000 and 2011, the country submitted its first and second national communications respectively to the Conference of Parties (COP) to the UNFCCC. The Third National Communication (TNC) is prepared in compliance consistent with Ghana's obligations under the Convention. The main objective of the TNC was to prepare, update and communicate to the COP, policies and measures Ghana has taken and envisaged to implement the convention in the country and at the regional level. Components being reported on include Energy, Industrial Processes and Product Use, Agriculture, Forestry and Other Land Use and Waste.

Ghana intends to increase the contribution of RE source (including hydro, solar, biomass and wind) by 10% for grid, mini grid and off-grid applications; by 2020, thus the development of the wind power projects is one of the proposed carbon offsets projects in Ghana.

### **Kyoto Protocol**

UNFCCC has been identified as only the initial step in the international response to climate change. Climate prediction models showed that greater reductions in emissions will be needed to prevent serious interference with the climate. The Kyoto Protocol to the United Nations Framework Convention on Climate Change [5], agreed in December 1997, was designed to address this issue. The Protocol has since been ratified by over 150 countries, including Ghana, and entered into force (becoming legally binding) on 16th February 2005.

The 1997 Kyoto Protocol shares the Convention's objective, principles and institutions, but significantly strengthens the Convention by committing developed countries to individual, legally-binding targets to limit or reduce their overall greenhouse gas emissions (of carbon dioxide, methane, nitrous oxide, hydro fluorocarbons, perfluorocarbons and sulphur hexafluoride). Developing countries are not required to reduce emissions of greenhouse gases to specific targets as yet on the basis that it is industrialised countries that produce most of the emissions and more urgently need to take corrective action.

Developing countries were asked to contribute as far as possible, but were not bound to take action, under the principle of 'shared but differentiated responsibility'. The Kyoto Protocol sets out how developing countries must monitor and report on their greenhouse gas emissions. There are also agreements on how the international community must help developing countries adapt to the impacts of climate change.

Developed countries must put in place domestic policies and measures to help mitigate climate change and promote sustainable development. A key mechanism is the Clean Development Mechanism (CDM) under Article 12 of the Kyoto Protocol. The Kyoto Protocol provisions allow for the use of the clean development mechanism (CDM), under which, beginning in 2000, greenhouse gas emissions from projects in non-Annex I countries that are certified by designated operating entities can be acquired by Annex I countries and credited against their emissions binding commitments. The CDM allows Annex I Parties to implement project activities that reduce emissions and contribute to sustainable development in non-Annex I Countries while claiming the resulting emissions reductions for themselves. The availability of CDM financing may alter, in some cases, the choice of the least-cost project alternative.

Currently, VRA has initiated a Carbon Accounting Programme, with assistance from the Ghana EPA, and from 2016, will be reporting annually on its carbon emissions for the generating plants as well as carbon offsets projects.

***Convention for Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (Abidjan Convention).***

This Convention was signed by Ghana on March 1981 and ratified on July 1989. The convention covers the marine environment, coastal zones and related inland waters falling within the jurisdiction of the States of the West and Central African Region, from Mauritania to Namibia inclusive, which have become Contracting Parties to this Convention under conditions set forth in article 27 and paragraph 1 of article 28 (hereinafter referred to as the Convention area).

The Contracting Parties shall, individually or jointly as the case may be, take all appropriate measures in accordance with the provisions of this Convention and its protocols in force to which they are parties to prevent, reduce, combat and control pollution of the Convention area and to ensure sound environmental management of natural resources, using for this purpose the best practicable means at their disposal, and in accordance with their capabilities.

### **4.3 PRINCIPLES FOR SCOPING AND PUBLIC PARTICIPATION**

The public participation process (PPP) for this Scoping and ESIA Process is being driven by a stakeholder engagement process that will include inputs from authorities, Interested & Affected Parties (I&APs), technical specialists and the project proponent. Effective public participation also improves the ability of the Competent Authority (CA) to make informed decisions and results in improved decision-making as the view of all parties are considered.

An effective PPP could therefore result in stakeholders working together to produce better decisions than if they had worked independently.

- It provides an opportunity for I&APs, EAPs and the CA to obtain clear, accurate and understandable information about the environmental impacts of the proposed activity or implications of a decision;
- Provides I&APs with an opportunity to voice their support, concern and question regarding the project, application or decision;



- Enables an applicant to incorporate the needs, preferences and values of affected parties into its application;
- Provides opportunities for clearing up misunderstanding about technical issues, resolving disputes and reconciling conflicting interests;
- Is an important aspect of securing transparency and accountability in decision-making; and
- Contributes toward maintaining a health, vibrant democracy.

To the above, one can add the following universally recognised principles for public participation:

- Inclusive consultation that enables all sectors of society to participate in the consultation and assessment processes;
- Provision of accurate and easily accessible information in a language that is clear and sufficiently non-technical for I&APs to understand, and that is sufficient to enable meaningful participation;
- Active empowerment of grassroots people to understand concepts and information with a view to active and meaningful participation;
- Use of a variety of methods for information dissemination in order to improve accessibility, for example, by way of discussion documents, meetings, workshops, focus group discussions, and the printed and broadcast media;
- Affording I&APs sufficient time to study material, to exchange information, and to make contributions at various stages during the assessment process;
- Provision of opportunities for I&APs to provide their inputs via a range of methods, for example, via briefing sessions, public meetings, written submissions or direct contact with members of the ESIA team.
- Public participation is a process and vehicle to provide sufficient and accessible information to I&APs in an objective manner to assist I&APs to identify issues of concern, to identify alternatives, to suggest opportunities to reduce potentially negative or enhance potentially positive impacts, and to verify that issues and/or inputs have been captured and addressed during the assessment process.

At the outset, it is important to highlight two key aspects of public participation:

- There are practical and financial limitations to the involvement of all individuals within a PPP. Hence, public participation aims to generate issues that are representative of societal sectors, not each individual. Hence, the PPP will be designed to be inclusive of a broad range of sectors relevant to the proposed project.
- The PPP will aim to raise a diversity of perspectives and will not be designed to force consensus amongst I&APs. Indeed, diversity of opinion rather than consensus building is likely to enrich ultimate decision-making. Therefore, where possible, the PPP will aim to obtain an indication of trade-offs that all stakeholders (i.e. I&APs, technical specialists, the authorities and the development proponent) are willing to accept with regard to the ecological sustainability, social equity and economic growth associated with the project.

#### **4.4 OBJECTIVES OF THE SCOPING PROCESS**

This Scoping Process is being planned and conducted in a manner that is intended to identify and provide sufficient information to enable the authorities to reach a decision regarding the scope of issues to be addressed in this ESIA Process, and in particular to convey the range of specialist studies that will be

included as part of the Environmental Impact Reporting Phase of the ESIA, as well as the approach to these specialist studies.

As highlighted in Chapter 1 of this Scoping Report, within this context, the objectives of this Scoping Process are to:

- Identify and inform a broad range of stakeholders about the proposed development;
- Confirm the process to be followed and opportunities for stakeholder engagement;
- Clarify the project scope to be covered;
- Identify and confirm the preferred activity and technology alternative;
- Identify and confirm the preferred site for the preferred activity;
- Clarify the alternatives being considered and ensure due consideration of alternative options regarding the proposed development, including the “No-go” option;
- Conduct an open, participatory and transparent approach and facilitate the inclusion of stakeholder issues in the decision-making process;
- Identify and document the key issues to be addressed in the impact assessment phase (through a process of broad-based consultation with stakeholders) and the approach to be followed in addressing these issues; and
- Confirm the level of assessment to be undertaken during the impact assessment

#### **4.5 TASKS IN THE SCOPING PHASE**

This section provides an overview of the tasks being undertaken in the Scoping Phase, with a particular emphasis on providing a clear record of the PPP followed. As discussed in Chapter 1 of this Scoping Report, a gas-to-power project is being proposed by the Applicant which requires a Scoping and ESIA Process.

##### **TASK 1: I&AP IDENTIFICATION, REGISTRATION AND THE CREATION OF AN ELECTRONIC DATABASE**

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Appendix B of this Scoping Report contains the current I&AP database, which has been updated to include requests to register interest in the project, and comments received. At the time of compiling this Scoping Report, the database stands at 63 I&APs, who will be informed about the availability of the Scoping Reports for comment.

While I&APs have been encouraged to register their interest in the project from the start of the process, following the public announcements (refer to Task 2), the identification and registration of I&APs will be ongoing for the duration of the study. Stakeholders from a variety of sectors, geographical locations and/or interest groups can be expected to show an interest in the proposed project, for example:

- Local Government Departments;
- Local interest groups, for example;
- Surrounding landowners;
- Farmer Organisations;
- Environmental Groups and NGOs; and
- Grassroots communities and structures.

In terms of the electronic database, I&AP details are being captured and automatically updated as and when information is distributed to or received from I&APs. This ongoing record of communication is an

important component of the PPP. It must be noted that while not required by the regulations, those I&APs proactively identified at the outset of the Scoping Process will remain on the project database throughout the ESIA Process and will be kept informed of all opportunities to comment and will only be removed from the database by request.

### **TASK 2: ANNOUNCEMENT OF THE SCOPING PROCESS**

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In order to notify and inform the public of the proposed project and invite I&APs to register on the project database, the project and ESIA Process will be advertised in national newspapers such as the Daily Graphic, Ghanaian Times. A draft of the advertisement as shall be placed in the newspapers is shown in Appendix C of this report.

In addition to the newspaper advertisement, a Background Information Document (BID) inviting possible I&APs to register for the project has been made available to key stakeholders. This BID which is shown in Appendix D provides I&APs with an opportunity to register their interest on the project database. The purpose of the BID was to inform the public of the proposed projects, provide information on the project description, the ESIA Processes and to provide an overview of the opportunities and mechanisms for public participation. As indicated earlier under Section 1.6, issues raised by I&APs in line with the BID will be captured in an Issues and Responses Trail and will be included in the Plan of Study for ESIA and the Draft ESIA Report.

### **TASK 3: ONGOING COMMUNICATION AND CAPACITY BUILDING**

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The process for this Scoping and ESIA aims to ensure that people are involved from the outset, that we proactively solicit the involvement of stakeholders representing all three dimensions of sustainability (i.e. biophysical, social and economic dimensions), and that we provide them with sufficient and accessible information to contribute meaningfully to the process. In this manner, the PPP aims to build the capacity of stakeholders to participate.

Within the context of the ESIA Process, capacity building is not viewed as a “once off” event, but rather a series of events and/or information sharing which provides information on a continuous basis thereby building the capacity and knowledge of I&APs to effectively participate in the ESIA Process and raise issues of concern.

Public participation by its very nature is a dynamic process with various sectors of society having varying needs, values and interests. The core question for public participation is “*How can I, the interested and affected party, meaningfully participate in the process?*” This varies according to the needs of I&APs. The PPP should be inclusive of all I&APs, and afford them the opportunity to raise their issues and concerns in a manner that suits them. All aspects such as varying socio-economic, literacy and language levels all of which need to be considered in the participation process. For example, certain I&APs may want to receive documentation only and not attend meetings, some I&APs may want to only attend meetings, other I&APs may not want to attend meetings and send their comments in writing, and some I&APs may want to be actively involved throughout the process.

In order to accommodate the varying needs of I&APs and develop their capacity to participate in the process, information sharing forms an integral and ongoing component of the ESIA Process to ensure effective public participation. The following provides an overview of how information sharing is being

effected throughout the ESIA Process in order to develop the capacity of I&APs to effectively engage in the PPP:

- **BID** – which contains information on the proposed projects, the ESIA Process and PPP;
- **Report Distribution** – providing hard copies of the Scoping and ESIA Reports at the Ada West District Assembly for I&APs to access for viewing. Electronic copies of the reports would also be made available on the VRA Corporate website. Key organs of state will be provided with hard copies and/or electronic copies of the reports;
- **Public Meeting** – a public meeting could possibly be held during the review of the ESIA Report if warranted and if there is substantial public interest during the ESIA Phase. Furthermore, telephonic consultations with key I&APs will take place, upon request; and
- **Focus Group Meetings** – may be undertaken (depending on the interest in the projects) with key I&AP groups (surrounding landowners, affected organs of state, environmental organisations, etc).

#### **TASK 4: CONSULTATION WITH AUTHORITIES**

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All public participation documentation will reach the EPA, as well as other relevant authorities and organs of state included on the I&AP database. Additionally, consultation with relevant authorities on a one-on-one basis will be effected where necessary and notes from these meetings will be compiled summarising the main outcomes thereof. Comments received on the Scoping Process from the authorities will be included in the Issues and Response Trail as an appendix to the Scoping Report (which will be submitted to the EPA for decision-making).

#### **TASK 5: TECHNICAL SCOPING WITH PROJECT PROPONENT AND ESIA TEAM**

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The Scoping Process has been designed to incorporate two complementary components: a stakeholder engagement process that includes the relevant authorities and wider I&APs; and a technical process involving the ESIA team and the project proponent.

The purpose of the technical Scoping Process is to draw on the past experience of the ESIA team and the project proponent to identify environmental issues and concerns related to the proposed project, and confirm that the necessary specialist studies have been identified. The specialist team has worked with the SELJEN and CSIR on several other projects in the Ghana and South Africa. The specialists were therefore able to identify issues (as shown in Chapter 6 of this Scoping Report) to be addressed in the ESIA based on their experience and knowledge of the area and type of activity. Their inputs have informed the scope and Terms of Reference for the specialist studies (as included in Chapter 8 of this Scoping Report). The findings of the Scoping Process with the public and the authorities will inform the specialist studies, which will only be completed after the public Scoping Process has been finalised.

#### **TASK 6: CONSULTATION WITH WIDER I&APS (PUBLIC) TO IDENTIFY ISSUES AND CONCERNS**

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As noted above, in order to accommodate the varying needs of I&APs as well as capture their views and issues regarding the project, a comment and registration period began at the start of the project. The comments received from I&APs, via fax, email and at public meetings have been captured in the Issues and Responses Trail contained in Chapter 7 of this Scoping Report. The Issues and Responses Trail includes comments received from affected authorities in response to the first notification distributed on the project. Appendix G of this Scoping Report contains copies of all the comments received.

The Issues and Responses Trail (Chapter 7) also includes responses from the ESIA team (and, in some cases, the project proponent) to the issues raised. In general, the responses indicate how the issues will be addressed in the ESIA Process. In some cases, immediate responses and clarification were provided. Where issues were raised that the ESIA team considers beyond the scope and purpose of this ESIA Process, clear reasoning for this view is provided.

The Scoping Process is currently at this stage, when I&APs are invited to review the Scoping Report. This stage and the forthcoming steps in the Scoping Process are presented below.

As noted above, various opportunities have been provided for I&APs to have their issues noted prior to the release of the Scoping Report. These include:

- BID and a Comment and Registration Form
- Newspaper advertisement placed, and
- Written, faxed or email correspondence.

#### **TASK 7: REVIEW OF THE SCOPING REPORT (CURRENT STAGE)**

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This stage in the process entails the release of the Scoping Report for a 60-day period for public review. The Scoping Report, reflecting the comments received so far will be submitted to the EPA for decision-making. In line with best practice, I&APs on the project database will be notified of the submission of the Scoping Reports to the EPA for decision-making as well as for their review. The EPA usually has 25 days (from receipt of the Scoping Reports) to either accept the Scoping Reports with or without conditions, or refuse EP.

- **Correspondence to I&APs** – Letter or emails to notify I&APs of the release of the Scoping Reports and the comment period will be sent via registered mail and email (where postal, physical and email addresses are available for I&APs and organs of state on the project database). The letter will include an Executive Summary of the Scoping Reports and a Comment and Registration Form;
- **Availability of Information** - the Scoping Reports will be made available for review by I&APs and key authorities through the following means:
  - The Scoping Reports will be placed at the Ada West District Assembly and the VRA Head office in Accra as well as that of the Engineering Services and Environment & Sustainable Development Departmental Libraries in Akuse and Akosombo respectively.
  - Key authorities will be provided with either a hard copy and/or CD of the Scoping Reports.
  - Telephonic consultations will be held with key I&AP and organs of state groups, as necessary.

Following the 60-day review of the Scoping Report, all issues will be captured. This step marks the end of the PPP for the Scoping Phase. The PPP for the subsequent ESIA Phase is presented in the Plan of Study for ESIA (Chapter 9).

## **4.6 SCHEDULE FOR THE ESIA**

The proposed schedule for the ESIA is presented in Table 4.4. It should be noted that this schedule could be revised during the ESIA Process, depending on factors such as the time required for decisions from authorities.





Environmental Impact Assessment  
for 75MW Wind Power Project 2,  
situated at Wokumagbe and Goi  
in the Ada West District of the  
Greater Accra Region

# CHAPTER 5: Stakeholder Engagements

# SCOPING REPORT



**VOLTA  
RIVER  
AUTHORITY**

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## 5 STAKEHOLDER ENGAGEMENTS

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### 5.1 INTRODUCTION

A stakeholder to the project refers to any individual or group which is potentially affected directly or indirectly by the proposed project or who has an interest in the proposed Project and its potential impacts. Subsequently, the rationale for any stakeholder engagement is to help to identify potential points of disagreements between stakeholders, ethnic / gender / religious / political based tensions, raised expectations by the project and emerging social problems that require attention and with which the project developer may be able to assist.

Stakeholder engagement is an ongoing process that may involve, in varying degrees, the following elements: stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism, and ongoing reporting to Affected Communities. The nature, frequency, and level of effort of stakeholder engagement may vary considerably and will be commensurate with the project's risks and adverse impacts, and the project's phase of development.

The principles for public participation process for this project has been detailed out under Section 4.3 of this Scoping Report. The engagement process has been designed to meet Ghanaian legal requirements for public participation and to align as far as practically possible with good international industry best practice (GIIP), based on the project timing and budget.

This chapter presents a summary of the engagement activities undertaken as well as future engagement activities planned as part of the ESIA process for the wind power project. Participatory and consultative approach was employed for information dissemination and data collection. At this stage, the ESIA project team has conducted the scoping round of engagement with various stakeholders/bodies within the project area comprising of community members, comprising of traditional authorities, property affected person as well as representatives from state agencies and the details of the I&APS engaged so far provided in Appendix B. Further, pictures of the various stakeholder consultations are provided in Appendix E.

### 5.2 STRATEGIES FOR PROJECT BRIEFING

#### 5.2.1 *Background Information document*

As part of project briefing to the general public, a Background Information Document (BID) has been prepared for the project for the information of Interested and Affected Party (I&AP). The rationale for the BID is to allow I&APs to register their interest in the project in order to get the opportunity to be involved in the Scoping and ESIA Processes through receiving information, raising issues of concern and commenting on reports. Inputs from I&APs, together with the information and assessment provided by the ESIA Specialists is expected to assist the Environmental Protection Agency with their decision-making in terms of whether to grant or refuse an environmental permit for the proposed projects.

#### 5.2.2 *Verbal Communication*

Verbal brief, in Akan (local language) or in English language as may be appropriate, on project information provided the stakeholders were as follows:

- a) Increased electricity demand requires that other sources of generation are developed to meet the demand.
- b) VRA's REDP intends to develop a mixed Renewable Energy portfolio in various potential locations noted/established to have available RE resources
- c) VRA has since 2014 undertaken a one-year wind measurement at 8 locations in Ghana for the development of the first 150MW of Wind Energy.
- d) Various sites have been identified within the Anloga Beach, Anyanui and the road leading to Saviotula Junction at Srogbe within the Keta Municipality as potential sites for a 75MW.
- e) Again, sites have been identified at Goi and Workumagbe in the Ada West District as potential sites for a 75MW.
- f) Feasibility studies are now ongoing to finalise the design for the project at the various sites.
- g) Project development will entail the following:
  - ✓ Construction of Access and Internal road network linking all wind turbines
  - ✓ Procurement and Installation of the finally selected Wind turbines, made up of 75 MW, 38 VESTAS V110 each with 2 MW nominal power and on a hub height of 95 m.
  - ✓ Installation of corresponding number of step-up transformers mounted at the foot of each turbine tower
  - ✓ Construction of operations and control building; substation and grid connection.
  - ✓ The integration of the wind farm to the existing grid will be done by the construction of a new 161/33 kV substation (100 MVA) in the Wind Farm ("wind farm substation"); preliminarily it is assumed to be implemented in the northwest area of the wind farm and a new to be built 161 kV overhead transmission line (OHL) of approximately 40 km to the existing grid at the Tema substation.
  - ✓ Within the wind farm, all 38 WTGs will be connected on MV level to the sub-station.
  - ✓ Construction of underground electrical collection system leading to the project substation
  - ✓ Impact during Construction phase
- h) Operation of the wind farm will require the following environmental issues to be addressed:
  - ✓ Land Use Changes
  - ✓ Visual Effects
  - ✓ Noise Effect
  - ✓ Flicker Effects
  - ✓ Cultural Heritage and Archaeological Issues
  - ✓ Flora
  - ✓ Fauna (Wildlife, Birds)
  - ✓ Wetland Impacts
  - ✓ Aviation & Telecommunications Impact
  - ✓ Wind Farm Development Advantages (positive effects)
  - ✓ Recreational and Tourism Issues
- i) VRA has engaged SCL and CSIR-SA to undertake the ESIA for the study.
- j) The scoping phase of the ESIA is on-going and relevant health, safety, environmental, social and economic issues are being identified for input into the ESIA study report.
- k) Studies being undertaken include Flora & Faunal Assessment, Bird Assessment, Heritage and Archaeological Assessment, Wetland Impact Assessment, Aviation & Communication Impact, Property Valuation, Noise and Flicker Impact, Socio-Economic Evaluation & Assessment.



- l) As part of the Scoping phase, SCL is mandated to undertake stakeholder engagement and issues raised by stakeholders are to inform the terms of reference for the study which will guide the client in the finalisation of the project design.
- m) It is expected that the ESIA Studies for the 2 projects are to be completed by June 2016 for which an Environmental permit is to be issued to allow for physical construction to commence.
- n) Physical construction could commence by close of 2017.

### **5.2.3 Power Point Presentation**

A power point presentation on the key issues on the project has been prepared and is made to stakeholders during the engagements where applicable.

## **5.3 MEETING WITH PROJECT AFFECTED COMMUNITIES**

At the scoping sessions with communities around the proposed site, groups and individuals were first provided all relevant information about siting of, construction at and operation of the Wind Farm and the Consultants' experience on projects similar to the one that is being proposed. The community representatives consulted were:

- ✓ Chief and Elders of the project affected community of Goi
- ✓ Chief and Elders of the project affected community of Wokumagbe
- ✓ Chief and Elders of the project affected community of Omankope, who were contesting the project land at Wokumagbe

Some of the resident communities already knew about the project, but did not know the specific details, particularly about the environmental issues involved.

## **5.4 MEETING WITH GENERAL ASSEMBLY OF THE ADA WEST DISTRICT**

The ESIA team took opportunity of the General assembly of the Ada West District Assembly held on March 31, 2016 at the Ada West District Assembly hall and briefed them on the project. The Presiding Member of the General Assembly, Member of Parliament of the Ada West Constituency, Assembly persons of the various communities within the district including that of Goi and Wokumagbe and representatives of the under-listed state agencies participated in the meeting:

- ✓ Ada West District Assembly
- ✓ Ghana Education Service
- ✓ Physical Planning Department
- ✓ Department of Social Welfare
- ✓ Department of Community Development
- ✓ Environmental health & Sanitation Department
- ✓ National Disaster Management Organization
- ✓ Information Services Department
- ✓ Works Department
- ✓ Ghana National Fire & Rescue Services

Signed List of participants at the General Assembly's forum is attached as Appendix E.

## **5.5 CONSULTATIONS WITH STATE AGENCIES**

WPP2 is to be subjected to an environmental assessment and permitting prior to construction as required under the Environmental Protection Agency Act, 1994 (Act 490). Subsequently, as indicated under Chapter 2.4 of this report, VRA has formally registered the project with the EPA as part of project consultations process. The EPA has by letter dated February 26, 2016 confirmed that the project falls under the category for which an EIA and an Environmental Scoping Study is required in order to generate the relevant terms of reference to guide satisfactory EIA study of the propose project. It was further indicated that the scoping was 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. EPA's Response to Project Registration is attached as Appendix A. It is based on this that the Scoping Report for WPP2 has been prepared for review both by EPA and the general public.

The Energy Commission is expected to provide a provisional license for the WPP 1, and this has already been achieved. A Provisional License, dated 27 July 2015, has been issued by the Energy Commission to allow VRA to generate and Supply Electricity from wind energy at Wokumagbe and Goi in the Ada West District of the Greater Accra Region and this is attached as Appendix G.

Approvals will also be needed from Ghana Civil Aviation Authority as well as National Communication Authority in case the project is sited near or under the aircraft flyway zone and telecommunication masts. Each of these departments has individual requirements for grant of approvals. Subsequently, VRA has formally notified the Ghana Civil Aviation Authority (GCAA) of its intention to construct the wind power facilities. The GCAA has per letter dated February 3rd 2014 requested the VRA to complete a Form GCAA/SRD/ASAS - 01 to enable its safety inspectors conduct the aeronautical assessment of the proposed site(s). This was confirmed by the Mrs. Anita Adjei Nmasie, Manager, Aerodrome Safety & Standards during an initial consultation with GCAA to confirm the requirements for this assignment.

VRA subsequently in March 2014 completed and forwarded the forms with associated cadastral maps to GCAA. VRA further in June 2015 formally requested GCAA to advise on regulations on lighting and painting requirements for the wind turbines as well as any other regulations that has to be adhered to for the wind farms. GCAA is yet to response to these requests. Meanwhile, Aviation Impacts Experts have been engaged and are conducting the relevant assessment as part of the ESIA exercise to determine possible aviation impacts.

Although no major impact is anticipated, communications operators may need to be contacted, during the initial stages of development. SCL in May 2016 formally notified the NCA of the project, and made available a copy of the Background Information document for their review. NCA is yet to respond to this formal notification. Details of these consultations are to be made available in the ESIA Report.

From February to March 2016, initial one-on-one meetings were held with officials of various state agencies within the Ada West District. This included the District Coordinating Director who is also acting as the District Chief Executive, Alhassan Ziblim and Hon. Christian Corletey Otuteye, the Member of Parliament of the Sege Constituency. A major formal consultation was held with relevant state agencies within the Keta Municipal on April 13, 2016 in the at the District Assembly to brief them on the project to allow for the relevant issues of concern to be discussed. At this forum, the purpose of the ESIA and the steps to be followed when conducting the ESIA was presented. Signed List of participants at the State agency's forum is attached as Appendix E.

State agencies within the Keta Municipal consulted so far are listed below:

- ✓ Town & Country Planning Department
- ✓ Information Services Department
- ✓ Physical Planning Department
- ✓ Department of Agriculture
- ✓ Department of Community Development
- ✓ National Commission for Civic Education
- ✓ National Disaster Management Organization
- ✓ Works Department
- ✓ Ghana National Fire & Rescue Services
- ✓ Ghana Wildlife Department
- ✓ Department of Urban Roads
- ✓ Department of Agriculture
- ✓ Department of Social Welfare
- ✓ National Commission of Civic Education

## 5.6 ISSUES & RESPONSES TRAIL

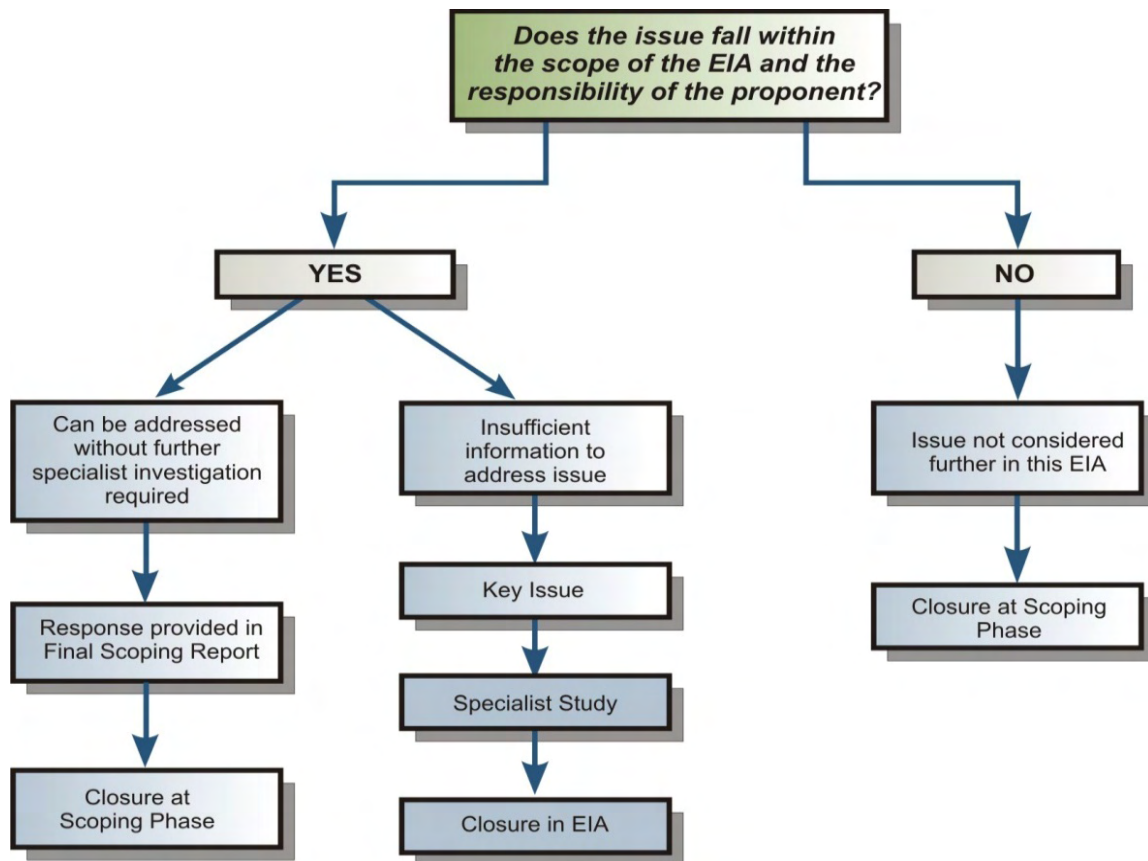
As shown above, issues were sourced by the SELJEN team from the following Scoping interactions:

- *Telephone* – issues raised by I&APs during telephonic consultations;
- *Email* – issues sent to SELJEN Consult via email correspondence; and
- *Comment Form* – issues submitted to via the Comment Form that was provided with the Background Information Document (BID)
- *Public meetings held with stakeholders during the course of the scoping phase*

From the public meetings, h the communities and other stakeholders, including the state agencies, generally welcomed the plans to establish the proposed wind 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.

An important element of the Scoping process is to evaluate the issues raised through the Scoping interactions with the specialists, authorities and the public, the ESIA team and the project proponent. In accordance with the philosophy of Integrated Environmental Management, it is important for the ESIA to focus on the key issues. To assist in the identification of key issues, a decision-making process is applied to the issues and concerns raised, based on the following criteria (Figure 5.1):

1. Whether or not the issue falls within the scope and responsibility of the proposed WPP1 project ESIA; and
2. Whether or not sufficient information is available to respond to the issue or concern raised without further specialist investigation.



**Figure 5-1 Decision-making framework for identification of key issues for the ESIA**

Issues raised during the stakeholder engagements prior to the release of the Scoping Report, together with responses from the ESIA team is outlined in Table 5-1.

### 5.7 NEXT STEPS IN THE STAKEHOLDER ENGAGEMENT PROCESS

As required, consultation for the project will be an ongoing process and therefore will see another round of information sessions and displays as well as other activities undertaken during the main ESIA. These activities will include public notices, one-on-one meetings and responses to emails, telephone and written enquires with state agencies and a district based public forum. A synthesis of issues to be addressed in the Specialist Studies is provided in the Plan of Study for ESIA (Chapter 6). The results of the Specialist Studies will be made available to I&APs for comments during the district based public forum as well as part of the Draft ESIA Report. All comments received following the release of the Scoping Report, through meetings and written correspondence will be made available in the main ESIA Report.

### 5.8 PUBLIC DISCLOSURE

According to the requirements under the Ghana EIA process in accordance to the Regulation 15 (1) of LI 1652, the Administrative procedure for scoping exercise required that the public is adequately and appropriately informed. The IFC Disclosure Policy (1998) highlights the importance of accountability and transparency in the development process of projects. Under the “**Equator Principle 10: Reporting &**

**Transparency**”, clients are committed to ensure that, at a minimum, a summary of the ESIA is accessible and available online. From these, it is recognised that disclosure of information throughout the project will help to ensure accountability and transparency and this has been reiterated at the various stakeholder engagements that the project has conducted so far.

Furthermore, a Scoping Notice on the project will be advertised in any of the national newspapers. Notices of the Scoping Report are to be issued to relevant ministries, departments and agencies including the Ada West District Assembly. Further, the notice shall be posted at appropriate locations including the project site and adjoining facilities, within the communities and the premises of the District Assembly. The Scoping Notice / Scoping Report shall be posted on the corporate website at [www.vra.com](http://www.vra.com). All those with concerns, interests or special knowledge relating to potential environmental effects of the proposed undertaking are to contact or submit such concerns to the VRA or the EPA. Such comments are to be reviewed and addressed as necessary and incorporated in the ESIA report, and plans are that they will subsequently have an impact on the project design, construction and operation. Sample of the Scoping Notice is attached as Appendix D and it follows the format as prescribed by the Ghana EPA.

It is expected that following the preparation of the Draft ESIA Report, an advertisers’ Announcement will be made in a widely circulating national dailies for the general public to assess and make inputs into the Draft ESIA Report. Copies of the Draft ESIA Report will be made available at the following locations:

- ✓ VRA Corporate website
- ✓ VRA Head Office Library in Accra
- ✓ VRA Environment & Sustainable Development Department Library in Akosombo
- ✓ EPA Head office in Accra
- ✓ EPA Accra East Area Office in Tema
- ✓ Ada West District Assembly

As part of the disclosure processes, VRA will also give approval for potential funding agencies to publicly disclose the Draft ESIA report on their online portal. The Final ESIA Report shall also be available in the offices of VRA and the website as well as the EPA for public disclosure purposes.

**Table 5-1: Issues raised by I&APs**

Date	Stakeholder	Location	Summaries of Main Inquiries, Proposals and Concerns presented by Stakeholders	Response
February 17, 2016	Chief and Elders of Wokumagbe	Regent House	1. They have been briefed on the project by the personnel from the VRA	No Response needed.
			2. They are glad that their community has been chosen for such a project	No Response needed.
			3. They want the negotiation for the acquisition of their land done quickly and the payment done promptly	This will be done after the project site has been properly demarcated and the total area clearly determined. VRA recognises that compensation issues are key to the success of the project. To facilitate compensation payments, Land owners are urged to have a proper land title document to their property. VRA will also conduct further checks to determine the true owners of the land before compensations are paid.
			4. They expect the other packages such as scholarships and provision other social amenities for the people	The community will benefit from the VRA's Community Development programme which provides among others, educational scholarships to needy students in project impacted communities.
			5. They want workers to be recruited from the community	This is dependent on the skill set available within the community and what is required to successfully execute the project. Meanwhile, the Local content policy of VRA will be applicable to the project and the contractor will be required to consider locals for recruitment



Date	Stakeholder	Location	Summaries of Main Inquiries, Proposals and Concerns presented by Stakeholders	Response
			6. They want workers to respect their traditions and observe festivals	These issues are being captured during the ESIA study and will be made known to the contractor for adherence. The workers and the entire team will be adequately briefed on these traditional rights and festivals.
February 18, 2016	Ada West District Education Directorate	Office of the Assistant Director, In Charge of Supervision	1. The request that VRA provide additional educational facilities such as School blocks and furniture, District Education Office, and other material such as text books, balls and jerseys, among others.	The community will benefit from the VRA's Community Development programme which provides among others, educational scholarships to needy students in project impacted communities.
17 <sup>th</sup> and 19 <sup>th</sup> February, 2016	Chief and Elders of Goi	Under coconut trees at the beach	1. They are aware of the choice of their community for the project	No Response needed.
			2. They indicated that the presence of the project will lead to an influx of people for jobs and related activities	They were urged to take advantage of this positive economic effect. Meanwhile, the Local content policy of VRA will be applicable to the project and the contractor will be required to consider locals for recruitment
			2. They demanded an immediate meeting with the VRA estate department concerning the size of the land they require, its location among others	This will be done after the project site has been properly demarcated and the total area clearly determined
			3. They will not cooperate with any consultant(s) or land demarcation until VRA arrange a meeting with them.	This was noted and the information will be conveyed to the VRA. However, any grievance should be communicated formally using the BID.
February 17, 2016	Chief and Elders of Omarkope	Pentecost Church, Omarkope	1. They are aware of the choice of their community for the project	No Response needed.
			2. They are of the view that the land at Wokumagbe belong to them. The people of Wokumagbe are only settlers on their land	VRA recognises that compensation issues are key to the success of the project. To facilitate compensation payments, Land owners are urged to have a proper land

Date	Stakeholder	Location	Summaries of Main Inquiries, Proposals and Concerns presented by Stakeholders	Response
			3. They will not incorporate with any consultant(s) or land demarcation until VRA arrange a meeting with them.	title document to their property. VRA will also conduct further checks to determine the true owners of the land before compensations are paid. This was noted and the information will be conveyed to the VRA. However, any grievance should be communicated formally using the BID.
February 18, 2016	Ada West District Assembly	District Finance Office, Sege Ada	1. They are aware of the project's location within the district	No Response needed.
			2. They don't know the sites selected to host the project	Details of the project was explained to them
			3. They are prepared to offer every support towards the successful execution of the project	VRA was grateful for that.
			4. They will ask the VRA to improve some of the road networks within the communities	By the scope of the project, ancillary developments such as roads will be required
February 18, 2016	Ada West District Health Directorate	Office of the District Health Information Office	1. They are not aware of the project	Details of the project was explained to them. Background information to the project will be made available to them in due course. This documents contains all issues there is to the project.
			2. They ask the consultants to critically examine every health hazards likely to be caused by the project to the indigenes within the communities	Associated impacts like noise and shadow flicker are being investigated and the siting of the turbines will be done in order to mitigate these.
			3. They should examine whether the land taken will not affect the nutritional needs of the people	This issue is well noted and there will be a health assessment and potential impact to the capability of agricultural to determine mitigative measures to be employed on the project.

Date	Stakeholder	Location	Summaries of Main Inquiries, Proposals and Concerns presented by Stakeholders	Response
March 31, 2016	General assembly of the Ada West District Assembly	Ada West District Assembly	1. The physical construction of the project is taking too long to commence.	Projects development in the power sector is quite laborious and requires very forms of studies to come to a final decision on exactly what is to be done. It is therefore important that land owners and the municipality in general to exercise some patience since a project of such magnitude requires several processes including the Wind Measurement and ESIA before actual construction
			2. The road between Anyamam and Wokumagbe is very bad and therefore needs to be done before the project commences	By the scope of the project, ancillary developments such as roads will be required
			3. How will the salt mining activities be affected by the project?	This issue is well noted and there will be a flood risk assessment as well as wetland assessment to determine mitigative measures to be employed on the project
			4. How soon will compensation be paid to those whose livelihoods are negatively affected by the project.	Property evaluation will be done and payment effected in line with requirements of the Lands Commission. VRA recognises that compensation issues are key to the success of the project. To facilitate compensation payments, Land owners are urged to have a proper land title document to their property. VRA will also conduct further checks to determine the true owners of the land before compensations are paid.
April 13, 2016	Ada West District	District Assembly Hall	1. Land in the project area belongs to individuals so the developers will have to identify the individual landowners and ensure compensation is paid directly to such people.	Detailed property valuation will be done leading to the development of the Compensation Action Plan which is expected to adequately address this

Date	Stakeholder	Location	Summaries of Main Inquiries, Proposals and Concerns presented by Stakeholders	Response
				concern.
			2. The project should consider the impact of the wind turbines on birds as well as the transmission component within the Songor Ramsar Site.	A birds study is underway to assess the impact and provide mitigative measures as required.
			3. As the project may involve the construction of roads, the project developer should also consider paying compensation for properties destroyed during this development.	As indicated, a detailed property valuation will be done leading to the development of the Compensation Action Plan which is expected to adequately address the concern of any property to be affected by the project.
			4. It is understood that there are challenges with the resettlement programme under the recently constructed Bui dam, which VRA was involved. How assured are they that such challenges will also not prevail under this project?	There are no resettlement issues regarding the current project. However, livelihoods would be affected and plans are in place to develop a plan for compensation such losses.
			5. Employment of local labour should be of key consideration under this project.	The Local content policy of VRA will be applicable to the project and the contractor will be required to consider locals for recruitment. The contractor will subsequently be advised to consider this proposal from the community. However, this will be dependent on the skill set available within the community and what is required to successfully execute the project.
			6. The developers should ensure that geotechnical studies are performed before the district assembly can provide them with developmental permit for the project.	Geotechnical studies are to be performed to determine the foundation requirements. VRA will make the geo tech data available if required by the district

Date	Stakeholder	Location	Summaries of Main Inquiries, Proposals and Concerns presented by Stakeholders	Response
				assembly.
			7. What will be the associated social projects to the development?	The community will benefit from the VRA's Community Development programme which provides among others, educational scholarships to needy students in project impacted communities.
			8. What's is the lifespan of the wind power project?	About 25 years but they facilities will undergo continuous maintenance and retrofitting and there could last for more than the said period.

Environmental Impact Assessment  
for 75MW Wind Power Project 2,  
situated at Wokumagbe and Goi  
in the Ada West District of the  
Greater Accra Region

# CHAPTER 6: Project Alternatives Selection Process

# SCOPING REPORT



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## 6 PROJECT ALTERNATIVES SELECTION PROCESS

The Ghanaian EIA Regulations LI 1652 of 1999 require the provision of an outline of the main alternatives considered with the main reasons for the choice selected. This chapter provides a full description of the process followed to select the proposed preferred activity, technology, site and location within the project site, including details of all the alternatives considered and the outcome of the site selection matrix, taking into account environmental, social and economic variables.

This analysis is aimed at comparing, based on a set of previously established criteria, the best feasible alternatives in order to identify the one causing the least impact and allowing to determine the optimal option for the Project location.

### 6.1 NO-GO ALTERNATIVE

The no-go alternative assumes that the proposed project will not go ahead i.e. the proposed WPP1 and WPP2 project is not constructed and developed into an operational energy facility. This alternative entails that the development of the proposed facility would not drive any environmental change and results in no environmental impacts on the site or surrounding local area. It provides the status quo or baseline against which other alternatives are compared and will be considered throughout the report.

The costs/implications and benefits of implementing the ‘no-go’ alternative is presented in Table 6.1. Implementing the ‘no-go’ alternative entails that this **WEF facility will not be contributing to environmental, social and economic change** (positive/negative) in the area proposed at the project site.

**Table 6-1: Costs and benefits of implementing the ‘no-go’ alternative**

COSTS	BENEFITS
<ul style="list-style-type: none"> <li>• No additional power will be generated or supplied through means of wind energy generation by this project at this location.</li> <li>• A WEF is not present to assist Government in achieving its energy generation targets.</li> <li>• Electricity generation sources will remain unchanged.</li> <li>• Electricity generation will remain constant (i.e. no additional energy generation will occur on the proposed site) entailing that the local economy will not be diversified.</li> <li>• The local municipality’s vulnerability to economic downturns will increase because of limited access to capital.</li> <li>• No additional employment opportunities will be created. Both skilled and unskilled employment opportunities are anticipated to be created for the construction and operation of the WEF.</li> <li>• No additional opportunities for skills transfer and education/training of local communities created.</li> <li>• Potential positive socio-economic impacts likely to result from the project, such as increased local spending and the creation of local employment opportunities, will not be realised.</li> </ul>	<ul style="list-style-type: none"> <li>• No threatened vegetation will be disturbed or removed.</li> <li>• The current landscape character will not be altered.</li> <li>• No influx of people (mainly job-seekers), driven by the development of a facility will occur, which entails that there would not be additional pressures on the infrastructure and service delivery of local municipalities and towns in the area.</li> <li>• No fragmentation of habitat or disturbance to faunal species.</li> </ul>

Ghana faces a critical energy challenge, unmet demand and an unreliable energy supply. According to Essah, 2011, electricity consumption in Ghana is estimated to be increasing by 10% per annum due to the demand from the growing population. It is estimated that between 200MW and 250MW is expected to be added to the installed capacity each year to keep up with the demands of a growing economy and improve the reserve margin. The country in 2014/15 was shedding between 400 and 700 Megawatts of power during off-peak and peak periods, respectively due to a shortfall in production. The crisis was as a result of poor water levels in the three hydropower dams, lack of gas flow from the West Africa Gas Pipeline in Nigeria to thermal plants in Ghana for production as well as the breakdown of some of the thermal power plants. Thus the need for a stable, adequate, and regular power supply in stimulating the country's development cannot be underestimated. Solving the energy crisis requires the highest priority given the damaging cost it poses to the growth of Ghana's economy.

In spite of the fact that the "No Go Alternative" does not relocate anybody, it does not guarantee that the existing environmental quality will continue to be maintained. At the same time, the large society of people in the local area as well as Ghana in general would not derive the associated socio-economic benefit rather they are going to lose in terms of development, improved quality of life through access to cheap electricity, increased pollution and deforestation in some areas for fuel wood.

In summary, whilst the "no-go" alternative will not necessarily directly drive any negative environmental and social impacts; it will also not result in any positive community development or socio-economic benefits. Furthermore, it will also not assist government in addressing electricity shortages and electricity demand within the country. Based on the above, the "no-go" alternative is not deemed to be the preferred alternative but will be taken forward and indirectly considered within the ESIA Phase as this alternative will serve as the baseline against which the potential impacts associated with the project are assessed.

## **6.2 ALTERNATIVES FOR THE GENERATION OF ELECTRICITY FROM A NON-RENEWABLE RESOURCE**

VRA is undertaking more generation projects and is planning to add about 1,000 MW of generation capacity by 2020. This includes upgrading simple cycle plants to combine cycle to reduce cost of supply, pursuing Solar and Wind energy projects as well as pursuing the use of Liquefied Natural Gas (LNG) to generate electricity as a measure to secure future gas supply reliability. The proposed 75MW Power project could be obtained through the use of fossil fuels to generate electricity. However, by so doing, VRA will not be responding to the requirement of slowing down on fossil fuel consumption that is adding to global warming on the one hand and on the other hand depleting the resources.

As indicated, the Government of Ghana has formulated a Renewable Energy (RE) policy that projects that 10% of Ghana's electricity needs should come from RE by 2020. The RE Law is to provide for the management, development and utilization of renewable energy (RE); to provide for the sustainable and adequate supply of renewable energy; and to provide for related matters. The object of this Act is to promote the sustainable development and utilization of RE resources for electricity and heat generation.

The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows Ghana to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. According to the National GHG Inventory Report (2014), Ghana generated 3,955.9 GWh of thermal-based electricity to the economy in 2012. Out of this, 64.14%,

35.17% and 0.68% of thermal electricity were produced from LCO, natural gas and diesel fuels. This resulted in a total of 3.2MtCO<sub>2e</sub> greenhouse gas emissions, which was about 85% higher than the 2000 emission levels. This translated into CO<sub>2</sub> intensity of 0.07 GgCO<sub>2e</sub>/GWh in 2000 to 0.26 GgCO<sub>2e</sub>/GWh in 2012.

The 10% Renewable Energy into the electricity mix targeted by 2020 means 500MW of RE and this project is helping achieve the national target. Thus the use of other forms of energy like fossil fuels (Light crude oil, diesel fuel oil, heavy fuel oil, natural gas) as an alternative power generation with high impact on climate change will not assist the Ghanaian government in addressing climate change, in reaching the set targets for renewable energy, nor will it assist in supplying the increasing electricity demand within the country.

### 6.3 TECHNOLOGY ALTERNATIVES

There is a limited range of alternative technologies (turbines) for commercial scale wind energy facilities. In addition, the technology is constantly evolving and there are currently no significant differences from an environmental perspective between technologies. As indicated earlier, VRA has engaged the services of two wind developers, Vestas Eolica and Elsewedy/EYRA (Energía y Recursos Ambientales S.A.). The WPP2 site is proposed to be equipped with WTGs manufactured by General Electric and would comprise 45 General Electric GE1.7-103, each of 1.7 MW nominal power on a hub height of 80 m above ground level.

General Electric (GE) is an American corporation incorporated in New York and headquartered in Fairfield, Connecticut. It is ranking within the 30 largest companies in the world. It has its roots in companies founded by Thomas Edison at the end of the 19th century and back in 1889 the “Edison General Electric Company” was incorporated, growing over the decades to the actual GE conglomerate. GE moved into the wind energy business in 2002 by acquiring bankrupt Enron Wind, which had been formed from mainly two companies, Zond (established in 1980 in the US) and Tacke Windtechnik (established in 1990 in Germany). Under the GE brand, at the beginning the only WTG model was a 1.5 MW machine, which evolved over the years in the actually produced models of 1.6 - 1.85 MW. In 2004 additionally a 2.5 MW model was introduced and led to actually produced models of 2.0-2.4 MW. Building on this base, also models around 3 MW of rated power have been introduced.

The GE 1.7 is a WTG following one of the main concepts in wind industry, based on the initial simple three bladed, upwind positioned, horizontal-axis rotor and using a distributed drive train design with the major drive train components (main shaft, bearings, gearbox, generator). The auxiliary components (yaw drives and control panel) are attached to a bedplate. The generator is a doubly-fed induction generator (DFIG) design. The control system allows several machine features such as: active and reactive power control, optimized aero-dynamic efficiency to maximize power output while minimizing the wind loads, increasing power quality and reliability. For the rotor blades, GE is offering the “low-noise trailing edge” option (vortex generators applied to the surface) for lowering the acoustic emission from 107 to 105 dB(A).

### 6.4 LOCATION ALTERNATIVES

Due to the large amount of capital investment required for the development, construction and operation of wind energy projects, it is imperative that developers follow due diligence throughout the project planning and design processes in order to minimise the possibility of wind energy projects becoming non-starters. In order to improve the potential success of any particular project reaching the construction and

operational phases of development, there are a number of factors which need to be taken into consideration when identifying and developing potential wind energy sites.

The selection of a wind farm site is a complex process and involves the consideration of technical, commercial, environmental and planning criteria. One of the key variables in the site selection process is the regional wind speed at the site. Other criterion to take into consideration when selecting the best location alternative include:

- Land availability
- Site size
- Landscape and visual impact assessment
- Residents in the vicinity
- Aviation
- Telecommunications
- Proximity to grid connection
- Good transport access to the site from point of WTG manufacture or delivery
- Archaeology issues
- Hydrology
- Relevant planning considerations
- General environmental considerations

Once a site is deemed suitable for wind farm development using the initial site selection criteria, it is then progressed further to a detailed feasibility assessment. Technical Consultants review the site and its merits from a technical, planning and environmental standpoint.

In principle, the selection of any preferred alternative system and site for establishment of wind farm needs to be based on:

- a) Current status of energy production system,
- b) Strategic needs of energy production, conservation and environmental protection,
- c) Urgent need to provide better level of service in power production to meet the current and future demand.

#### **6.4.1 Wind Resource**

The most important criterion to take into consideration when selecting a potential site for a wind energy facility is the availability of a reliable wind resource. Without the wind resource there will be no wind energy facility. Wind resources are defined in terms of average wind speed and this includes Weibull distribution (used to describe wind speed distributions); turbulence, wind direction, and pattern of wind direction (as depicted by a wind rose). These factors are all key considerations used in determining whether micro-siting constraints will render a potential project feasible or not. An energy assessment then takes into account these key characteristics at each of the proposed turbine locations in order to determine the potential overall energy capture of a project.

From 2002 till 2005, a study was paid for by the United Nations Environment Program (UNEP) in which the esteemed US institution NREL (National Renewable Energy Lab) worked with the Ghana Energy Commission and Meteorological Service to conduct on- and off-shore assessments of Ghana's wind power

potential. The study became known as SWERA – the Solar and Wind Energy Resource Assessment<sup>1</sup>. The project assessed every part of Ghana for indications of wind energy potential with focus on the potential for large-scale grid connected wind turbines for power production; and solar energy resource for the deployment of solar energy technologies for various applications (non-grid, grid connected, heating, etc.). The assessment was based on available local data and site inspection.

The study reached a number of conclusions:

- Of the 6 Wind classes (with Class 6 being the highest wind resource potential and Class 1 being the lowest), Ghana has Class 4-6 wind resources at the highest ridges near the border with Togo and the highest ridges northwest of Accra (See Figure 6-1)
- There is approximately 413 km sq area with good-to-excellent (Class 4-6) wind resource which could support just over 2,000 MW of wind power, and if moderate-to-excellent wind resources were included, that could go up to 5,640 MW (see 6.2 for details).

The Energy Commission came out with some more facts about the exact locations of the high wind areas – such as Nkwanta, the Accra Plains, and Kwahu and Gambaga mountains. The SWERA report concluded that the maximum energy that could be tapped from the country's available wind resource for electricity is estimated to be about 500 – 600 GWh/year. These assessments did not take into consideration further limiting factors such as land-use restrictions, the existing grid (or how far the wind resource may be from the grid) and accessibility. To conclude, wind energy has the potential to contribute significantly to the country's energy portfolio – **10% can certainly be attained in terms of installed capacity, and about 5% of total electric generation potential from wind alone.**

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<sup>1</sup> <http://www.arrakis-group.com/energy/renewable-energy-what-is-ghanas-wind-power-potential/>



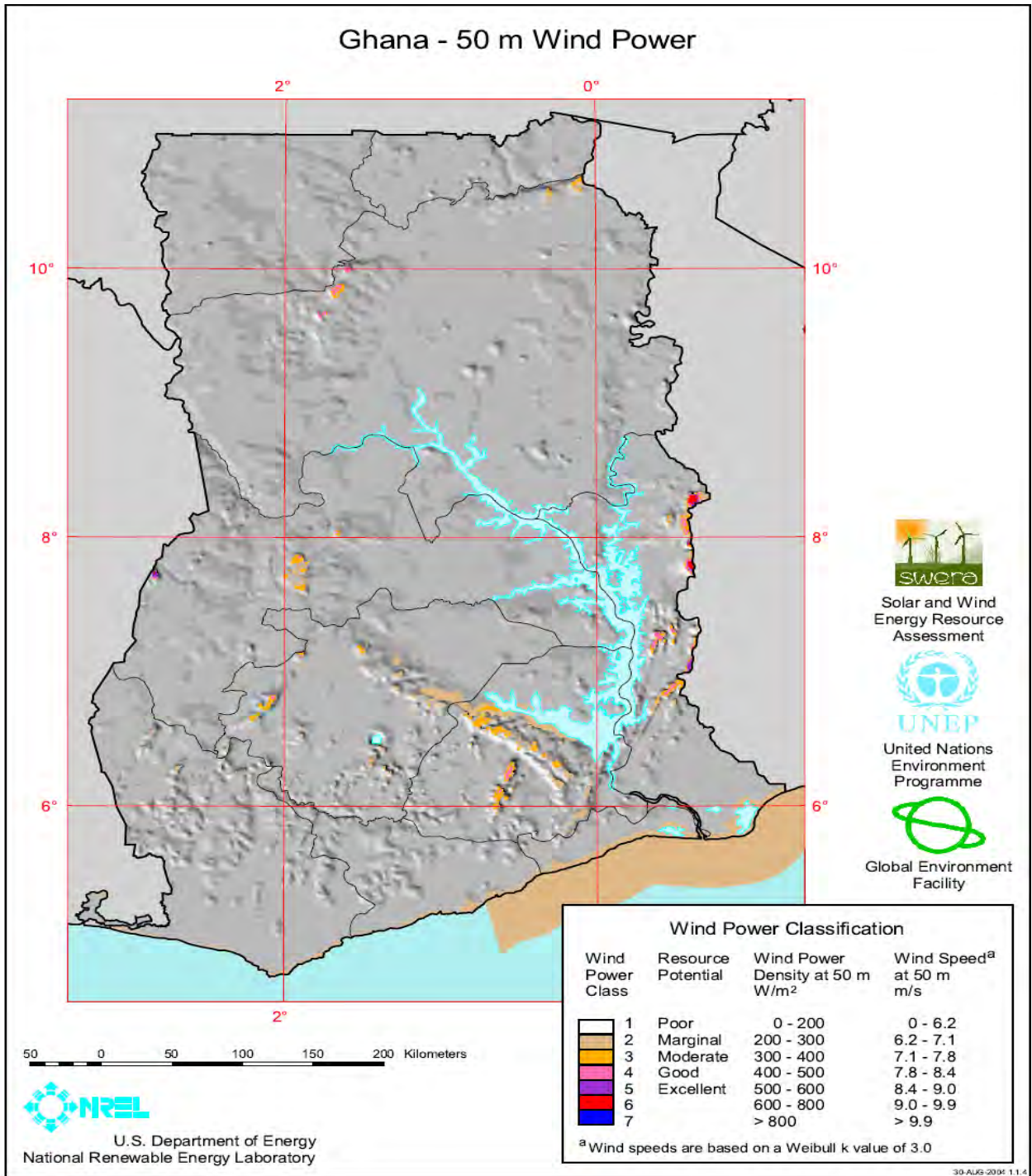


Figure 6-1: Ghana Wind Classification Map (Source: <http://www.arrakis-group.com/energy/renewable-energy-what-is-ghanas-wind-power-potential/> )

**Table 6-2: Ghana – Wind Electric Potential (Source: <http://www.arrakis-group.com/energy/renewable-energy-what-is-ghanas-wind-power-potential/> )**

Good-to-Excellent Wind Resource at 50 m						
Wind Resource Utility Scale	Wind Class	Wind Power at 50 m (W/m <sup>2</sup> )	Wind Power at 50 m (m/s)*	Total Area Km <sup>2</sup>	Percentage Wind Land	Total Installed Capacity (MW)
Good	4	400-500	7.0-7.5	268	0.1	1,340
Excellent	5	500-600	7.5-8.0	62	<0.1	410
Excellent	6	600-800	8.0-8.8	63	<0.1	315
Total				413	0.2	2,065
Moderate -to-Excellent Wind Resource at 50 m						
Moderate	3	300-400	6.4-7.0	715	0.3	3,575
Good	4	400-500	7.0-7.5	268	0.1	1,340
Excellent	5	500-600	7.5-8.0	82	<0.1	410
Excellent	6	600-800	8.0-8.8	83	<0.1	315
Total				1128	0.5	5640
* Wind speeds are based on a Weibull k value of 2.0						
Assumptions						
Installed capacity per km <sup>2</sup> = 5MW						
Total Land Area of Ghana = 230, 940km <sup>2</sup>						

VRA has undertaken a rigorous analysis of potential sites in order to minimise the effects on local people, the environment and the landscape. Based on national data obtained from the above studies, VRA identified 8 potential candidate sites (located in various regions of the country as listed in 6.3) where, based on general knowledge, favourable wind conditions were expected. VRA subsequently engaged the services of consultancy company Barlovento Recursos Naturales to carry out 8 wind measurement campaigns to define 8 draft project conceptions prior to the development of the wind farm.

**Table 6-3: Locations of selected sites for Wind Measurements (Source: VRA, 2014)**

Site	Easting	Northing	Latitude	Longitude
Anloga	31267054	639704	5° 47' 0.606"N	0° 53' 47.041"E
Lekpogunu	31204880	641019	5° 47' 34.873"N	0° 20' 6.921"E
Akplabanya	31211343	641192	5° 47' 41.482"N	0° 23' 36.830"E
Amoama South	30620093	857865	7° 45' 34.216"N	1° 54' 39.280"W
Gambaga	30795913	1170509	10° 34' 37.703"N	0° 17' 45.551"E
Anloga West 2	31248499	641046	5° 47' 41.946"N	0° 43' 43.962"E
Nsutapong	30803402	697905	6° 18' 24.037"N	0° 15' 28.588"E
Amoama North	30621174	865262	7° 49' 34.958"N	1° 54' 3.365"W

A wind measurement campaign has been performed over a complete year on these 8 sites. Subsequently, of the initial 8 sites, the 6 most interesting sites have been further analysed. Factors considered in the selection of the sites included energy yield, accessibility to national grid, road access, basic soil conditions, environmental aspects. The 6 sites were grouped into 4 areas as listed below.

- a) Anloga/Anloga West 2
- b) Lekpoguno/Akplabanya
- c) Gambaga
- d) Amoama North/Amoama South

#### **6.4.2 Terrain and Access**

Wind turbines operate optimally under calm operating conditions where there is a constant supply of wind, as opposed to areas characterised by large gusts of strong wind. Complex terrain introduces wind flow effects such as turbulence which may not be acceptable for turbine siting. Wind turbines therefore need to be aligned in such a way to capitalise on the wind direction while avoiding any constraints associated with unfavourable terrain. This needs to be assessed in order to ensure that a workable turbine configuration can be implemented.

#### **6.4.3 Existing grid infrastructure**

In addition to the proposed projects proximity to the national electricity grid, another key consideration to account for relates to existing grid connection infrastructure. Grid infrastructure in the region needs to be of sufficient strength, and needs to be configured in such a way to be able to accept the electricity generated by the proposed Wind Energy Facility. Upgrades to the existing grid infrastructure and the length of powerlines required to reach the infrastructure will contribute significantly to the overall cost of the project. This is often a key factor in determining whether a potential project is financially feasible, as high costs associated with connecting to and/or upgrading the electricity grid can result in renewable energy projects being abandoned.

#### **6.4.4 Land tenure**

When identifying potential wind energy sites it is important to ensure that the land required for the facility is both available and compatible in terms of existing land uses; and that the owners of land are open to the possibility of a wind energy facility being implemented on their land. Ideally wind energy facilities should not result in an overall change of land use, and should ensure that the existing land use can continue uninterrupted alongside the operational wind energy facility. The implementation of a wind energy facility should therefore form a complimentary use of land.

#### **6.4.5 Social and environmental constraints**

Having identified the WPP2 Wind Energy Facility as a potential wind energy project, the feasibility of the project now needs to be assessed from an environmental and social perspective. While a high level preliminary assessment of social and environmental constraints was conducted during the site selection process, an understanding of the detailed environmental and social conditions present on site is required in order to verify the feasibility of the proposed project. The presence of any environmental or social “fatal flaws” may render the Wokumagbe and Goi site unsuitable with regards to the development of a wind

energy facility. An investigation of the social and environmental opportunities, constraints and impacts relative to site identified by Lahmeyer International GmbH therefore forms part of this ESIA process.

Potential social and environmental impacts which may arise as a result of the implementation of the WPP2 Wind Energy Facility and associated infrastructure need to be assessed in detail as part of the current ESIA process. A range of independent specialist studies covering a broad set of issues will therefore be conducted as part of the impact assessment phase of ESIA and the findings of these studies will be incorporated into the Draft ESIA report which will be released for a 60 day comment period.

#### **6.4.6 Road access**

Access roads providing access to the project area also need to be assessed with regards to terrain. Wind turbine components need to be transported via large, often abnormal load, vehicles. This is due to the fact that many of the large components of a wind turbine (such as rotor blades and nacelles) are transported in one piece. The presence of complex terrain may result in access constraints due to limited road infrastructure and constricted turning circles.

Based on the above criteria, Anloga/Anloga West 2 (WPP1) and Lekpoguno/Akplabanya (WPP2) have been selected as the two (2) candidate sites for the development of the proposed wind farms by the VRA (Table 6-4). These have subsequently undergone full detailed feasibility studies.

**Table 6-4: Results of site assessments for candidate site selection based on energy yield (Source: Renewable Energy Development Training, 150MW Wind Farm Development Project, VRA, February 2015)**

Site	Gambaga	Amoama	Anloga/Anloga West 2	Akplabanya/Lekpogonu
Energy Yield	Good wind conditions for VESTAS	Good wind conditions for VESTAS	Good wind conditions for TWT & VESTAS	Good wind conditions for TWT & VESTAS
Site complexity	Complex and uncertain flow model (Uncertain yield calculation / Turbulences WTG aging)	Low Complex Feasible flow model	Flat terrain trustable flow model	Flat terrain trustable flow model
Access road	Extreme long transport way to site. The sum of all defects may effect high costs	High frequent of defects between Accra and Kumasi Resulting in long distance and roads to care	Short roads access but a critical bridge (Sogakofe Bridge)	-Short roads access
Grid Connection	Grid Far	Grid near	Grid in feasible distance	Grid in feasible distance
Extendability	Wind farm extendable along the scarp/cliff	Wind farm extendable	Restricted space (noise)	Restricted space (noise)
Environmental and Social aspects	Possible conflict with inhabited houses	Conflict with Anlo-Keta Wetlands (Ramsar site) as WTG is planned within it	Conflict with Anlo-Keta Wetlands (Ramsar site) as WTG is planned within it	Conflict with Songor Lagoon (Ramsar site) as WTG is planned within it
		Scattered houses (More persons to support)	Scattered houses (More persons to support)	Scattered houses (More persons to support)
TWT Yield gross[MWh/a]	151,073	145,384	170,533	147,931
Cap (gross)	23%	22%	26%	23%
MWh/MW (gross)	2035	1958	2297	1992
V110 Yield gross [MWh/a]	209,634	211,405	246,812	219,770
Cap (gross)	31%	32%	37%	33%
MWh/MW (gross)	2758	2782	3248	2892



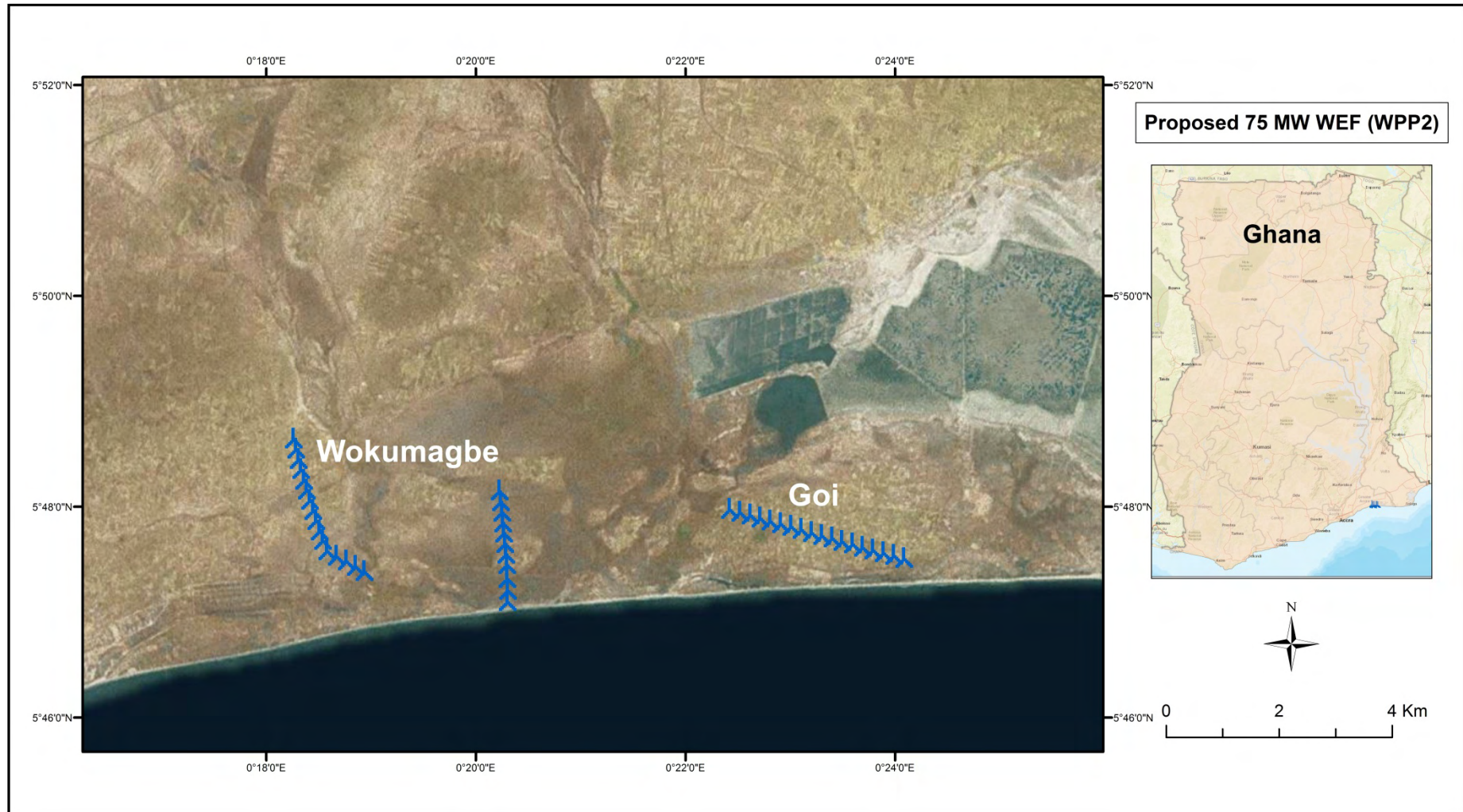


Figure 6-2: Preferred location of the WPP2 being taken forward in the ESIA Phase



## **6.5 CONCLUDING STATEMENT ON PREFERRED ALTERNATIVES**

Taking into consideration information on energy yield, energy uncertainty, site complexity, access roads, grid connection the VRA is proposing to develop the 75 MW wind energy project at the following preferred locations:

- A. Anloga, Anyanui & Srogbe communities in the Keta Municipal in the Volta Region for the 75MW Wind Power Project 1 (Anloga Extension)
- B. Wokumagbe and Goi communities in the Ada West District in the Greater Accra Region for the 75MW Wind Power Project 2.

This ESIA covers the proposed WPP2, while a separate ESIA covers WPP1.

Environmental Impact Assessment  
for 75MW Wind Power Project 2,  
situated at Wokumagbe and Goi  
in the Ada West District of the  
Greater Accra Region

# CHAPTER 7:

## Identification of Issues and Potential Impacts

# SCOPING REPORT



**VOLTA  
RIVER  
AUTHORITY**

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## 7 IDENTIFICATION OF ISSUES AND POTENTIAL IMPACTS

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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 for the WPP2. These issues and impacts have been identified via the environmental status quo of the receiving environment (environmental, social and heritage features present on site) (discussed in Chapter 3 of this Scoping Report), a review of environmental impacts from other similar wind projects and input from specialists that form part of the project team. The Terms of Reference for the specialist studies deemed necessary, based on the relevant issues and impacts discussed within this chapter, are incorporated into the Plan of Study for the ESIA (refer to Chapter 8 of this Scoping Report).

### 7.1 ECOLOGY - TERRESTRIAL ECOLOGY (VEGETATION AND FAUNA, INCLUDING AVIFAUNA) AND AQUATIC ECOLOGY

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#### 7.1.1 Key Issues

The proposed development will result in a number of actions or aspects that will arise during both the construction and operation phases of the project and that may potentially impact on the ecology. These include *inter alia*:

- Possible levelling of topographic features;
- Clearance of land for construction;
- Establishment of hardpanned roadways and related surfaces;
- Excavation and construction of structures using wet trades;
- Cabling at a sub-surface level;
- Establishment of transformers and substations;
- Fencing of the site;
- Placement of overhead power lines/transmission lines; and
- Establishment of other supportive infrastructure.

The construction phase is a relatively short term undertaking, although “intensive” in terms of the rapid physical changes that arise on site. The operational phase is more benign in nature, with limited staff and minor activity in and around the proposed facility. Given this situation, it is expected that the following impacts of an ecological nature may arise during the construction and operational phases of the proposed WPP2.

#### **Terrestrial Impacts – Vegetation and Fauna**

The predominant impacts to terrestrial ecology likely to arise as a result of the proposed project include the following:

- Impacts on vegetation and protected plant species

Site preparation and construction will result in a lot of disturbance and the loss of currently intact vegetation. In addition there are likely to be some provincially protected species as well as Red-data listed species present which may be impacted by the development. The vegetation of the project site at

Wokumagbe is seasonally flooded grassland vegetation which is heavily grazed, farm re-growth and isolated thicket clumps. The seasonally flooded grassland is dominated by *Cyperus articulatus*, *Typha domingensis*, *Chloris pilosa*, *Eluesine indica*, *Sporobolus pyramidalis* and *Cynodon dactylon*. The farm re-growths and thickets have species such as *Hygrophila auriculata*, *Dichrostachys cinerea*, *Croton lobatus*, *Securinega virosa*, *Capparis erythrocarpos*, *Zanthoxylum xanthoxyloides* and *Elaeis guineensis*.

The project site at Goi straddles lagoon margin and mangrove vegetation and Thicket and grassland vegetation. The mangrove and lagoon margin vegetation is patchy and degraded. It is composed of stunted *Avicennia germinans*, *Sesuvium portulacastrum*, *Cyperus maritimus*, *Opuntia vulgaris* and *Cocos nucifera*. The Thicket vegetation has largely been cultivated, the main crop being Cassava (*Manihot esculenta*). It occurs in a mosaic with farms and farm re-growths. Some of the common species of the thicket are *Azadirachta indica*, *Chassalia kholly*, *Millettia thonningii*, *Paullinia pinnata*, *Schrankia leptocarpa*, and *indigofera hirsuta*.

- Alien Plant Invasion Risk

The large amount of disturbance created during construction will leave the site vulnerable to alien plant invasion. Invasion of the natural plant communities within the site would be undesirable and could impact on the biodiversity of flora and fauna species as well as affect ecosystem processes. This would be a particular concern if it resulted in the spread of large woody species which would have ecosystem-level consequences for hydrology as well as biodiversity and the delivery of ecosystem services.

- Increased erosion risk

An increased erosion risk would result from soil disturbance and the loss of plant cover within cleared and disturbed areas. The site is topographically diverse and this is likely to pose a significant risk due to the presence of several steep areas which would be vulnerable to erosion impact. Erosion would result in reduced productivity and diversity within the area from which the soil has been lost as well as negative impacts on vegetation and fauna in drainage lines or wetlands where the silt is deposited. The risk of erosion problems would therefore be high.

- Faunal impacts

Increased levels of noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Major impacts on reptiles related to the development would also include habitat loss and fragmentation, while the major threats to amphibians stem from an increased risk of erosion resulting from the large amount of disturbance associated with the construction phase of development, as well as pollution related to construction activities and the presence of heavy machinery with the associated risk of fuel and oil spills.

- Loss of landscape connectivity and disruption of broad-scale ecological processes

The presence of the Wind Energy Facility and associated infrastructure could potentially contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions. Many fauna avoid crossing open areas or are vulnerable to predation when doing so and the so the extensive road network which would be required for the facility would contribute to this impact on a long-term cumulative basis. Development within and loss of intact vegetation would contribute to the fragmentation of the landscape and potentially disrupt the connectivity of the landscape. Such impacts would be undesirable and would be of high significance.

### **Terrestrial Impacts - Avifauna**

The proposed project site is located close to the designated Songor Ramsar Site. Assessment of the conservation status of species recorded focused on the various IUCN threat categories whereas protection status focused on **Schedule I** of the Wildlife Conservation Regulation. All animal species listed under **Schedule I** of the Wildlife Conservation Regulation, are Wholly Protected in Ghana from any form of hunting and capture. Key reference guide used was Birds of Ghana, which was actually co-authored by the specialist consultant.

A total of 101 bird species were recorded at the various sites during the study. The ten (10) most abundant species recorded were the **Common Bulbul, Vinaceous dove, Laughing dove, Village weaver and the Yellow-crowned Gonolek Black-crowned Tchagra, Zitting Cisticola, Black billed Wood-dove, Yellow-billed Kite, Tawny-flanked Prinia and Western Grey Plantain-eater**. All the species recorded are categorised as 'Least Concern' based on the IUCN Red list. A full list of species recorded and their resident and conservation statuses shall be provided in the Main ESIA Report.

With the exception of 13 migrant species (Palearctic and intra-African) constituting 13%, all other species observed were residents of the area. Of the observed species no migrant species was found to be part of the top 10 abundant species. The Yellow-billed Kite was the only raptor species found in the top 10 of the total species recorded.

Raptors are a group of species of concern with regards to wind farms in that they fly at heights that potentially put them at collision risk with the wind mills. Only five (5) raptor species were observed during the study. These were the African Hobby, Black Shouldered Kite, Grey Kestrel, Gabar Goshawk and the Yellow-billed kite. All of which are listed under Schedule I of the Wildlife Conservation Regulation as wholly protected in Ghana. The Yellow-billed Kite was only raptor found among the top 10 most abundant species recorded at all the sites.

Special attention has been paid to the Goi site which is in close proximity to the Songor Ramsar site, an area of high concentration of migrant waterfowls. This was to ascertain the potential risks with regard to flight over the study area. Because of the importance of the interphase between the lagoon and Goi site some effort was put into assessing the waterfowls occurring at the Songor Lagoon and how their flight path could be impacted on by any future development. Few waterfowls, which are also migrants, were recorded at the lagoon. However, the most abundant migrants observed within the study area is the Barn Swallow which is not under threat.

The predominant impacts on birds likely to arise as a result of the proposed project include the following:

- Destruction of bird habitat

A certain amount of natural habitat will inevitably be altered and removed during the construction of the proposed facility. This will take place with the construction of roads, turbines and other infrastructure. The significance of this impact will vary according to the sensitivity of the habitat destroyed. Impacts associated with the destruction of bird habitat are often difficult to mitigate for as a certain amount of habitat destruction is unavoidable.



- Disturbance of birds

Disturbance of birds is an impact that is likely to take place during the construction phase predominantly, but could also be relevant during the operation of the facility. Of particular relevance are any breeding species.

- Displacement of birds from the site and barrier effects

Extreme disturbance could result in a bird or species being displaced from a site. However displacement can also mean that birds stop flying across the site or foraging on the site. This may have effects on the bird in various ways, not least of which is through impacting on the birds energy balance. If for example an eagle needs to travel a lot further to foraging areas from its nest, this increased effort will have implications for the birds energy balance.

- Collision of birds with turbine blades/Collision and electrocution on overhead powerlines

Collision of large terrestrial birds with turbine blades or powerlines may be the largest single impact on certain bird species, electrocution is a significant impact for large perching birds such as eagles. Fortunately electrocution can be relatively easily mitigated. In both cases these impacts can be successfully reduced to low significance with mitigation. For example, parts of the WPP2 site and proposed powerline servitude route are characterized as migratory bird routes. Furthermore small drainage lines which bisect the area are also important as large terrestrial species utilize these areas as flight paths.

- Disturbance of bats

The study has so far not yielded any occurrence of bat species in the project area. Should these be found in the study area, the predominant impacts on bats likely to arise as a result of the proposed project include the following:

- Direct collision.
- Barotrauma (mortality due to damage to bats' lungs caused by sudden change in air pressure close to the turning turbine blade; Baerwald et al., 2008).
- Loss of foraging and/or roosting habitat (either due to wind farm construction or because bats avoid the wind farm area).
- Barrier effect of commuting and migrating routes.
- Emission of ultrasound by wind turbines (probably limited).

### **Aquatic Impacts**

The following key issues in terms of freshwater ecosystems, associated with the proposed wind energy facilities have been identified as a result of Wpp2 being located close to the designated Songor Ramsar Site:

- The potential loss of aquatic habitat (physical destruction)

The project footprint has the potential to result in a loss of wetland/aquatic habitat. The construction of access roads and powerlines would invariably need to cross or intersect water courses/drainage lines within the area which has the potential to impact negatively on aquatic habitat.

- Loss of ecosystem services

This impact is linked to the physical disturbance of the river or wetland areas and would affect basic habitat function and ecosystem services such as surface flow attenuation (Water quantity issue) and surface flow filtration (Water quality risk of surface water / groundwater pollution). Potential impacts posed by the development would be similar during both the construction and operational phases, due to the relationship between wetland disturbance (without mitigation) and the loss in the provision of ecosystem services (e.g. flood attenuation or biodiversity maintenance). Linked to this impact is the possible

alteration of the habitats due to the potential changes in the local hydrology, i.e. increased flow of surface water flow due to stormwater management brought about by roads or hard surfaces.

- Habitat fragmentation (fish support areas)

This impact would be categorised as a cumulative impact both in the construction and operational phase, as it would impact on the region with regard to habitat fragmentation. The permanent loss of any freshwater systems would be seen as habitat fragmentation. The majority of mobile aquatic organisms require “stepping stones” to leap frog between their required habitats.

- Potential loss of Species of Special Concern (plants & fish)

Loss of aquatic habitats could possibly result in the loss of Species of Special Concern (SSC) within the habitats as a result of their destruction during the construction phase. Changes in the hydrological state in the operational phase, could limit the presence of these species, should surface water flows be diverted or an over abstraction of water should occur. This would then limit the potential formation of the required habitats (fauna and flora).

- Sedimentation and erosion

This impact would be also categorised as a cumulative impact, as it would impact on the region should the wetland areas receive excessive surface flows. This would increase surface water flow velocities within the site possibly resulting in a risk of soil erosion and later downstream sedimentation. Should sediments eventually reach the downstream systems, this could have impacts on sediment loads, but also smother benthic habitats (plants and invertebrates).

## 7.2 FLOOD RISK

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The main environmental hazard to be expected at the project sites is flooding. However, no details on the risk and extent of flooding are currently available. As a limited source, a case study on flooding risks in Accra is being used, which states historic most important flood events for 1973, 1986, 1995, 1999, 2001, 2002 (i.e. around every 3-10 years) and mentions the months of June and July of those with highest rainfalls. Additionally, an extreme flood was reported in Accra in October 2011, killing around 9 people. The impact of flooding in Accra seems to be limited and it is assumed that this would be valid also for the project sites, resulting in assumed flooding for a duration of several days only during a year.

The flat nature of the topography of Ada West District exposes it to serious threat of flood accounting for majority of cases of disasters. The project area consists of approximately 15 km of coastline located west of the Volta Estuary. The stretch is fast eroding posing a great threat to property, infrastructure, tourism and sea turtle nesting sites. High tides have to be considered in the civil works planning during the ESIA and project design. Considerations about the shore line protection as well the access road protection is to be considered. The target of the study will be to confirm that a raft foundation type can be used, which however needs to be verified by the foundation design engineer. The study can also conclude that for the heavy infrastructures, a pile foundation may be considered. On flood control measures and their vegetation, site fencing should be made of retaining crop by animals from the adjoining land. The occurrence of gully erosion in the area is to be avoided. Being a coastal back swamp and estuary of the Volta River, ground water is expected at less than 300mm depth. If ground levels at the proposed site are raised to protect it from flooding, this could however exacerbate flood risk in other low lying areas potentially resulting in farmland or properties locally being flooded more frequently and or more severely

than currently occurs. In addition, climate change related changes in sea level and or rainfall/run-off could alter the flood regime locally further.

## 7.3 VISUAL IMPACTS

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### 7.3.1 *Key Issues*

It is expected that the main contributions to the significance of the visual impact for this project will focus on the proposed WEF and on-site substation during the construction and operational phase of the plant.

Potential visual impacts associated with the proposed project include:

- Impact of introducing highly visible wind turbines into a landscape which did not have any , and the impact this would have on existing character or sense of place of the region
- Visual intrusion of wind turbines on existing views of residents of surrounding areas;
- Visual impact of a wind energy facility on tourists visiting the region;
- Visual intrusion of wind turbines on views of motorists (tourists) travelling on main roads;
- Potential effect of lighting on the existing nightscape of the region;
- Visual intrusion of highly visible construction activity on sensitive visual receptors in the region.
- Large areas will be cleared of vegetation for the proposed project, equipment laydown area and buildings;
- Construction activities and equipment associated with construction of the proposed development, including access roads and buildings;
- An increase in traffic can be expected on rural roads, particularly large construction and freight vehicles;
- The nightscape will potentially be affected by security and construction lighting at night;
- Construction of the overhead distribution lines and the onsite substation are likely to be visible against the skyline in places;
- Activities during construction of the proposed overhead distribution lines are likely to be visible against the skyline in places; and
- Large areas cleared of vegetation will potentially generate dust which will draw attention to the development over a wide area (i.e. increase the visibility of construction activities)

## 7.4 Heritage: Archaeology, built environment, cultural environment and sense of place

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### 7.4.1 *Key Issues*

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.

The heritage and scientific potential of an archaeological or heritage site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose artefacts of heritage significance, the artefacts are relatively meaningless once removed from the area in

which they were found. Large scale excavations may damage heritage sites and can contribute towards high levels of impact.

Potential heritage impacts associated with the proposed project include:

- **Impacts on Living Heritage**  
Living heritage is defined as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationship. Close association with the land, such as that experienced by land owners and workers, may result in certain features on the landscape enjoying particular social or ritual significance. For example, certain places may be utilized for social outings while others may be visited for indigenous plants, etc. The implementation of a proposed wind energy facility therefore has the ability to impact on the living heritage through the destruction of places which may have significant social/ritual consequences for the community.
- **Cultural landscape and scenic routes**  
Cultural landscapes are highly sensitive to accumulative impacts and large scale development activities that have the potential to change the character and public memory of a place. The construction of a large facility is likely to result in profound changes to the overall landscape qualities and sense of place of a locality and/or region. The proposed activity would essentially constitute a visual intrusion which is very difficult to measure due to the fact that there is little reference material on which the sense of change can be gauged. The locating of infrastructure close to historical settlements may result in impacts to the quality of the place and detract from sense of history and/or remoteness.

The land at Wokumangbe belongs to the Kuogbo clan. 'Osuola' is the deity of the land and the shrine of the 'Buokumaa' deity is also situated on their land. The deity forbids chaos and murder hence its isolation from the community. A reconnaissance survey conducted over the Wokumagbe project area did not reveal any archaeological site of significance. It is mainly flood zone and grazing fields. A reconnaissance survey was conducted over the Goi project area. An abandoned local building and associated cultural remains were identified on the site. This archaeological site will need further archaeological testing to salvage heritage remains from the site in the next phase of work.

## 7.5 WATER AND WASTEWATER USE

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### 7.5.1 *Key Issues*

Potential impacts associated with water usage include:

- Temporary (construction phase) increases in water consumption in an area where water supplies are limited; and
- Contamination or disturbance of a wetland on the property.

Water will be required during the construction phase mainly for human consumption (i.e. workers on the site will need water for drinking and ablution facilities) and for construction activities such as mixing of

cement. It is the intention of the project applicant to source the required amounts of water from an existing reticulation system, i.e. from the local municipality.

There are a number of wetlands and drainage lines on the project site that could be affected by the proposed development. The potential impact of wastewater on these rivers, wetlands and drainage lines would therefore need to be investigated as part of the Freshwater Ecosystems specialist study.

## 7.6 SOILS AND AGRICULTURAL POTENTIAL

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### 7.6.1 *Key Issues*

Impacts with regards to soil and agricultural potential which may occur as a result of development include:

- Loss of agricultural land occupied by turbines and other infrastructure for the duration of the project.
- Land surface disturbance due to construction of turbine foundations, hard standing areas, roads etc., and its resultant potential impact on erosion.
- Change in land use from agriculture to wind farming.
- Competing land use rights resulting in the wind 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.

## 7.7 SOCIO-ECONOMIC ISSUES

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### 7.7.1 *Key Issues*

By far the most significant driver of change likely to result from the proposed project is the influx of people into the study area, and the corresponding increase in spending and employment. Such an influx of “strangers” into the receiving environment is likely to cause a disturbance in the order of the existing social structure and might also lead to increases in social deviance. Increased spending and employment (even though such employment might be short-term) generates positive impacts through the multiplier effect and by providing much needed financial relief in the area. However, it also creates significant, and often unrealistic, expectations regarding potential employment.

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.

#### **Impact on labour and working conditions**

As indicated, this project will bring in employment opportunities for the local inhabitants. It is expected that the project will create approximately 50 direct construction employment opportunities over this period (i.e. 8 skilled, 18 semi-skilled, and 24 low skilled). Construction crews will constitute mainly skilled and semi-skilled workers.

Unskilled jobs will be offered mainly to the local people particularly during the construction phase. About 10 VRA support staff will be present in addition to the above. About 5 expatriate workers are expected to be on site. Approximately 20 technical persons on shift basis shall be hired for operations at the wind farm and power plant during operational phase. This number will be in addition to those engaged at site for security and administrative duties expected.

It will be necessary for the Engineering Procurement Contractor and project parties to ensure appropriate labour and working conditions and facilities are in place for their workforce. These conditions will need to meet national and international requirements.

#### **Change in land use**

The project is situated within two areas within the Ada west District; Wokumagbe and Akplabanya-Goi sites. The proposed site at Wokumagbe is marshy with open grass land. The Akplabanya-Goi site is predominantly farmlands. Land use in the project area includes farming, animal rearing, fishing, salt collection, recreation, settlement and associated constructions such as roads. On elevated land where the rooting zone is above the saline water table the following crops can be farmed; cassava, maize and vegetables (particularly okro, pepper and tomatoes). Cultivation is particularly intense west of Ada and between Goi and Anyaman. The mud-flats and the saline marshes, in the east are not extensively cultivated. Because of the scarcity of arable land, the same plots are cultivated continuously with heavy use of fertilizer. Small scale free range livestock production is widespread in all the villages.

Fishing is undertaken in both the Songor lagoon and the sea, the latter being a major commercial activity. Lagoon fishing is particularly important to older people who cannot go out to sea. The main species caught were tilapia and lagoon crabs.

Salt winning is a major commercial activity in villages around the lagoon and majority of the people derive their livelihood from salt collection. Ownership of the lagoon and salt winning rights have in the past, been a source of serious conflict between the, local people and external private salt mining companies.

#### **Resettlement of residence**

It is hoped that physical displacement for associated facilities can be avoided as much as possible. Some land acquisition and economic displacement is anticipated for the Rights of Way (ROW) for the access roads and associated transmission lines. During the scoping, some legitimate representatives for the



acquisition of community lands especially at Omankope and Wokumagbe have been identified. However, ownership of the affected lands at Wokumagbe is being contested between the people of Omankope and Wokumagbe

Physical displacement of residential communities (with or without legal entitlement) or economic displacement from key activities such as fishing or farming, as a result of the development and associated infrastructure can plunge households into poverty and / or dislocate communities severing extended support networks such as childcare. If not mitigated appropriately and early, resettlement impacts can cause great controversy and result in significant public objections, time delays and considerable cost overruns for the project.

During the ESIA process it will be determined whether these settlements will need to be resettled as part of the proposed project. If located on land impacted by the project, the people and houses will need to be relocated to make way for the project and new land or alternative means of subsistence or livelihood generating activities may be required.

**Impact on health:**

Coinciding with the influx of migrant workers is typically a raise in demand for goods and services during the construction period which can result in a rapid expansion in supply chain businesses operating in the area. This will result in increases in formal employment and informal labour. This expansion may result in migration into the area. The impacts that may arise from the presence of migrant and/or expatriate employees are largely comprised of:

- Spread of transmissible diseases including HIV/AIDS both within the workforce and between the workforce and the local community;
- Increased pressure on infrastructure, services (such as healthcare) and roads, particularly with the establishment of informal settlements.

The ESMP will include a requirement for a management plan to address the above issues.

The socio-economic assessment will consider potential impacts to the community, health, safety and security from the project. Initiatives to encourage local recruitment and training will be considered within the ESIA. Community, health, safety and security will be considered in environmental and social management plans developed for the project. Consultation will take place with community members. Information about the project will be disclosed and grievance mechanisms developed and implemented.

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## **7.8 AIR QUALITY AND DUST**

Potential impacts on air quality as a result of the proposed project include temporary decrease in air quality (i.e. limited to the construction phase of development).

The current air quality is generally good given that the area is predominantly agricultural and that it is rural in character. The absence of heavy industries also contributes to the good air quality of the area.

During the pre-construction phase, the site will need to be cleared of vegetation. Bare soil will be exposed to wind and dust will likely be generated from the movement of construction vehicles on the site. The generation of dust is expected to be short term and only last for the duration of the construction period.

Standard dust suppression interventions used in civil construction projects must be applied in order to minimise the impact on surrounding receptors.

The Ghana EPA Ambient Air Quality Guidelines represents a move to an air pollution control strategy that is based on receiving air quality management. It sets standards as the benchmark for air quality management performance. At the same time, it sets emission standards to minimize the amount of pollution that enters the environment. The Guidelines regulates the control of noxious and offensive gases emitted by industrial processes, the control of smoke and wind borne dust pollution.

Given the above actions, the impact of the project on air quality is considered negligible and does not require a specialist study during the ESIA process. These management actions will be incorporated into the Environmental Management Plan (EMP) that will form part of the ESIA Report.

## **7.9 WASTE GENERATION**

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Potential impacts associated with waste generation as a result of the proposed project include:

- Soil contamination in the event that there is a hazardous spill outside of hard surface areas; and
- Water contamination in the event that there are hazardous spills near water resources.

Solid waste will be generated during the construction phase and will likely consist of biodegradable waste such as cleared vegetation; general waste such as paper, packaging, plastics, food waste; and construction related waste such as rubbles, metal off cuts, etc. The applicant proposes to temporarily store general waste on the site in skips. The skips will be emptied and the waste will be taken to the nearest landfill site.

Wastewater will also be generated from human activities such as hand washing on the site and from water used for construction purposes such as washing tools covered in excess cement. Sewage will also be generated on site and this is likely to make use of portable ablutions.

It is proposed that any areas set aside for washing of hands or tools must be located in excess of 100 meters from any water resource. Additionally, an approved contractor must be employed to regularly empty and maintain the portable ablution facilities if implemented on site. It is the responsibility of the applicant to ensure that the sewage removal contractor removes and transports the sewage to a licensed sewage treatment facility.

During the operational phase, general waste is expected to be generated from food wastes, i.e. packaging, paper, etc. The wind facility will also undergo routine maintenance which may necessitate the use of oils, grease and other lubricants. Accidental spillage of small amounts of oil for machinery maintenance or from vehicles may contaminate the soil. Management and mitigation measures will be included in the EMP to ensure optimal use and recycling of material and to minimize the possibility of soil pollution on site

Solid waste that might be produced during routine maintenance must be disposed of at the closest registered landfill. There is no known solid waste that could be classified as hazardous in terms of the relevant legislation. The associated impact is therefore considered negligible provided that an appropriate waste management plan is efficiently implemented.

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 ESIA process. Appropriate waste management actions will be incorporated into the draft EMP for the project that will form part of the ESIA Report.

## **7.10 NOISE EMISSIONS**

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Noise impacts associated with the proposed project are likely to occur during both the construction and operational phases of development.

- Noise impact likely to occur during construction of the proposed project and associated infrastructure.

The use of construction equipment and machinery will result in a noise impact during the construction phase of development. Areas surrounding the construction site may therefore be affected for short periods of time as a result. This noise impact is however confined to the construction phase of development, and also possibly during maintenance processes when the use of machinery may be required.

- Noise impacts from the operation of the turbines on local residents, avifauna as well as terrestrial fauna in the vicinity of the turbines.

Aerodynamic broadband sound is typically the largest component of noise emissions from wind turbines, and this originates from the flow of air around the blades. In addition to aerodynamic sounds wind turbines may also emit a mechanical sound as a result of the movement of mechanical components within the turbine housing/nacelle.

- Impact of low frequency and infra sound

Functional wind turbines may release low frequency and infra sound. Low frequency sound is sound which falls below the audible range of what humans typically hear. This sound is generally from 20 to 200 Hz, while infrasound is sound which falls below the frequency of low frequency sound (i.e. below 20 Hz). The emission of such sounds from turbines may result in impacts such as disturbance, vibration and annoyance. The sound emissions of a wind turbine increase as the wind speed increases. However, the background noise will typically increase faster than the sound of the wind turbine, tending to mask the wind turbine noise in higher winds. At any given location, the noise within or around a wind farm can vary considerably depending on a number of factors including the layout of the wind farm, the particular model of turbines installed, the topography or shape of the land, the speed and direction of the wind and the background noise. Sound levels decrease as the distance from wind turbines increases. Wind turbine noise typically increases with increasing wind speed, as does the background noise levels. At low wind speeds, when background noise levels are low, the turbines do not operate. The critical period for noise impacts is likely to be at low wind speeds when turbines cut-in and when background noise levels are still relatively low.

## **7.11 SHADOW FLICKER**

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Shadow flicker is the effect caused when rotating WTG blades periodically cast shadows through constrained openings such as windows of neighbouring properties. Shadow flicker usually occurs in the morning or evening when the sun is low in the sky and shadows are long. When the sun is obscured by clouds, fog, or by intervening objects no shadow flicker will be present. There will also be no shadow flicker

from a WTG when the WTG is not operating, or when the rotor is turned parallel to a line between the receptor and the WTG.

Potential impacts associated with the Shadow Flicker Effect on property occupiers in the vicinity of the proposed project sites therefore need to be addressed as part of the ESIA study shall assess the potential for shadow flicker impacts

## **7.12 TRAFFIC GENERATION**

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During all phases (construction, operation and decommissioning) of the project, traffic will be generated over the 12 – 24 month construction period. The activities that will generate traffic during the construction phase include site preparation and the transportation of construction materials and associated infrastructure to the site, as well as the transportation of employees to and from the site on a daily basis.

The proposed sites are well served by public transport - the local bus service known as the Metro Mass, as well as short-hub transport, popularly known as “Tro-tro”, and taxis run several times on the route. However, encroachment and current traffic load on the designated road are not considerably heavy. Hence, traffic congestion during the construction phase is not anticipated to be a major issue. It is recommended that suitable temporal segregation of traffic be undertaken in order to ease the load of traffic in the project area.

The equipment, supplies and personnel will move in and out from the site using the access road and the Accra – Aflao NI Highway. WTG components will require delivery via specialised heavy goods vehicles which would be escorted along the public highway and upgraded access tracks. Heavy vehicles carrying the wind turbines and necessary equipment will operate from the Tema Port and take the link road to the NI Highway for onward journey to project sites site by the dirt road which will be upgraded to take the heavy load of towers (~162 tons), rotor blades (~60 tons), turbines (Nacelle ~82 tons), machinery and equipment. Analysis of the difficulties to be encountered on these routes has been performed and recommendations have been made on how to overcome them. Within this context, the access to the site of along the N1 shows no major obstacles, only small works are anticipated to be necessary at roundabouts and turnings to assure sufficient space without electricity poles, traffic signs, etc.

The site will receive many truckloads of fill material, construction materials daily for the constructional period. Concrete plant and some material (cabling, cement etc.) will be transported to the site via normal articulated heavy goods vehicles. Aggregate for tracks and foundations will be sourced from off-site quarries in proximity to the Project therefore no borrow pits are proposed. Building materials supply to the site would be frequent for sand, stones, cement, and blocks, especially during early stages of the construction period. In addition to this are the equipment and machinery, and this would be delivered to be project site, via road to the project sites.

The road way and entrance/exit design, driver safety, and road worthiness of the trucks are all important issues, as is the need to contain all garbage, trash and fluids in the load. In terms of total traffic generated by the construction phase, daily movements will be low.

The ESIA will include desktop assessment of the existing capacity of the roads, ability to accommodate wide heavy loads and give preferences for routing. 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. To this end, a Traffic Impact Statement (which will include management measures for road maintenance) will be prepared by the EAP, which will provide recommendations for inclusion in the EMP. No further traffic assessments will be undertaken during the ESIA phase.

### **7.13 AVIATION AND TELECOMMUNICATION**

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An aeronautical study is required to ensure that proposed structures do not have an effect on the safety of air navigation as well as the efficient utilization of navigable airspace. Identified impacts can then be mitigated through the installation of obstruction marking and lighting, the issuance of notices to airmen (NOTAM), and other means.

Electro-magnetic Interference (EMI) caused by the development of wind farm is not expected to be significant. Electro-magnetic Interference produced from either WTG placement in the direct line of sight of point-to-point communications, or too close to omni- (all) directional communications or radar equipment, is the main point of interest for communications and radar operators.

VRA has formally notified the Ghana Civil Aviation Authority (GCAA) of its intention to construct the wind power facilities. Based on this, GCAA Safety Inspectors have been engaged and are conducting the relevant assessment. Current finding shows that the locations of the wind turbines in the 3 localities is not located under the flyway of commercial aircrafts. The wind turbines would be at the hub height of above 95 m (to be confirmed at final design stage), which would necessitate adequate provision of warning lights and signals necessary for elevated structures. This would require obtaining clearance from the Ghana Civil Aviation Authority and the National Communication Authority, in line with the "Guidance On Lighting and Marking of Obstacles", which are yet to be obtained.

### **7.14 POTENTIAL IMPACTS LINKED TO THE DECOMMISSIONING PHASE**

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The key impacts regarding decommissioning of the WEF are:

- Generation of waste;
- Potential termination of the employment opportunities associated with the facility; and
- Necessity to rehabilitate or restore the development footprint of the WEF.

#### **7.14.1 *Generation of waste***

At this stage, it can be assumed that the generation of waste is a potential direct impact. The removal of the supporting infrastructure (e.g. cabling, fencing and control rooms, etc.) will generate waste. Recommendations regarding the management of decommissioning wastes will be included in the EMP, e.g. where feasible, waste must be re-used or recycled. For example, steel support structures may be suitable for re-use elsewhere or re-cycled to form new products. The amount of waste will be limited and is not expected to significantly reduce the capacity of the closest operational landfill.

#### ***7.14.2 Potential termination of the employment opportunities associated with the wind energy facility***

With respect to socio-economic aspects, the jobs that were offered by the WEF will be terminated. At the approach of the decommissioning phase, staff employed at the facility and contracted service providers must be given adequate notice so that they may seek alternative employment.

#### ***7.14.3 Necessity to rehabilitate or restore the wind energy facility development footprint***

With respect to ecology and vegetation issues, the development footprint must be returned to an ecological functional state. The strategy for rehabilitating or restoring the development footprint will be developed in the course of the ESIA, for incorporation into the project EMP.

### **7.15 CUMULATIVE IMPACTS**

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Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed wind power facility. There are no existing wind power projects within the study area. The nearest similar wind power project will be the proposed 75MW Wind Power Project 1 (Anloga Extension) to be located in Anyanui, Srogbe and Anloga communities in the Keta Municipal in the Volta Region and to be developed by the VRA. Other developments (refer to Chapter 1, Section 1.2) are under implementation by Upwind International AG and are in different stages of development. Cumulative impacts from operation of project will need to be considered in relation to existing and proposed developments.



Environmental Impact Assessment  
for 75MW Wind Power Project 2,  
situated at Wokumagbe and Goi  
in the Ada West District of the  
Greater Accra Region

# CHAPTER 8: Plan of Study for ESIA

# SCOPING REPORT

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## 8 PLAN OF STUDY FOR ESIA

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This chapter presents the Plan of Study for the ESIA (PSESIA) which sets out the process to be followed in the ESIA Phase in line with the Ghanaian EIA Regulations LI 1652 of 1999. The PSESIA is based on the outcomes of the Scoping Phase (to date) and provides the Terms of Reference (TOR) for the specialist studies that have been identified as well as the public participation process (PPP) that will be undertaken during the ESIA Phase.

### 8.1 PURPOSE OF ESIA AND REQUIREMENTS OF THE GHANAIAN EIA REGULATIONS LI 1652 of 1999

The purpose of the ESIA Phase is to:

- Address issues that have been identified through the Scoping Process;
- Assess alternatives to the proposed activity in a comparative manner;
- Assess all identified impacts and determine the significance of each impact; and
- Recommend actions to avoid/mitigate negative impacts and enhance benefits.

The ESIA Phase consists of three parallel and overlapping processes:

- Central assessment process through which inputs are integrated and presented in an ESIA Report that is submitted for approval to the EPA and other commenting authorities
- Undertaking of a PPP whereby findings of the ESIA Phase are communicated and discussed with I&APs and responses are documented
- Undertaking of specialist studies that provide additional information/assessments required to address the issues raised in the Scoping Phase

### 8.2 OVERVIEW OF APPROACH TO PREPARING THE ESIA REPORT AND EMPR

The results of the specialist studies and other relevant project information for the VRA WEFs project will be summarised and integrated into the ESIA Report. The ESIA Report will be released for a 60-day I&AP and authority review period, as outlined in Sections 8.3 and 8.4 of this chapter. All registered I&APs on the project database will be notified in writing of the release of the ESIA Report for review. Should it be deemed necessary (based on feedback on the Scoping Process), a public meeting can be arranged during this review period, or following requests from stakeholders, several focus group meetings with key I&APs and stakeholders can instead be arranged. The purpose of these meetings (if deemed necessary) will be to provide an overview of the outcome and recommendations from the specialist studies, as well as provide opportunity for comment. Comments raised, through written correspondence (emails, comments, forms) and at meetings (public meeting and/or focus group meetings) will be captured in a Comments and Responses Trail for inclusion in the ESIA Report that will then be submitted to the EPA for decision-making. Comments raised will be responded to by the ESIA team and/or the applicant. These responses will indicate how the issue has been dealt with in the ESIA Process. Should the comment received fall beyond the scope of this ESIA, clear reasoning will be provided. All comments received (and the associated responses from the ESIA team) will be attached as an appendix to the ESIA Report for submission to the EPA.

The ESIA Report will include an EMPr, which will be prepared in compliance with the relevant regulations. This EMPr will be based broadly on the environmental management philosophy presented in the ISO 14001 standard, which embodies an approach of continual improvement. 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. If the project components are decommissioned or re-developed, this will need to be done in accordance with the relevant environmental standards and clean-up/remediation requirements applicable at the time.

### 8.3 PUBLIC PARTICIPATION PROCESS

The key steps in the PPP for the ESIA Phase are described below. This approach will be confirmed with the provincial and national environmental authorities through their review of the PSESIA.

#### **TASK 1: I&AP REVIEW OF THE ESIA REPORT AND EMPr**

A district based public forum during the ESIA phase would be held as part of the process to explain the findings of the various specialist studies and impacts identified and the proposed mitigative measures to enable the general public make inputs. Following this, a Draft ESIA report will be prepared and submitted to the EPA for review. The first stage in the review process will entail the release of the ESIA Reports for a 60-day I&AP and stakeholder review period. Relevant organs of state and I&APs will be informed of the review process in the following manner:

- Placement of one English advertisement in a newspaper to notify potential I&APs of the availability of the ESIA Reports;
- A letter will be sent via registered mail and/or email to all registered I&APs and organs of state (where postal, physical and email addresses are available) on the database. The letter will include notification of the 60-day comment period for the ESIA Reports, as well as an invitation to attend the public meeting and/or focus group meetings, if required. The letter will include an Executive Summary of the ESIA Reports and a Comment and Registration Form;
- A district based public meeting could possibly be held during the review of the ESIA Report, if warranted, and if there is substantial public interest during the ESIA Phase. Furthermore, telephonic consultations with key I&APs will take place, upon request; and
- Meeting(s) with key authorities involved in decision-making for this ESIA (if required and requested).

The ESIA Reports will be made available and distributed through the following mechanisms to ensure access to information on the project and to communicate the outcome of specialist studies:

- The EIA Reports will be placed at the Ada West Assembly and the VRA Head office in Accra as well as that of the Engineering Services and Environment & Sustainable development Libraries in Akuse and Akosombo respectively.
- Key authorities will be provided with either a hard copy and/or CD of the ESIA Reports and
- Telephonic consultations will be held with key I&AP and organs of state groups, as necessary.

#### **TASK 2: COMMENTS AND RESPONSES TRAIL**

A key component of the ESIA Process is documenting and responding to the comments received from I&APs and the authorities. The following comments on the ESIA Reports will be documented:

- Written and emailed comments (e.g. letters and completed comment and registration forms);
- Comments made at public meetings and/or focus group meetings (if required);
- Telephonic communication with SELJEN project team; and
- One-on-one meetings with key authorities and/or I&APs (if required).

The comments received during the review of the ESIA Reports will be compiled into a Comments and Responses Trail for inclusion in an appendix to the ESIA 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 ESIA 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 ESIA Reports for submission to the EPA and in the project design or EMPRs.

### **TASK 3: COMPILATION OF ESIA REPORT FOR SUBMISSION TO THE EPA**

Following the 60-day commenting period of the ESIA Report and incorporation of the comments received into the reports, the ESIA Report (i.e. hard copies and electronic copies) will be submitted to the EPA for decision-making. In line with best practice, I&APs on the project database will be notified via email (where email addresses are available) of such submission.

The ESIA Report submitted for decision-making will also include proof of the PPP undertaken to inform organs of state and I&APs of the availability of the ESIA Report for review (refer to Task 1).

The EPA will have 90 days (from receipt of the ESIA Report) to either grant or refuse an Environmental Permit (EP).

### **TASK 4: EP AND APPEAL PERIOD**

Subsequent to the decision-making phase, if an EP is granted by the EPA for the proposed project, all registered I&APs and stakeholders on the project database will receive notification of the issuing of the EP and the appeal period. Should the need arise, a public hearing will be held upon which comments/appeals will be heard within 15 days of EP being granted.

The following process will be followed for the distribution of the EP (should such authorisation be granted by the EPA):

- A letter will be sent via registered mail and/or email to all registered I&APs and organs of state (where postal, physical and email addresses are available) on the database

#### **Authority Consultation during the ESIA Phase**

Authority consultation is integrated into the PPP, with additional one-on-one meetings held with the lead authorities, where necessary. It is proposed that the Competent Authority (EPA) as well as other lead authorities will be consulted at various stages during the ESIA Process.

The authority consultation process for the ESIA Phase is outlined in Table 8.1 below.



**Table 8.1: Authority Communication Schedule**

STAGE IN ESIA PHASE	FORM OF CONSULTATION
During the ESIA Process	Site visit for authorities, if required.
During preparation of ESIA Reports	Communication with the authorities on the outcome of Specialist Studies.
On submission of ESIA Report for decision-making	Meetings with dedicated departments, if requested by the EPA, with Local Authority and potentially including relevant specialists.

## 8.4 APPROACH TO IMPACT ASSESSMENT AND SPECIALIST STUDIES

This section outlines the assessment methodology and legal context for specialist studies.

### 8.4.1 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. In order 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 other applicable projects, such as construction and upgrade of electricity generation, and transmission or distribution facilities in the local area 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 reviews 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 <sup>1</sup> (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 <sup>2</sup> , individual economic loss	High	8
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

<sup>1</sup> Note that a Loss of species is a global issue and is differentiated from a loss of “flora/fauna” population

<sup>2</sup> 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

- 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. <i>E.g. the construction noise temporary impact that is highly reversible as it will stop at the end of the construction period</i>	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. <i>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</i>	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. <i>E.g. The loss of a palaeontological resource on site caused by construction activities is permanent and would be irreversible.</i>	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 8.2: Guide to assessing risk/impact significance as a result of consequence and probability.**

Scoring	Significance rating	Description
18-26	<b>Fatally flawed</b>	The project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating.
10 - < 18	<b>High</b>	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	<b>Medium</b>	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	<b>Low</b>	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	<b>Very Low</b>	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. Table 8.3 is to be used by specialists for the rating of impacts.

- **Mitigation and Assessing Residual Impacts**

As specified in Section 12 of part II of the ESIA 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 EMPr 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. In Table 8.2 above, the scenario “without mitigation” considers all management actions already proposed by the proponent as part of the project description. “With mitigation” assesses the significance rating of the potential impact, taking into account any key mitigation or additional management actions recommended by the specialist.

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.

- **Proposed Monitoring**

Subsequent to 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.

- **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 wind power 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 ESIA 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.

Table 8.3: Example of Table for Assessment of Impacts

Construction Phase																
Direct Impacts																
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Study Site	Status	Spatial Extent	Duration	Intensity	Probability	Reversibility of Impact	Irreplaceability	Can the Impact/Risk be Avoided?	Can the Impact/Risk be Mitigated/ Managed?	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confi dence Level
													Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Clearing of 150 ha of vegetation	Habitat and species loss	Wokumagbe	Negative	Site	Long- Term	Substantial	Very likely	Moderate	Moderate	No	Yes	Plant search and rescue plan	Moderate	Low	4	Medi um



## 8.5 ISSUES TO BE ADDRESSED IN THE SPECIALIST STUDIES

The issues that will be addressed in the specialist studies/input are included in Chapter 7 of this Scoping Report, however they have been summarised below in Table 8.4 for ease of reference.

**Table 8.4: Brief summary of Issues to be addressed during the ESIA Phase as part of the specialist studies/input**

Specialist Study/Input	Issues to be addressed
Aviation Impact Assessment	<u>Construction Phase and Operation Phase:</u> <ul style="list-style-type: none"> <li>• Permits needed</li> </ul>
Avifauna	<u>Construction Phase and Operation Phase:</u> <ul style="list-style-type: none"> <li>• Sedimentation and erosion</li> <li>• Destruction of bird habitat:</li> <li>• Disturbance of birds:</li> <li>• Displacement of birds from the site and barrier effects:</li> <li>• Collision of birds with turbine blades:</li> <li>• Collision and electrocution on overhead power lines:</li> <li>• Bat roost disturbance and/or destruction due to construction activities;</li> </ul>
Cultural Heritage Impact Assessment	<u>Construction and Operational Phase:</u> <ul style="list-style-type: none"> <li>• Living heritage</li> <li>• The cultural landscape</li> </ul>
Noise Impact Assessment	<u>Construction and Decommissioning Phases:</u> <ul style="list-style-type: none"> <li>• Noise impact from the construction vehicles and equipment (including blasting if required).</li> <li>• Noise generation from demolition and construction work (e.g. grinding and use of angle grinders), as well as from the removal of waste material (e.g. crane and truck engines).</li> </ul> <u>Operational Phase:</u> <ul style="list-style-type: none"> <li>• Impact on the closest residents due to noise from the operation of the WEF</li> <li>• Potential noise impact from road transport of products during the operational phase (i.e. increased road traffic).</li> <li>• Impacts from noise disturbance and nuisance that will not meet the noise guidelines.</li> </ul>
Socio-economic/ Property Valuation Impact Assessment	<u>Construction Phase and Operation Phase:</u> <ul style="list-style-type: none"> <li>• Influx of job seekers;</li> <li>• Increased competition for urban-based employment;</li> <li>• Increases in social deviance;</li> <li>• Impact on health;</li> <li>• Increases in incidence of HIV/AIDS infections;</li> <li>• Expectations regarding jobs;</li> <li>• Local spending;</li> <li>• Change in land use</li> <li>• Creation of temporary jobs during construction (including local jobs);</li> </ul>

Specialist Study/Input	Issues to be addressed
	<ul style="list-style-type: none"> <li>• Skills training for local workers during construction;</li> <li>• Creation of long-term jobs during operations and skills training;</li> <li>• Potential for sourcing materials locally (during construction and operations); and</li> <li>• Job losses at the end of the project life-cycle.</li> </ul>
Terrestrial Ecology Impact Assessment	<p><u>Construction Phase:</u></p> <ul style="list-style-type: none"> <li>• Impacts on vegetation and listed/protected plant species</li> <li>• Alien Plant Invasion Risk</li> <li>• Increased erosion risk</li> <li>• Faunal impacts</li> <li>• Loss of landscape connectivity and disruption of broad-scale ecological processes</li> <li>• The impact that noise generated during the construction phase, but more importantly the long term operations phase by the proposed project may have on sensitive noise receptors such as small mammal species.</li> </ul>
Visual Impact Assessment	<p><u>Construction Phase and Operational:</u></p> <ul style="list-style-type: none"> <li>• Impact of introducing highly visible wind turbines into a landscape which did not have any , and the impact this would have on existing character or sense of place of the region</li> <li>• Visual intrusion of wind turbines on existing views of residents of surrounding areas;</li> <li>• Visual impact of a wind energy facility on tourists visiting the region;</li> <li>• Visual intrusion of wind turbines on views of motorists (tourists) travelling on main roads;</li> <li>• Potential effect of lighting on the existing nightscape of the region;</li> <li>• Visual intrusion of highly visible construction activity on sensitive visual receptors in the region.</li> <li>• Construction activities and equipment associated with construction of the proposed development, including access roads and buildings;</li> <li>• Impact of security and construction lighting at night;</li> <li>• Construction of the overhead distribution lines and the onsite substation are likely to be visible against the skyline in places;</li> <li>• Activities during construction of the proposed overhead distribution lines are likely to be visible against the skyline in places; and</li> </ul>
Wetland Impact Assessment	<p><u>Construction Phase and Operational:</u></p> <ul style="list-style-type: none"> <li>• The potential loss of aquatic habitat (physical destruction)</li> <li>• The potential loss of aquatic habitat (physical destruction)</li> <li>• Loss of ecosystem services</li> <li>• Habitat fragmentation (fish support areas)</li> <li>• Potential loss of Species of Special Concern (plants &amp; fish)</li> <li>• Sedimentation and erosion</li> <li>• Impact on Ramsar site</li> </ul>

## 8.6 ALTERNATIVES TO BE ASSESSED IN THE ESIA PHASE

A description of the alternatives that will be assessed or considered during the ESIA Phase is provided in Chapter 6 of this Scoping Report. However, they have been summarised below for ease of reference:

- **No-go Alternative:**
  - The no-go alternative assumes that the proposed project will not go ahead i.e. it is the option of not constructing the proposed WEF. This alternative would result in no environmental impacts on the site or surrounding local area, as a result of the facility. It will provide a baseline against which other alternatives will be compared and considered during the ESIA Phase.
- **Land Use Alternative:**
  - No other energy technologies were deemed to be appropriate for the site and therefore these technologies will not be further assessed during the ESIA Phase.
    - The wind resources available at the WPP2 site are the most favourable for wind energy.
    - The close proximity of the harbour facility, suggests that electricity generation-related land use/s are the most appropriate for the preferred site with regards to ease of transport of WEF components.
- **Location Alternatives within the Selected Site:**
  - The selection of the site is described in Chapter 6 of this Scoping Report. During the ESIA Phase, possible layout plans within the preferred WPP2 project site will be discussed (refer to Layout Alternatives).
- **Technology Alternatives:**
  - Applicable and relevant technology options related to wind energy will be described during the ESIA Phase.
- **Layout Alternatives:**
  - Layout alternatives for the project will be discussed following the input from the various specialists. The studies will aim to identify various environmental sensitivities present on the preferred site that should be avoided, which will be taken into account during the determination of the proposed layout of the wind power facility.

It is important to note that where alternatives are not feasible or will not be assessed, a motivation has been provided in Chapter 6 of this Scoping Report.

## 8.7 TOR FOR THE SPECIALIST STUDIES

The TOR for the specialist studies will essentially consist of the generic assessment requirements and the specific issues identified for each discipline. The TOR will be updated to include relevant comments received from I&APs and authorities during the 60-day review of the Scoping Report.

The following specialist studies have been identified based on the issues identified to date, as well as potential impacts associated with the project (refer to Table 8.5). The TOR for each specialist study is discussed in detail below. Additional specialist studies could possibly be commissioned as a result of issues raised during the Scoping Process.

**Table 8.5: Specialist Studies and Associate Specialists**

NAME	ROLE/STUDY TO BE UNDERTAKEN
Kofi Gatu	Socio-economic Impact Assessment Study
Dr. James Kojo Adomako	Terrestrial Ecology Impact Assessment Study
Dr. Erasmus Owusu	Bird Impact Assessment Study
Dr. Wazi Apoh	Heritage Impact Assessment Study
William Agyare	Aviation & Communication Impact Assessment Study
Charles Amankwah	Wetland Impact Assessment Study
Alex Whitehead	Wetland Impact Assessment Study
Frank Cudjoe	Property Valuation Study
Nicollete von Reiche	Noise and Flicker Impact Assessment Study
Scott Masson	Visual Impact Assessment Study

As explained in Chapter 6 of this Scoping Report, it is important to note at the outset that cumulative impacts will be assessed the specialist studies (as applicable) by identifying other applicable projects, such as construction and upgrade of electricity generation, transmission or distribution facilities in the local area (i.e. within 20 km of the proposed projects) that have been approved (i.e. positive EP has been issued) or for which an ESIA process is currently underway.

### 8.7.1 Aviation & Telecommunication Impact

The ESIA Study shall conduct radar line-of-sight assessments of radar systems that may be affected, considering the wind farm as a potential obstruction to aerial navigation given the airspace it would occupy and nearby aerodromes. Possible electromagnetic interference on telecommunications, navigation and surveillance systems other than radar shall also be investigated. The ESIA Study shall determine the aviation protection that will be required for the project.

In order to accomplish the assessment, the likely impact of the location, height and blade rotation of the proposed wind turbines would be considered. The following would be assessed:

#### Impact on Airports

- Evaluate the proposal's effect upon existing and planned airports including: airport operations, capacity, efficiency, and development

#### Impact on Air Traffic Operations and Flight Procedures

- Determine a proposal's impact on aeronautical operations, air traffic procedures, and airport traffic patterns
- Evaluate the object's effect on visual flight rules (VFR) routes, VFR terminal operations, and other concentrations of VFR traffic (en route environment)
- Determine a structure's impact to terminal area instrument flight rules (IFR) operations such as transitions, radar vectoring, holding, approaches, and arrival and departure procedures
- Evaluate the effect of the proposed construction on en-route IFR operations including minimum en route altitudes (MEAs), minimum crossing altitudes (MCAs), and minimum holding altitudes (MHAs)
- When an effect occurs, provide a statement as to what adjustments can be made to eliminate the adverse effect.

#### Impact on Telecommunication, Navigation and Surveillance Facilities

- Evaluate the physical and/or electromagnetic effect on the quality of navigational or communication signals
- Assess the impact on air traffic services such as control tower line-of-sight issues, ground-based radar, sunlight reflection, etc.

#### Impact on Military Operations

- Evaluate the effect of a proposal on military airports, special use airspace, and military training routes

Using information obtained from this evaluation, the ESIA Study shall generate graphical overlays to determine proximity to public and military airports, published instrument procedures, military operational areas, enroute airways, civil minimum vectoring altitude charts, and military training routes. The ESIA shall then evaluate all published instrument approach and departure procedures, visual flight rules, civil minimum vectoring altitudes, and enroute operations. All formulas, headings, altitudes, bearings, and coordinates used during this study will be derived from documents and data sources from the GCAA and the Ghana Armed Forces.

#### **8.7.2 Compensation Action Plan**

The project requires the acquisition of land of about 193.31 ha for the development of the wind power projects in the various areas. The ESIA Study shall provide information on affected individual and community properties, forest reserves, if any, and compensation packages that may be required for the acquisition of the land and any impacts due to the project. The Compensation Action Plan (CAP) for the project is expected to be prepared, in accordance with required standard of the Resettlement Policy Framework (RPF), 2011 under the Ghana Public Private Partnership (PPP) Programme and other international funding agencies. Such guidelines include the World Bank Operational Directive on Involuntary Resettlement OP 4.12 revised April 2013 as well as the African Development Bank Guidelines for the Development of a Resettlement Action Plan, June 2003. To encourage development and reduce poverty, the development of the CAP will aim at the following:

- To carry out compensation and resettlement both in accordance with the local laws and regulations of Ghana, and in accordance with World Bank guidelines on involuntary resettlement;
- To consider involuntary compensation as an integral part of project design, and deal with resettlement issues from the earliest stages of project preparation;
- To undertake resettlement in partnership and consultation with affected stakeholders including the communities to be resettled and the host communities;
- To compensate project-affected persons (PAPs) fully and fairly for all assets lost permanently or temporarily, this means timely payment of full replacement value prior to construction;
- To ensure that only PAPs who meet agreed eligibility criteria will be entitled to compensation and relocation measures;
- To ensure that lack of legal rights to land and assets occupied or used will not preclude a PAP from entitlement to resettlement and compensation measures;
- To ensure that all PAPs who lose residences or businesses are provided acceptable alternative accommodations before construction;
- To assist PAPs in proportion to impact, recognizing the special needs of vulnerable populations; i.e. widows, orphans, HIV/AIDS victims, elderly people and handicapped people;
- To ensure that PAPs who lose income-generating resources are assisted in their efforts to improve their livelihoods and standards of living or at least restore them, in real terms, to pre-project levels;
- To disclose the proposed mitigative measures to the local community prior to resettlement and conduct ongoing consultation with affected communities during the resettlement process and afterwards;
- To provide a grievance procedure whereby local people can lodge concerns and complaints regarding the resettlement;
- To monitor the resettlement and rehabilitation components during and after resettlement, and ensure that vulnerable groups are identified and receive additional assistance as necessary;
- To consult with project-affected persons (PAPs) in a meaningful manner, and to provide opportunity for their participation in the planning and execution of resettlement programs;
- To facilitate a smooth integration with the host communities;
- To provide assistance to the affected persons in their efforts to improve former production levels, income earning capacity and living standards or at least restore them to the levels they would have been without the project.
- To ensure that pre-construction and actual construction work on each particular affected site will not commence until PAPs have been satisfactorily compensated and/or relocated.



### 8.7.3 Ecological Survey & Habitat Assessment Study

An assessment of the current ecological status of the project sites, including an ornithological survey is undertaken by a team of experts. This is being performed in line with IFC P6 and World Bank OP 4.04. 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 (including bats) of conservation importance; which could possibly occur at the site.
- Assess impacts of the proposed wind 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.
- Undertake an ornithological study to assess the significance of the effects of the Project on the bird populations within the proposed footprint of the Project and immediately adjacent.
- Outline the biodiversity values of each identified bird species as well as the overall value of the site for each species.
- Make recommendation on suitability of site for the project regarding the extent of impacts on ecology.

### 8.7.4 Historical Resources & Cultural Heritage Assessment

The ESIA Study will continue with a reconnaissance survey to identify available historical and cultural heritage resources that are present in the proposed development area. The following wide range of places and objects are to be investigated during the survey:

- places, buildings, structures and equipment
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds,
- movable objects

This assessment shall aim 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 Decree (1969) NLCD 387. A “**Historical Resources & Cultural Heritage Assessment**” report will be prepared and will include:

- the nature, scope, description, photos and video documentary of all activities undertaken during fieldwork;
- the identification and mapping of all heritage resources in the area affected;
- an assessment of the significance of such resources;
- an assessment of the impact of the development on such heritage resources;
- the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
- if heritage resources will be adversely affected by the proposed development, the consideration of alternatives;
- as well as recommendation on the sites to be excavated and on heritage features to be protected or relocated.

#### **8.7.5 Noise and Flicker Impact Assessment**

A noise impact assessment study will be undertaken to establish the relationship between the Wind Turbine Generators 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.).

The following broad terms of reference have been specified for the noise specialist study:

- Conduct a desktop study of available information that can support and inform the specialist noise study;
- Identify all noise sensitive receptors within the study area;
- Measure the existing ambient noise at the proposed site during both the day and night time;
- Identify potential noise sources and their relative contribution to noise generated by the development;
- Specify methodologies and intervals for noise monitoring to evaluate, assess and report the noise emissions; and
- Consider a range of parameters including topography, location of receptors, weather conditions and seasonal variations that can influence the location and timing of noise measurements required to determine the noise level emitted by other developments within the enclave of the wind farm.

The shadow flicker analysis shall be conducted using the Shadow Flicker module of the WindPro Version 2.9 Software. The analysis reports the 'worst case' scenario, i.e. a situation where there is always sunshine, the wind is always blowing, and the wind and the WTG rotor track the sun by yawing the WTG exactly as the Sun moves. In addition, the model does not include consideration of any screening effects of existing vegetation and buildings.

The minimum angle of the Sun above the horizon to be analysed also has an effect on the results. As the Sun approaches the horizon, the light becomes less intense and therefore the shadow influence is reduced. The analysis will be conducted using a 2° minimum angle above the horizon. This value is considered to be conservative because the lower the sun is in the sky the longer the shadow cast by WTG would be. However below 2° it is generally considered that the intensity of the light decreases such that shadow flicker is unlikely to occur to any significant extent.

The shadow Flicker effect is to be analyzed in more detail at the designing and siting stage for the final layout. The IFC Environmental, Health & Safety Guidelines for Wind Energy, Environmental issues specific to the operation of wind energy projects identifies Light and illumination issues as a critical component of a wind power project. In Ghana, there are no set guidelines for assessment of shadow flicker, or set limits for acceptable exposure to shadow flicker. In the absence of Ghanaian limits, it is useful to bench-mark modelled results against European and international good practice, which draws upon German guidance that suggests a shadow flicker limit of 30 hours / year or 30 minutes / day on the worst affected day, based on an astronomical worst case scenario. This view is supported by Northern Irish planning guidance which recommends that “shadow flicker at neighbouring offices and dwellings within 500m should not exceed 30 hours per year or 30 minutes per day”.

#### **8.7.6 Socio-economic Impact Assessment**

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 ESIA 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.

#### **8.7.7 Visual Intrusion Assessment**

The following broad terms of reference have been specified for the visual specialist study:

- A desktop review of any existing data and literature on the specialist field of expertise which will inform the rest of the assessment process in terms of documentation (e.g. municipal and regional planning policy, spatial development frameworks, legislation, national and international examples of similar developments) and availability of data (sensitive landscapes and visual receptors, spatial data for visibility analyses and landscape assessment). The desktop review will also provide a basis for evaluating the confidence levels for the overall assessment.

- A desktop analysis using GIS and available spatial data should be used during the preliminary study to determine:
  - Areas of scenic interest (nature reserves, sites of cultural importance, heritage sites)
  - Potential sensitive visual receptors (viewpoints, residences, tourists)
  - Preliminary zone of visual influence
  - Principal representative viewpoints.
- A photographic survey which 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).
- 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 in particular 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 local residents and other sensitive receptors should also be determined.
- The visual baseline information gathered during the field survey on the influence of vegetation and topography on the potential visibility of the wind farm shall provide a basis for determining the Zone of Visual Influence and the practical extents of the area for which the visibility analyses will be done. The visual absorption capacity (VAC) for the area shall be determined to aid in site selection and mitigation.
- The following criteria should be used to assess the magnitude and significance of the potential visual impact of a development:
  - Potential visibility of the development;
  - Sensitivity of visual receptors to changes in the quality of their views
  - Distance of the development from sensitive viewers (visual exposure)
  - Compatibility of the development with the 'sense of place' of the area (visual intrusion).
- Photo-montage and 3D modelling should be used to compare existing visual conditions with probable scenarios if the development is introduced to the landscape. In the case of a wind farm it is expected that the magnitude of visual impact will be high, and photo-montage and 3d modelling will be required, although this will depend on the number of highly sensitive visual receptors in close proximity to the site as well as the landscape character, quality and sensitivity (and therefore on the final site selected for the wind farm).
- Utilise a recognised visual impact assessment methodology, such as “Guidelines for Landscape and Visual Impact Assessment [GLVIA] Third edition, Landscaped Institute, Institute for Environmental Management & Assessment and Routeledge, 2013”.
- Develop a monitoring programme to be included in the EMPr, if applicable

### 8.7.8 Wetland Ecology Impact Assessment

The proposed project site is located close to the designated Songor Ramsar Site. Our team of experts shall therefore undertake a wetland impact assessment on the site of the wind power project to inform the site development plan as part of the Environmental and Social Impact Assessment Process. This study will largely lean on information to be provided in the ongoing geo-technical and topographical studies. The objectives of the wetland assessment will be to:

- A desktop review of any existing data and literature on the specialist field of expertise which will inform the rest of the assessment process in terms of documentation (e.g. municipal and regional planning policy, spatial development frameworks, legislation, national and international examples of similar developments) and availability of data. The desktop review will also provide a basis for evaluating the confidence levels for the overall assessment;
- The indicators to be assessed at each of the final two (2) project sites shall include:
  - Terrain Unit - parts of the landscape where wetlands are most likely to occur e.g. valley bottoms and low lying areas;
  - Soil Form - soil forms associated with prolonged and frequent saturation.
  - Soil Wetness - soil morphological "signatures" that develop in soils characterised by prolonged and frequent saturation;
  - Vegetation - presence of 'hydrophilic and hydrophytic vegetation associated with frequently saturated soils;
- The creation of maps depicting demarcated aquatic and wetland vegetation delineated to a scale of 1:10 000, following the recognised methods and international standards.
- The determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of any waterbodies, estimating their biodiversity, conservation and ecosystem function importance with regard ecosystem services.
- The recommendation of buffer zones and No-go areas around any delineated aquatic areas based on the relevant legislation or best practice.
- Provide mitigations regarding project related impacts, including engineering services that could negatively affect demarcated aquatic vegetation units.
- Recommend specific actions that could enhance the aquatic functioning in the areas, allowing the potential for a positive contribution by the project.
- Where possible, Supply the client with geo-referenced GIS shape files of the waterbodies as per the required specifications supplied.
- Make recommendations on possible interventions needed to minimize any impact in the project area.

## 8.8 CONTENT OF ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT REPORT

Annex B to Operational Procedures 4.01 provides an outline of the information that should be included in a full EA. In addition, Annex C provides the outline of content of an Environmental Management Plan. The ESIA Team will collate all the gathered and generated information and data into a ESIA Report in a format acceptable by the Ghana EPA and submit same toward the acquisition of an environmental permit. The ESIA report will also include a Table of Contents, a Glossary of Terms and Abbreviations and a Reference List and Annexes. The ESIA report will provide maps, figures and process diagrams to facilitate understanding of the descriptive elements of the report.

In accordance to the LI 1652, the ESIA is intended to meet the formal requirements of Ghana’s EPA as well as international requirements and will consist of two (2) volumes as follows:

<b>VOLUME 1:</b>	<b>ENVIRONMENTAL &amp; SOCIAL IMPACT ASSESSMENT REPORT</b>
	Non-Technical Summary
Chapter 1:	Introduction
Chapter 2:	Policy, Legal & Regulatory Framework
Chapter 3:	Description of the Project
Chapter 4:	Consideration of Alternatives
Chapter 5:	Description of Existing Environment
Chapter 6:	Consultations & Public Disclosure Process
Chapter 7:	Methodology for Identification, Analysis Identification, Analysis and Evaluation of Impacts
Chapter 8:	Impacts & Mitigation Measures
Chapter 9:	Cumulative Effect Assessment
Chapter 10:	Provisional Environmental Management Programme
Chapter 11:	Decommissioning & Site Closure Plan
Chapter 12:	Conclusion & Recommendations
	References
<b>VOLUME 2:</b>	<b>APPENDICES</b>

## 8.9 KEY MILESTONES OF THE ESIA PROCESS

Key Milestones activities	Proposed Timeframe
Submit Scoping Reports to the EPA for Decision-making.	June 2016
I&AP, Stakeholder and Authority Review of the Scoping Reports: 60 days	June 2016 – July 2016
Submit Draft ESIA Report to the EPA for review Decision-making.	August 2016
I&AP, Stakeholder and Authority Review of the ESIA Reports: 60 days	August – September 2016
Submit Final ESIA Report to the EPA for Decision-making.	October 2016
Next steps: notification to applicant	



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# CHAPTER 9:

## Provisional Environmental Management Programme

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## 9 PROVISIONAL ENVIRONMENTAL MANAGEMENT PROGRAMME

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### 9.1 OVERVIEW

As required under the EIA Regulations 1999 (LI 1652), a detailed Provisional EMP with estimated costs shall be provided in the main ESIA Report. This Chapter gives an overview of the content of the Environmental Management Plan (EMP) is the implementation mechanism to manage environmental and social issues and mitigation measures identified on screening potential environmental impacts and mitigation measures.

#### 9.1.1 Components of EMP

The Provisional EMP shall consist of the following components:

- a. Legislation and Guidelines
- b. Organizational Structure and Responsibilities
- c. Mitigation Plan
- d. Environmental Monitoring Plan
- e. Emergency Response and Contingency Plan
- f. Communication and Documentation

#### 9.1.2 Objectives of EMP

The Provisional EMP will help VRA in addressing the adverse environmental impact of the project, enhance project benefits, and introduce standards of good environmental practice. The primary objectives of the EMP are to:

- Facilitate VRA and project sponsors' corporate policy on environment.
- Define the responsibilities of project coordinators, contractors and other role players and effectively communicate environmental issues among them.
- Facilitate the implementation of mitigation measures identified in the EIA by providing the technical details of each project impact, and providing an implementation schedule.
- Define a monitoring mechanism and identify monitoring parameters to ensure that all mitigation measures are completely and effectively implemented.
- Ensure that after completion of Project, restoration of site and rehabilitation work will be carried out.
- Required equipment and human resources for environmental monitoring and meeting contingency plan objectives are in place and personnel are trained to meet accidents and emergencies.

### **9.1.3 Scope of Provisional EMP**

The Provisional EMP shall provide a detailed strategy to be implemented for achieving improved environmental performance in the areas requiring mitigation as identified in the ESIA, both during the constructional and operational phases. The preliminary content for the EMP is as follows:

- a. Pollution Prevention
- b. Environmental Management
- c. Water Usages and Disposal
- d. Waste Management
- e. Storm Water Management
- f. Bio-Diversity
- g. Resettlement
- h. Resource Management
- i. Traffic & Transport
- j. Community Awareness
- k. Grievance Mechanism
- l. Health & Safety
- m. Emergency Response Plan
- n. Competence & Training
- o. Documentation & Reporting

### **9.1.4 Mitigation Plans**

A Constructional Environmental & Social Action Plan (CESAP) as well as an Operational Environmental & Social Action Plan (OESAP) shall be outlined in the Provisional EMP as mitigation plans. The CESAP and OESAP will be developed to set out the Project commitments to avoid or minimise potential environmental impacts as identified in the project ESIA, including identification of environmental aspects to be managed and how environmental values may be protected and enhanced. It shall also serve as an early warning system by revealing unforeseen impacts and allowing additional corrective measures to be implemented to arrest the situation and ensure that irreversible damage is not caused.

The CESAP and OESAP is also expected to provide useful guidance for the successful planning and implementation of future wind power facilities that will be undertaken in Ghana.

### **9.1.5 Occupational Health and Safety Plan**

An Occupational Health & Safety (OHS) Plan will be developed for both the construction (EPC Contractor) and the operation phase in accordance with the VRA's Health and Safety guidelines and guided by the Factories, Offices and Shops Act, 328, (1970) as well as the 2007 IFC EHS guidelines. The purpose of the OHS plan will be to make all personnel onsite aware of their responsibilities and accountability as prescribed by all relevant regulations, guidance and protocol (international, national, lenders and company).

### 9.1.6 Monitoring

To verify the effectiveness of the mitigation measures and management practices, a program of monitoring shall be established for the project with the following objectives:

- a) To ensure that all mitigation and control measures are operating efficiently and with designed effect;
- b) To provide the information to develop improved practices and procedures for environmental protection;
- c) To ensure that environmental standards are being met;
- d) To detect changes in the receiving environment and enable analysis of their causes;
- e) To better enable effective liaison with the local communities, including addressing complaints and concerns.

### 9.1.7 Cost of EMPr

Financial provision will be made to ensure that mitigation measures, monitoring and training programmes are effectively implemented. The estimated total budget for the various environmental management activities of the project and associated facilities is to be provided in the Provisional EMPr.



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# CHAPTER 10: References

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## 10. REFERENCES

1. Leube, A., W.Hirdes, R.Mauer and G.O Kesse (1990): The early Proterozoic Birimian Supergroup of Ghana and some aspects of its associated gold mineralization, *Precambrian Res.*, **46**, 139-165.
1. Amponsah, P.E. (2002): Seismic activity in relation to fault systems in Southern Ghana, *J. African Earth Sci.*, **35**, 227-234.
2. Amponsah, P.E. (2004) Seismic activity in Ghana: past, present and future, *ANNALS OF GEOPHYSICS*, VOL. 47, N. 2/3, April/June 2004
3. Bacon, B. and Quaah, A.O. (1981): Earthquake activity in Southeastern Ghana 1977-1980, *Bull. Seismol. Soc. Am.*, **71**, 771-784.
4. Boateng, Isaac (Dr) (2009): Spatial Planning in Coastal Regions: Facing the Impact of Climate Change International: Federation of Surveyors, FIG PUBLICATION NO. 55. Publication of FIG Commission 8 Working Group 8.4
5. Boere, G. C., Galbraith, C. A. and Stroud, D. A. (eds) (2006) *Waterbirds around the world*. The Stationery Office, Edinburgh, UK. 960 pp. Available at: <http://www.jncc.gov.uk/page-3891>.
6. Burke, K. (1971). Recent Faulting Near the Volta dam: *Nature*, **231**; 439 – 440
7. Delany, S. and Scott, D. (2006). *Waterbird Population Estimates*. Fourth Edition. Wageningen: Wetlands International.
8. Dorbu, V. L. (1985). .Engineering review and recommendation for Solving the Keta Sea erosion problem. Dorbu & Associates Clairton PA 15025 47 p. Illustrated.
9. Earth tremor causes panic in parts of Accra, 25 July 2014. [Online. available: <http://citifmonline.com/2014/07/25/earth-tremor-hits-parts-of-accra/#sthash.19F3Twnb.dpbs>.
10. Environmental Protection Agency (EPA). 2014. Songor Ramsar Site and Man and Biosphere Reserve Management Plan. EPA/UNESCO/MAB.
11. Essah, E. A. (2011) Energy generation and consumption in Ghana. In: West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, pp. 391-401. Available at <http://centaur.reading.ac.uk/20973/>
12. ESSEL, P.E. (1997): Geophysical Investigation of the Seismicity of the Weija Area, M.Phil. Thesis (University of Ghana, Legon), 61-63.
13. Ghana's Power Crisis Deepens. Retrieved from: <http://www.arrakis-group.com/energy/renewable-energy-what-is-ghanas-wind-power-potential/Electricity>
14. Intergovernmental Panel on Climate Change (IPCC). 2011. IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation. Prepared by Working Group III of the Intergovernmental Panel on Climate Change [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer, C. von Stechow (eds)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1075 pp. (Chapter 9).
15. Laso trabsporters, 2015. Anloga 1/2/3 Annex 2, Route Survey, Ghana.
16. Lahmeyer International GmbH. (2015). Draft Feasibility Report for Anloga Wind Farm, Ghana.
17. Netherlands Institute for Sea Research (NIOZ) / Ghana Wildlife Society Report (1995), No.6.
18. Ntiamao-Baidu, Y. & Gordon C., (1991). Coastal Wetlands Management Plans: Ghana. Report to World Bank, Department of Zoology, University of Ghana, Accra.
19. Ntiamao-Baidu, Y. & Hepburn, I.R. (1988). Wintering waders in coastal Ghana. *RSPB Cons. Review*. **2**:85-8.
20. Piersma, T. & Ntiamao-Baidu, (1995). Waterbird Ecology and the Management of Coastal Wetlands in Ghana. Ghana Coastal Wetlands Management Project.
21. Quaah, A.O. (1980): Microseismicity, past seismic Activity and seismic Risk in Southern Ghana, Ph.D. Thesis (University of London), 10-223.

22. Ramsar Convention on Wetlands of International Importance, Especially as Waterfowl Habit, Ramsar Iran, 1971.
23. Tahal Consulting Engineers 1986. An appraisal of a flood control outfall for Keta Lagoon. Report prepared for Diamond Shamrock Africa petroleum Accra.
24. Wildlife Division, (1999). Coastal Wetlands Management Project (CWMP): Keta Ramsar Site Management Plan.
25. <http://www.vra.com/resources/facts.php>

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# APPENDICES

- Appendix A EPA Response Letter to Project Registration
- Appendix B Interested & Affected Persons Database
- Appendix C Background Information Document
- Appendix D Sample Scoping Notice
- Appendix E Pictures from Stakeholder's Engagements
- Appendix F Signed List of Attendants at State Agency's Forum  
Signed List of Attendants at Ada West General  
Assembly Forum
- Appendix G Energy Commission Provisional License

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# APPENDIX A:

## EPA Response Letter to Project Registration

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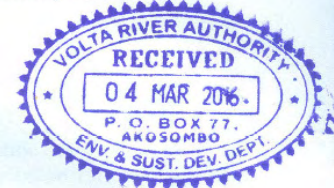
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**Environmental Protection Agency**

P. O. Box MB 326  
Ministries Post Office  
Accra

Website: <http://www.epa.gov.gh>



Our Ref: CE: 5639/01/02

February 26, 2016

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

Dear Sir,

**ENVIRONMENTAL IMPACT ASSESSMENT (EIA)**  
**PROPOSED 75MW WIND POWER PROJECT LOCATED WOKUMAGBE AND GOI IN THE**  
**ADA WEST DISTRICT OF THE GREATER ACCRA REGION**

We acknowledge receipt of the completed Environmental Assessment Registration Form (EA2) submitted to the Agency for the purpose of obtaining environmental approval for the above proposal 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 projects.

In line with Regulations 11 of LI 1652 however, 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 for study and agreement on the TOR, prior to the EIA studies.

It is important that 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 consult with the EPA Head Office (Room 305) and the EPA Central Regional Office, Cape Coast for any further guidance you may require in this regard.

Yours faithfully,

John Doghle  
PO/EAA Division  
For: Executive Director

② DESD - TMO 3/4/16

① DCE (E&O)

cc: The Regional Director, EPA, Accra East Region, Tema

① Mgr. E&I - Copied  
Aya, pls. TMO 3/4/16



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# APPENDIX B:

## Interested & Affected Persons Database

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Scoping Report for the proposed Wind Energy Facilities in Wokumagbe and Goi (WPP2)

No	Stakeholder	Name	Position	Contact Number
1	Sege Constituency	Hon. Christian Corletey Otuteye	Member of Parliament, Sege	0248523734
2	Badzorhe/Luta	Ameyaw David Narh	Assemblyman / Presiding Member	0242251193
3	Sege Constituency	Modjifa-Tanohu J.J.F	Government Appointee	0243363379
4	Sege Constituency	Nene Saki Keteni V	Government Appointee	0244411635
5	Sege Constituency	Doe Caesar	Government Appointee	0243363379
6	Sege Constituency	Maxwell Ofosu	Government Appointee	0249228083
7	Addokope	Ben Adi Senior	Assemblyman	0245511621
8	Bonikope	Osei Francis Lawer	Assemblyman	0242209134
9		Jonas Adabah	Assemblyman	0241228275
10	Akplabanya	Amos Dotse Kwao	Assemblyman	0243283516
11	Nakamkope	Moses Ayer Oklu	Assemblyman	0547328252
12	Sege-Koni	Namor Moses Lomotey	Assemblyman	024445030
13	Toflokpo	James Gaduge	Assemblyman	0246235100
14		Gloria A. Alimo	Assemblywoman	0245956315
15	Anyamam	Samuel Okutu	Assemblyman	0242387187
16	Matsekope	Marmah Mortey	Assemblyman	0548522261
17	Lolonya	Ahuakese Joseph Rockson	Assemblyman	0246772401
18	Koluedor	Akoto Prince Ofoe	Assemblyman	0240435414
19	Afiaddenyigba	James Narh Lawerteh	Assemblyman	0243211466
20	Akplabanya	Amos Dotse Kwao	Assemblyman	0243283876
21	Lolonya	Ahuakese Joseph Rockson	Assemblyman	0246772401
22	Wokumagbe	Stephen Charwetey	Assemblyman	0502716326

No	Stakeholder	Name	Position	Contact Number
23	Goi	John Akwafo Tsiri	Assemblyman	0242046358
24	Wokumagbe	John Alipuiteye Sowa Narh	Linguist	0264783890
25		Kofi Samuel Akwetey	Regent	0241527347
26		Sumaila Tetteh Kpakpah	Opinion Leader	0242731752
27	Omankope	Daniel Akwetey Blemano	Opinion Leader	0248185635
28	Goi Community	Amos Teye Sebi	Elder	0242049567
29		Amartey Sebi	Clan Elder	0244415451
30		Raymond Sebi	Clan Elder	0505844165
31		Johnathan D. Okutu	Opinion Leader	0243244508
32	Ada West District Assembly	Foster D. K. Ayivor	District Finance Officer	0207346979
33		Ephraim Anku	District Internal Auditor	0246304828
34		Frank K. Nikoi	District Planning Officer	0243664185
35		Moses Klu	Asst. Internal Auditor	0242920623
36		Alhassan Ziblim A.	District Cordinating Director	0507468565
37		Exangbe A.K Divine	Dept. of Social Welfare & Community Dept.	0242185409
38		Annan Emmanuel	Environmental Officer	0249688221
39		Sroda Awo Latsu	Asst. Human Resource Manager	0244283174
40		Felix Gotah	Asst. Budget Analysis	0242131118
41		Ayiwah David Ahunah	Works Department	0246195172
42		Francis Cofie	Information Services Department	0249451373
43		Bernice Okornoe	Procurement Officer	0272188655

No	Stakeholder	Name	Position	Contact Number
44		Yvonne Arhin	Procurement	0242934631
45		Alfred Lartey	Assistant District Engineer	0208120826
46		Asiedu Asare	Technician Engineer	0242963975
47		Reuben Adase	Director, Dept. of Agriculture	0242116573
48		Gilbert Akaba	Ag. District Coordinating Director	0243735526
49		Abigail Teye	Social Development Officer	0247166207
50		Godwin Dzivor	Senior Executive Officer	0205853087
51		Ben Apreku	Works Department	0243846909
52		Senyo Abgemasu	Assistant Director IIB	0244411868
53		Asiedu Asare	Works Department	0242963975
54		Bosompem Cloeopatra	Works Department	0249391316
55		Orna Reuben	Works Department	0242604798
56		Felix K. Worlanyo	PPD	024540280
57		Daniel Barketey	Environmental Officer	0240897980
58	District Health Directorate	Bessah Eric	Health Information Officer	0242258966
59	National Disaster & Management Organisation	Ayertey Wilson	Dept. Coordinator	0243437531
60	District Education Office	Jonathan Bosompem	Asst. Director Finance And Planning	0244765961

No	Stakeholder	Name	Position	Contact Number
61	Ghana Wildlife Division	Dickson Agyeman	Park Manager, Songor Wildlife Site	0244843464
62	Ghana Police Service	Benjamin A. Buxton	District Commander	0206920703
63	Dept. of Agriculture	Reuben Adase	District Director Agriculture	0242116573

Environmental Impact Assessment  
for 75MW Wind Power Project 2,  
situated at Wokumagbe and Goi  
in the Ada West District of the  
Greater Accra Region

# APPENDIX C:

## Background Information Document

# SCOPING REPORT



**VOLTA  
RIVER  
AUTHORITY**







## INTRODUCTION

The Volta River Authority in Ghana (hereinafter referred to as VRA) was established in 1961 with the main focus of the company being the generation and supply of electricity for domestic use in Ghana. VRA works with landowners, project developers, technology providers, regulators and investors to source and develop energy projects. Currently, the Government of Ghana has formulated a Renewable Energy (RE) Policy which aims to have 10% of Ghana's electricity needs come from RE by 2020. Subsequently, the Government passed a RE law in November 2011 to provide the necessary legal and regulatory framework to promote the sustainable development and utilization of RE resources for electricity and heat generation.

In line with this legislation, VRA has set a 5-10 year Renewable Energy (RE) generation capacity target taking into consideration the local and export demand as well as the current system's energy constraints. VRA's RE Development Programme Phase 1 (REDP1) aims at developing about 164 MW of installed renewable energy capacity before 2020. The program consists of three components, namely (a) a 150 MW Wind Power Project (Phase 1) (b) a 14 MW Solar Power Project (Phase 1), and (c) Renewable Energy Planning & Development Integration into the current energy plan.

VRA proposes to construct and operate two wind energy facilities as follows:

- 75MW Wind Power Project 1 (Anloga Extension) located at Anloga, Anyanui & Srogbe communities in the Keta Municipal in the Volta Region (Site A)
- 75MW Wind Power Project 2 (Wokumagbe and Goi) located in Wokumagbe and Goi communities in the Ada West District in the Greater Accra Region (Site B)

In accordance with the requirements of the Environmental Assessment Regulations, 1999 (LI 1652) and as outlined in the Environmental Impact Assessment (EIA) Guidelines for the Energy Sector, Volume 1, dated August 2010, the construction of wind energy facilities exceeding 20 hectares or exceeding an installed capacity of 15MW falls into the category for which an EIA Study is required. Seljen Consult and the Council for Scientific & Industrial Research (CSIR), a South African research council, have been appointed to undertake the ESIA process for the proposed projects.

An integrated Public Participation Process (PPP) will be undertaken for the proposed projects. Two separate Scoping Reports and two separate Environmental and Social Impact Assessment (ESIA) reports will be submitted to the Environmental Protection Agency (EPA) for decision-making.



#### **WIND ENERGY FACILITIES**

The proposed **75 MW Wind Power Project 1** will cover an area of approximately 177.46 ha (Site A). Site A is located east of the flat Volta River delta near the communities of Anloga, Srogbe and Anyanui on the coast in the Keta Municipality in the Volta Region. The electricity generated at the proposed **Wind Power Project 1** will be evacuated via a newly constructed 69/33 kV substation onsite and will be connected to the grid via a 69 kV overhead transmission line of approximately 37 km from the onsite substation to the Sogakofe Substation.

The proposed **75 MW Wind Power Project 2** will cover an area of approximately 193.31 ha (Site B). Site B is located within the Wokumagbe and Goi communities in the Ada West District of the Greater Accra Region. The electricity generated at the proposed **Wind Power Project 2** will be evacuated via a newly constructed substation onsite and will be connected to the grid via a new dedicated High Voltage transmission line to the existing grid.



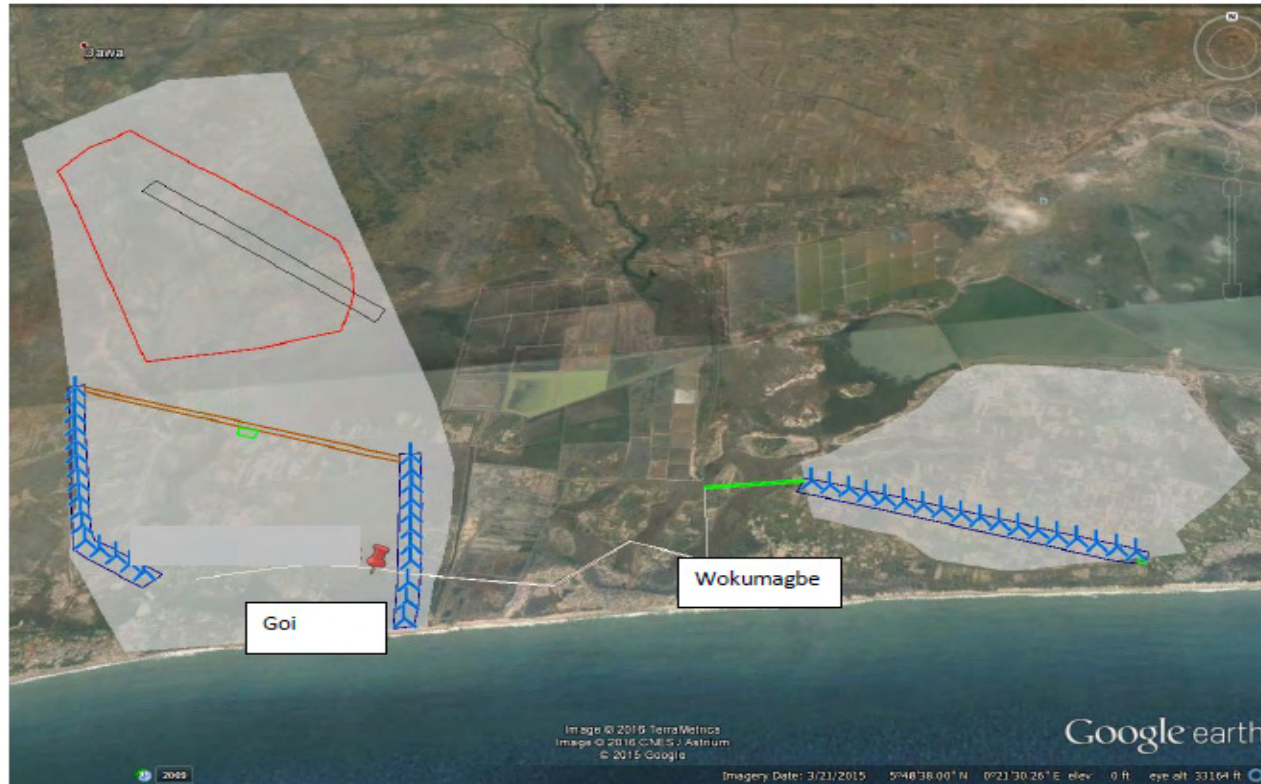


**STUDY AREA**

The study area for the Scoping and Environmental & Social Impact Assessment consists of sites at Anloga, Srogbe and Anyanui communities for the 75MW *Wind Power Project 1* and Wokumagbe and Goi communities for the *Wind Power Project 2* which are 424 and 470 ha, respectively (Figure 1 and 2 below).



**Figure 1 – Locality Map for the Proposed Development of 75 MW Wind Power Project 1 at Anloga, Srogbe and Anyanui (Anloga Extension) in the Keta Municipal, Ghana.**



**Figure 2 – Locality Map for the Proposed Development of 75MW Wind Power Project 2 at Goi and Wokumagbe in the Ada West District, Ghana.**

#### **WHAT DOES THE BACKGROUND INFORMATION DOCUMENT TELL YOU?**

This Background Information Document (BID) provides you, as an Interested and Affected Party (I&AP), with the background information on the proposed projects as follows;

- A description of the ESIA and Public Participation Processes that will be undertaken for the proposed projects; and
- Details on how to register as an Interested and Affected Party (I&AP) to indicate your interest in the projects and receive further information.

If you register as an I&AP, there will be opportunities for you to be involved in the Scoping and ESIA Processes through receiving information, registering your interest on the project database, raising issues of concern and commenting on reports. Inputs from I&APs, together with the information and assessment provided by the Environmental Assessment Practitioner and relevant specialists, will assist the Environmental Protection Agency Board with their decision-making in terms of whether to grant or refuse an environmental permit for the proposed projects.

#### **What do the projects entail?**

The 75MW Wind Power Project 1 (Anloga Extension) and 75MW Wind Power Project 2 (Wokumagbe and Goi) will each consist of the main components listed below. The components and their dimensions will be discussed in the Scoping and the ESIA Reports that will be produced for each facility:

- Wind Energy Facilities
  - Wind turbines
  - Building infrastructure
  - Offices;
  - Operational control centre;
  - Warehouse/workshop;
  - Ablution facilities; and
  - Converter station.
- Associated Infrastructure
  - Electrical infrastructure (including transmission lines and substations);
  - Access roads;
  - Internal gravel roads;
  - Fencing;
  - Operation and Maintenance Area;
  - Laydown Area;
  - Stormwater channels; and
  - Water pipelines.



### ENVIRONMENTAL AUTHORISATION

The applicable regulations that would be triggered in the context of the proposed projects are:

- The Constitution of the Republic of Ghana, 1992
- Environmental Protection Agency Act, 1994 (Act 490)
- Environmental Assessment Regulations 1999, LI 1652
- Renewable Energy (RE) Act, Act 832 of 2011
- Factories, Offices and Shops Act (1970) Act 328
- The Ghana Civil Aviation Act 678, 2004
- Road Traffic Acts, 2004, Act 683
- National Road Safety Commission Act 567 of 1999
- Road Traffic Offences Regulations, 1974 (LI 952).
- Ghana Civil Aviation Regulations (GCAR) part 1, LI 1818
- Labour Act No (2003) Act 651
- Labour Regulations, 2007 (LI 1833)
- New Lands Commission Act (2008) Act 767
- State Lands Regulations (1962) LI 230
- National Museums Decree (1969) NLCD 387
- National Land Policy, 1999
- National Biodiversity Strategy for Ghana, 2002
- Wetland Management (Ramsar Sites) Regulations LI 1999
- National Wetlands Conservation Strategy, 1999

The list of relevant regulations will be refined during the course of the Scoping and ESIA Processes, and other regulations triggered may be removed or added as applicable. The applicable project activities require environmental permit from the Environmental Protection Agency. The Scoping and ESIA Process needs to show the potential impacts of the proposed developments on the biophysical, social and economic environment. The steps in the Scoping and ESIA Process are outlined below.

#### Scoping and ESIA Process

The Scoping and ESIA Process being implemented can be summarised as follows:

##### Stage 1: Environmental Scoping:

This Scoping Process is being planned and conducted in a manner that is intended to provide sufficient information to enable the authorities to reach a decision regarding the scope of issues to be addressed in the ESIA, and in particular to convey the range of specialist studies that will be included as part of the Environmental Impact Reporting Phase of the ESIA, as well as the approach to these specialist studies.

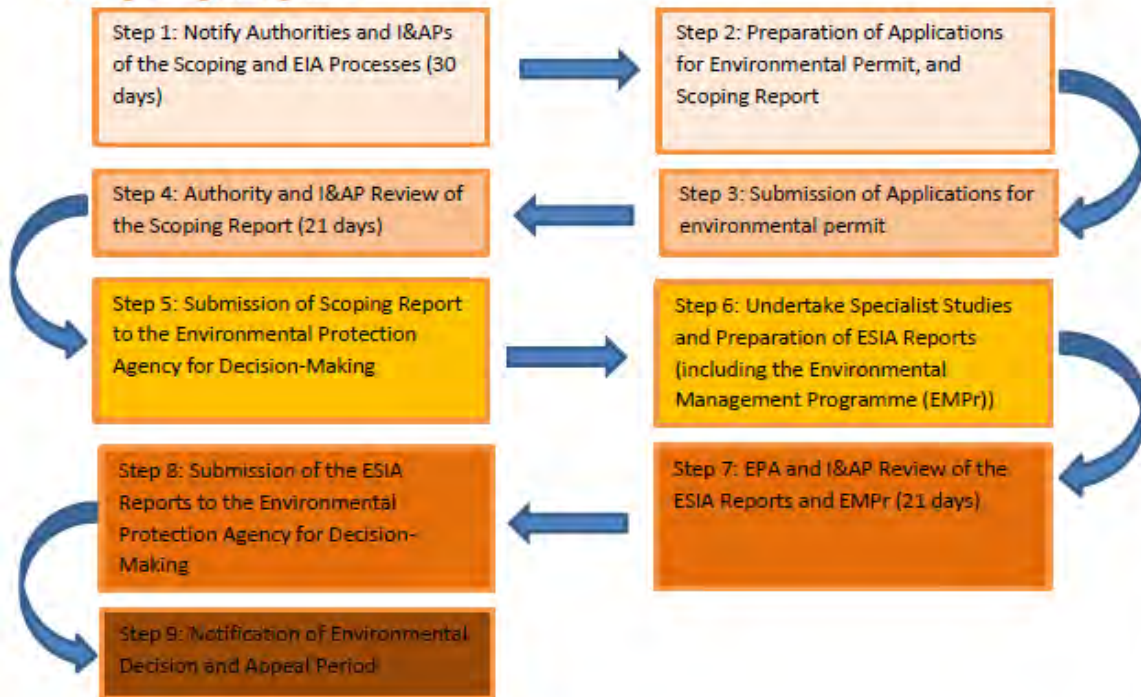
##### Stage 2: ESIA:

One of the purposes of this stage of the ESIA Process is to undertake specialist investigations to address the issues of concern that have been raised and identified through the Scoping Process. The following specialist studies have been identified, at this stage, to form part of the ESIA Phase of the proposed projects:

- Ecological Survey & Habitat Assessment Study;
- Historical Resources & Cultural Heritage Assessment;
- Landscape & Visual Intrusion Assessment;
- Aviation & Communication Impact;
- Compensation Action Plan;
- Noise and Flicker Impact Assessment



**Public participation process**



**How can you get involved?**

1. By responding to our invitation to register as an interested and affected party for this project.
2. By mailing or faxing a Comment and Registration Form to the Seljen Consult Limited (contact details provided below).
3. By telephonically contacting the Seljen Consult Limited if you have a query, comment, or require further project information.
4. By reviewing the various reports within the stipulated comment periods provided.
5. By attending any feedback meetings, which may be held during the review period.

**Contact us:**

To register as an I&AP, please complete the Comment and Registration Form included with this BID and kindly return to:

Name	Email	Mobile
Kofi Gatu	seljencon@gmail.com	+233-20-843-4557 / +233-24-206-3391
Dr. James Kojo Adomako	jadomak@yahoo.com	+233-20-818-0362 / +233-54-434-0346
Frank Cudjoe	cudjoefrank@yahoo.com	+233-50-973-8415 / +233-24-280-7339

**Postal Address:**

Seljen Consult Limited, P. O. Box AT 140, Achimota-Accra. Ghana-West Africa

**REGISTRATION AND COMMENT SHEET:**

Should you have any queries, comments or suggestions regarding the proposed 75MW Wind Power Project 1 (Anloga Extension) and 75MW Wind Power Project 2 (Wokumagbe and Goi) being developed by the Volta River Authority respectively in the Keta Municipality and Ada West Districts in Ghana, please note them below and return this sheet to:

Name	Email	Mobile
Kofi Gatu	seljencon@gmail.com	+233-20-843-4557 / +233-24-206-3391
Dr. James Kojo Adomako	jadamak@yahoo.com	+233-20-818-0362 / +233-54-434-0346
Frank Cudjoe	cudjoefrank@yahoo.com	+233-50-973-8415 / +233-24-280-7339

Please formally register me as stakeholder and provide further information and notifications during ESIA process	Yes	No
I would like to receive my notifications by:	Fax	Post      Email

<b>Comments:</b>

Please fill-in your contact details below for the project database:

<b>Title &amp; Name</b>			
<b>Organisation</b>			
<b>Telephone</b>		<b>Fax</b>	
<b>Mobile Phone</b>		<b>Email</b>	
<b>Postal Address</b>			
<b>Name</b>	<b>Signature</b>	<b>Date</b>	

	<b>Thank you for the Participation</b>	
--	--	--

**MARCH 2016**

Environmental Impact Assessment  
for 75MW Wind Power Project 2,  
situated at Wokumagbe and Goi  
in the Ada West District of the  
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# APPENDIX D: Sample Scoping Notice

# SCOPING REPORT



## SCOPING NOTICE

The Volta River Authority (VRA) intends to construct and operate two wind energy facilities as follows:

- A. 75MW Wind Power Project 1 (Anloga Extension) located at Anloga, Anyanui & Srogbe communities in the Keta Municipal in the Volta Region
- B. 75MW Wind Power Project 2 (Wokumagbe and Goi) located in Wokumagbe and Goi communities in the Ada West District in the Greater Accra Region

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

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

The Chief Executive  
Volta River Authority  
P. O. Box MB 77, Accra  
Tel No: +233-302-664941-9  
Fax: +233-30-2662610  
Email: [corpcomm@vra.com](mailto:corpcomm@vra.com)

**AND**

The Executive Director  
Environmental Protection Agency  
P. O. Box M 326, Accra  
Tel No: +233-302-664697/8  
Fax No: +233-302-662690  
Email: [info@epa.gov.gh](mailto:info@epa.gov.gh)

**Not later than 31<sup>st</sup> July, 2016**



Environmental Impact Assessment  
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situated at Wokumagbe and Goi  
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Greater Accra Region

# APPENDIX E:

Pictures from  
Stakeholder's Engagements

# SCOPING REPORT



## 75MW Wind Power Project 2 (Wokumagbe & Goi) Pictures from Scoping Phase Stakeholder Engagements



**Consultations with Ada West District Information Health Officer**



**Consultations with Ada West District Finance Officer**





**Consultations with Ada West District Education Directorate**



**Consultations with Chiefs & Elders of Wokumagbe**





**Consultations with General Assembly of the Ada West District**



**Consultations with Representatives of State Agencies in the Ada West District**

Environmental Impact Assessment  
for 75MW Wind Power Project 2,  
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in the Ada West District of the  
Greater Accra Region

# APPENDIX F:

- Signed List of Attendants at State Agency's Forum
- Signed List of Attendants at Ada West General Assembly Forum


# SCOPING REPORT



**VOLTA  
RIVER  
AUTHORITY**



## Signed List of Participants at State Agencies Forum on April 13, 2016



### STAKEHOLDER ENGAGEMENT - Participants List

Title of Project: WIND POWER PROJECT Date: 13-04-2016

Project Proponent: NIGERIA RIVER AUTHORITY Time: 15:00

Types of Stakeholder: STATE AGENCIES Venue: ABA KLEST ASSEMBLY HALL

Name	Agency	Position	Contact Number	Email
Amos Dotse Kwasi	Adeplabanya	Assemblyman	0243283876	
Ben A. Tackey	URA	Mgr. Env	0243344777	ben.tackey@ura.gov.ng
Dickson Agbenou	wildlife Sangha Conservation Soc	Park Manager	0244843466	yaw652008@yahoo.com
Almakesi Joseph	Loloma	Assemblyman	0246772401	
John Akwato Tsiri	COT	Assemblyman	0242046358	johnakwato@gmail.com
Jonathan S. Okute	Gei	Opinion leader	0243244508	
Felix K. Worlamo	PPD	S.T.O.	024540280	felix12@yahoo.com
Godwin Danwar	ANWA	SEO	020553087	godwin212@yahoo.com
Abigail Teye	A.W.D.A	S.S.D.O	0247166207	teya@yahoo.com
Ben Apreku	ANWA	BI	024384909	ben.ovi.com
Senyo Agbenanu	ANWA	ADIB	0244411868	romagbe@yahoo.com
Lydia Cape	CSIR	Project leader	027218882429	lcape@csir.co.za

Name	Agency	Position	Contact Number	Email
ABULELE ADAMS	CSIR	PROJECT MANAGER	+27722398220	aadamsl@csir.co.za
GILBERT AKABA	AWDA	AG. DEPT	0243735556	akabagilbert@gmail.com
AYERTY WILSON	NADMO	Dep. COORDINATOR	0243437531	
Kofi Gato	SELJEN CON	Tech. Director	0208474557	kofi.gato@gmail.com
Daniel Barkley	AWDA	E.O	0240897980	danielbarkley@gmail.com
Franc Cudjoe	SELJEN CONSULT	Comp. Admin. Plan	0242807335	CudjoeFranc28@yahoo.com
REUBEN ADASE	AGRIC	DISSEMINATION	0242116573	reubense@yahoo.com
YVONNE ARHIN	AWDA	Procurement	0242934631	yvonne.arhin@yahoo.com
Bernice Okoro	AWDA	✓	0272188665	bbokoro@africa-union.com
STEPHEN CHARWETEY	WOKUMAGBE	ASSEMBLY MEMBER	0502716326	Ksent2000@yahoo.com
SUMAILA TETTEH-KAPPAH	"	OPINION LEADER	0242731752	
ASIEU ASARE	AWDA	Tech. ENGINEER	0242963975	engineerastu12@yahoo.com
Escompen Cleopatra	AWDA	WORKS DEPT	0249391316	Cleopatra556@gmail.com
Dorm Reuben	AWDA	WORKS DEPT.	0242604798	dormreuben@yahoo.com



## Signed List of Participants at Ada West District General Assembly Meeting on March 31<sup>st</sup>, 2016

GENERAL ASSEMBLY MEETING OF THE ADA WEST DISTRICT ASSEMBLY HELD ON ~~THURSDAY~~ 31<sup>st</sup> MARCH, 2016 AT THE ASSEMBLY HALL.

NO	NAME	DESIGNATION	CONTACT	SIGNATURE
1.	Amassah Ziblim A.	<del>SCD</del>	058746856	
2.	Jonathan Basompem.	RES	0244795961	
3.	Alexander Okantey	PPD	0242777624	
4.	Bongbe Ak Divine.	<del>PERSONAL</del>	0242185409	
5.	Annan Emmanuel.	ETHSD	0247688221	
6.	Ayertey Neilson.	NASMO	0243437531	
7.	Sroka Awo Letsu.	<del>ADDA</del>	0244283074	
8.	John Cretch.	ABA	0242131118	
9.	Reuben A. Lele.	ABA	0242116570	
10.	Gilbert Akaba.	DBA	0243735820	
11.	Ephraim Arhen.	DIA	024-6304828	
12.	Frank K. Niso.	OPD	0243664185	
13.	Francis Cofie.	ISD	0249451323	
14.	Bernice Okornoe.	P.O	027218800	
15.	Yvonne Arhen.	Procurement	0242934631	
16.	Alfred Hartey.	ADE	0208120826	
17.	Asredu Asue	Wales	0242996397	
18.	Ajiwah David Asumal	u	0246195172	
19.	Klu M...	ATA	0242920222	
20.	Geoffrey Davitor.	SelfRecorder	020582289	
21.	Abigail Teye.	SDO/Recorder	024716620	
22.	Rosier D.K. ...	DFO		
23.	Benjamin A. Buxton.	POLICE	020692070	
24.	Senyo Agbemasi.			

Environmental Impact Assessment  
for 75MW Wind Power Project 2,  
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# APPENDIX G:

## Energy Commission Provisional License

# SCOPING REPORT



**VOLTA  
RIVER  
AUTHORITY**



