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7 August 2023

Attn.: The Executive Director.
Environmental Protection Agency,
PO Box MB 326
Ministries
Accra.

Your ref…….
Our ref: *PER EcoAtlantic Exploratory Drilling*

Dear Sir

RE: ECO ATLANTIC EXPLORATORY DRILLING PROJECT

ESL Consulting, on behalf of Eco Atlantic, respectfully wishes to submit the Preliminary Environmental Report (PER) describing the Preliminary Environmental Assessment in respect of Eco Atlantic's Exploratory Drilling Project. The PEA was conducted in accordance with the Ghana Environmental Regulations, 1999 (LI 1652) and the PER was prepared as specified in the guidance provided in the referenced letter. The environmental assessment was conducted jointly by ESL Consulting (Ghana) on behalf of the project.

We would like EPA to review the PER so that the environmental assessment permitting process can be concluded and subsequent issuance of permits and early site work can commence in line with the project's overall development schedule.

We are available to answer any questions or provide further information and look forward to your feedback. Please do not hesitate to contact me should the need arise.

Yours sincerely,

Ayaa Kojo Armah
CEO
(0244 771 707)

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Received by……

Department……

Position……

Contact No……

Signature……

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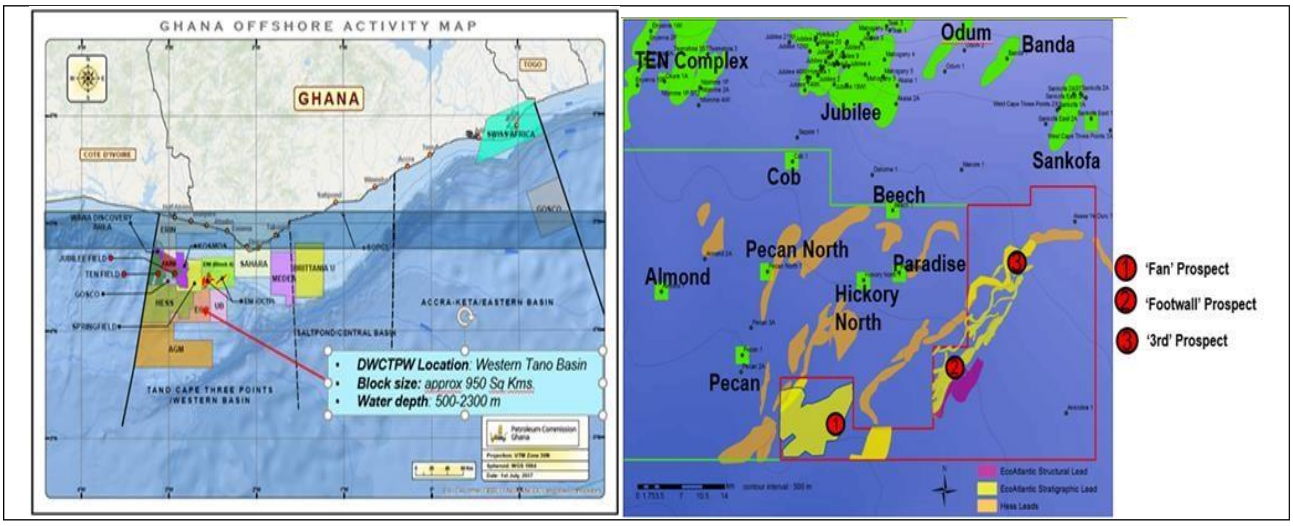
EcoAtlantic Ghana Exploration

Preliminary Environmental Report (PER)

Exploratory Drilling Project

2023



Deep Water Cape Three Point Offshore Block West

Western Region

July 2023

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LIST OF ACRONYMS

ABW	Antarctic Bottom Water
ADW	Antarctic Deep Water
AZ	Advisory Zone
BID	Background Information Document
BOP	Blow Out Preventers
CBD	Convention on Biological Diversity
CCMC	Chemicals Control and Management Centre
CFCs	Chlorofluorocarbons
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLO	Community Liaison Officer
CMS	Convention of Migratory Species
CSR	Corporate Social Responsibility
DST	Drill Stem Test
DWCTPW	Deep Water Cape Three Points West
DP	Dynamic Positioning
EA	Environmental Assessment
EHS	Environment, Health and Safety
EEZ	Economic Exclusion Zone
EMP	Environmental Management Plan
EP	Environmental Permit
EPA	Environmental Protection Agency
ERV	Emergency Response Vessel
EZ	Exclusion Zone
FAD	Fish Aggregating Device
FEU	Fisheries Enforcement Unit
FLO	Fisheries Liaison Officer
FPSO	Floating, Production, Storage and Offloading
GC	Guinea Current
GOG-LME	Gulf of Guinea Large Marine Ecosystem
MoFAD	Ministry of Fisheries and Aquaculture Development
MODU	Mobile Offshore Drilling Unit
MoU	Memorandum of Understanding
MSDS	Material safety Data sheet
MT	Metric Ton
NADW	North Atlantic Deep Water
NADF	Non Aqueous Drilling Fluid
NGO	Non-Governmental Organization
NOHSPCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOSCP	National Oil Spillage Contingency Plan
OBF	Oil Based Fluids
OGP	Oil and Gas Producers
OIM	Offshore Installation Manager
OOB	Oil Offloading Buoy
OOC	Oil on Cuttings
OPRC	Oil Pollution Preparedness, Response and Co-operation
OSCP	Oil Spill Contingency Plan
OSRL	Oil Spill Response Limited
PACs	Polycyclic Aromatic Compounds
PAH	Polycyclic Aromatic Hydrocarbon
PEMP	Provisional Environmental Management Plan
PER	Preliminary Environmental Report
PHC	Population and Housing Census
PC	Petroleum Commission
PNDCL	Provisional National Defence Council Law
PTS	Permanent Threshold Shift
ROV	Remotely Operated Vehicle
SACW	South Atlantic Central Water
SCAs	Special Consideration Areas

GHG	Green House Gas
GMA	Ghana Maritime Authority
GNCFC	Ghana National Canoe fishermen Council
GNGC	Ghana National Gas Company
GNPC	Ghana National Petroleum Corporation
GoG	Government of Ghana
GPHA	Ghana Ports and Harbours Authority
GPS	Global Positioning System
HIA	Health Impact Assessment
IBA	Important Bird Area
ICCAT	International Commission for the Conservation of Atlantic Tuna
IFC	International Finance Corporation
IMO	International Maritime Organisation
IPIECA	International Petroleum Industry Environmental Conservation Association
ITCZ	Inter-Tropical Convergence Zone
IUCN	International Union for Conservation of Nature
IUU	Illegal Unreported and Unregulated
IV	Ivorian Undercurrent
LI	Legislative Instrument
MFAC	Marine Fisheries Advisory Committee
MMDAs	Metropolitan, Municipal & District Assemblies
MMDCE	Metropolitan/Municipal/District Chief Executive
SDA	Shama District Assembly
SDGs	Sustainable Development Goals
SIA	Social Impact Assessment
SOPEP	Shipboard Oil Pollution Emergency Plan
SST	Sea Surface Temperature
ST	Short Ton
STMA	Sekondi-Takoradi Metropolitan Assembly
TEN	Tweneboa, Enyenra, Ntomme
TEU	Twenty-Foot Equivalent Units
TSW	Tropical Surface Water
TTS	Temporary Threshold Shift
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VOC	Volatile Organic Compound
VSP	Vertical Seismic Profile
WAGP	West African Gas Pipeline
WBDF	Water Base Drilling Fluid
WBF	Water Based Fluids
WBM	Water Based Mud
WERENGO	Western Region Development Network of NGOs

EXECUTIVE SUMMARY

EcoAtlantic Ghana Limited (EGL) is an indigenous independent energy company engaged in the exploration and production of crude oil and natural gas. The Environmental Assessment Regulations, 1999 (LI 1652) lists oil and gas exploration drilling as a Schedule 1 'undertaking' requiring registration by filling Form PO1 (initial assessment) for EPA's screening decision. Following review by the EPA of the duly submitted Form PO1, a Preliminary Environmental Report (PER) was required for the exploratory (and potential appraisal) well drilling project. Accordingly, EGL commissioned this PER study as the basis for consideration for the issuance of an Environmental Permit to conduct its campaign.

The project area is the Deepwater Cape Three Points (DWCTPW) Block, which occupies water depths ranging from 500 to over 2300 meters deep, and about 95km offshore from the nearest coast of Ghana. The area of the DWCTPW Block is approximately 950 km^2 with proposed drilling of up to three (3) vertical exploration wells – Fan Prospect, Footwall Prospect and Northern Prospect – in the DWCTPW licensed area. The proposed drilling programme will be executed in four general phases, namely: Site preparation; Drilling; Well Testing and Site restoration.

The PER is intended to identify and assess, as well as to provide measures to prevent or minimize potential adverse environmental and social impacts, while enhancing the beneficial impacts of the project. The PER is therefore expected to ensure a socially acceptable, environmentally sound and sustainable offshore drilling operation, with minimal or no adverse impact on fishing and fishing livelihoods and the marine environment in general. These are all achievable by conforming to a myriad of relevant legal and institutional frameworks that govern sound development and management in the oil and gas sector in Ghana.

It was important to include the evaluation of alternatives in the PER. For drilling campaigns of this nature, potential alternatives are often limited because of technical requirements for drilling programmes. The alternatives considered were the "No-Action" alternative (which was not considered viable for this project based on the manageable potential adverse impacts and the potential benefits of the drilling programme); the well locations, selected based on initial review; the interpretation of geophysical data; the potential environmental and social impacts; the type of drilling unit (in this case, only a DP type vessel is technically acceptable considering the depth of water in the DWCTPW Block); the types of drilling fluids; and the methods of drill cuttings disposal.

The environmental and social baseline study conducted under the project covered the physical, biological and social environments, the oil and gas sector development, and the local waste management capabilities.

The outcome of a consultation with EPA indicated that the key potential impacts and risks associated with offshore exploration drilling and related operations include oil spill risk and waste generation and disposal impacts. Offshore waste management companies consulted also indicated that volumes of drilling waste may be generated from the extensive drilling fluids and chemical use at the drilling stage. In addition, the physical footprint of the drillship and the required 500m Exclusion Zone around it were considered a source of concern for most of the fishermen. The strong perception of the fishers relates to the continuous decline in fish stock and poor catch, which rather unfortunately, they perceived to be caused by the attraction of the fish to the light on the drillship. The specific potential impacts identified and assessed include drilling chemicals and discharges, waste generation and disposal, potential oil spill, physical presence of operations, underwater noise and atmospheric emissions These potential

impacts identified by way of assessment and consultation will require mitigation measures to ensure environmental soundness, social acceptability, health and safety protection and project sustainability. While some of the measures will be in-built into the project design, others will be implemented during project execution. Other measures will also aim at enhancement, especially of beneficial impacts. The mitigation measures to address the afore-evaluated impacts include drilling chemicals and discharges handling and disposal, waste handling and disposal measures, oil spill prevention and response, physical presence of impact mitigation measures, underwater noise mitigation measures, and atmospheric emissions control measures.

The potential oil spill and thresholds have been modelled into three scenarios for drilling activities in the DWCTPW. Although a probability plot represents the chance (as a percentage) of an area of sea surface experiencing contamination from a spill, it is not a true representation of the extent that a potential spill would cover. The stochastic modelling results for the well blow-out scenarios suggest that: beaching will occur for all scenarios, with the volume beached, coastline impacted and the minimum arrival time dependent upon the original release volume and event type. Ghana's coastlines are likely to be impacted by oil beaching, with a probability of 100% in the well-blow-out scenarios (Scenario 1 and 2). The probability of beaching for the marine diesel spill (Scenario 3) is no greater than 10%. The minimum predicted time to reach shore is around 3.75 days (Scenario 2), corresponding to metocean and meteorological conditions experienced between January and March, although seasonal differences are not particularly significant; and similar beaching times occur for the other scenarios. The maximum mass of oil beaching is 23,081 tonnes, corresponding to the worst-case scenario modelled (Scenario 1)

The Provisional Environmental and Social Management Plan (PESMP) for the Exploration Drilling Project outlines the main pragmatic monitoring and mitigation measures. By considering the source and nature of impacts, mitigation measures, monitoring parameters and responsibility, the action plans incorporated in the PER include but are not limited to *Drilling chemicals and discharges management plan*, *Waste management plan*, *Oil spill management plan*, *Physical presence impact management plan*, *Underwater noise control management plan*, and *Atmospheric emissions control management plan*.

1.0 INTRODUCTION

1.1 Background

Eco Atlantic Ghana Limited (EGL) is an indigenous independent energy company engaged in the exploration and production of crude oil and natural gas. EGL is committed to meeting the highest standards of corporate citizenship through the protection of the health and safety of employees, safeguarding the environment and creating a long-lasting positive impact on the communities in which it conducts business. EGL has been the Operator of the Deepwater Cape Three Points (DWCTPW) licence block, offshore the Western Region of Ghana since 2014.

Eco Atlantic Ghana Limited is preparing to drill One (1) vertical exploration well in the license area. The proposed exploration well is part of the licence commitment on the DWCTPW Block. The concession block of 950 km2 is located about 70km off the coast in water depths varying between 500m to over 2,300m (Figure 3.1). The first well-drilling campaign is planned to commence in the third quarter of 2023 and is expected to last approximately 45 days (including drilling, mobilisation and demobilisation). The commitment well is required in the contract between the Petroleum Commission and EGL, consistent with Ghana's objective to develop its hydrocarbon resources.

The first well known as the 'Dawadawa-1x' is an exploration well, and is planned to be drilled between September and December 2023. Following successful drilling, an analysis will be carried out, and it is possible that up to two further wells will be drilled in the license area to explore new targets and/or assess the viability of the Fan prospect in producing oil in commercial quantities.

The following two wells have been drilled on the acreage.

Ankobra-1 (September 2008); Drilled by Hess with the Transocean Deepwater Discoverer rig

- AYD -1 Well (April 2010); Drilled by ENI with the Transocean Deepwater Pathfinder rig

10 wells have been drilled by Hess (now operated by Aker Energy) in the Deep Water Tano Cape Three Points (DWTCPT) that is located immediately to the east of the EGL Block DWCTPW Block;

- Paradise-1
- Hickory North-1
- Beech-1
- Almond-1 and 2
- Pecan-1, 2 & 3
- Cob-1
- PN1

1.2 Project Justification

The proposed exploration well is part of the licence commitment on the DWCTPW Block. The concession block of 950 km^2 is located about 70km off the coast in water depths varying between 500m to over 2,300m (Figure 3.1). The first well-drilling campaign is planned to commence in the third quarter of 2023 and is expected to last approximately 45 days (including drilling, mobilisation and demobilisation). The commitment well is required in the contract between the Petroleum Commission and EGL, consistent with Ghana's objective to develop its hydrocarbon resources.

1.3 Purpose of the Preliminary Environmental Report

The Environmental Protection Agency (EPA) Act, 1994 (Act 490) mandates the EPA of Ghana to ensure compliance with laid down Environmental Assessment (EA) regulations governing projects and other development activities. The Environmental Assessment Regulations, 1999 (LI 1652) lists oil and gas exploration drilling as a Schedule 1 'undertaking' requiring registration by filling Form PO1 (initial assessment) for EPA's screening decision. Following review by the EPA of the duly submitted Form PO1 (November 1, 2018), a Preliminary Environmental Report (PER) was required for the exploratory (and potential appraisal) well drilling project. Accordingly, EGL commissioned this Preliminary Environmental Report (PER) study as the basis for consideration for an Environmental Permit to conduct its campaign.

The PER is intended to identify and assess, as well as prevent or minimise potential adverse environmental and social impacts, while enhancing the beneficial impacts of the project. The PER is therefore expected to ensure a socially acceptable, environmentally sound and sustainable offshore drilling operation, with minimal or no adverse impact on fishing and fishing livelihoods and the marine environment in general.

1.4 Methodology for the PEA Study

The main methodology used in the PEA process involved the review of relevant documents and consultations with key institutions and other stakeholders. Relevant documents governing sound development and management in the oil and gas sector activities were reviewed, significant among them included socio-economic, fisheries and marine environment reports, policy, legal and institutional frameworks, as well as international marine and maritime laws and conventions.

Consultation sessions with key stakeholders also played an indispensable role in:

- Identifying potential key concerns, risks, constraints and impacts of the project requiring mitigation and the nature of acceptable and feasible mitigations;
- Assessing the degree to which relevant fishing stakeholders and related groups could be affected by the project;
- Dialoguing on the potential opportunities and expectations associated with the drilling operations, and measures to enhance these; and
- Obtaining relevant local knowledge that can positively influence project planning and sustainable implementation.

Two rounds of consultations were held with stakeholder groups consisting of key fishing communities and their

representatives in six (6) coastal districts. The first round was held in October 2018 and the follow-up one was done in July 2023. Not all the fishing landing sites were invited-only those that undertake offshore fishing, and the invitation was limited to the executives of the fishing communities.

1.5 Key Outcomes of the PER

The baseline conditions (physical, biological and socio-economic environment) of the Block and the general area of influence of the project, specifically covering the following have been reviewed:

- Fishing in the vicinity of the project area;
- The potential presence of marine mammals and other species, including whales; and
- Fishers in coastal communities that engage in artisanal fishing expeditions offshore.

This assessment concludes that the project's impacts on the fishery sector and fishing livelihoods will be minimal and, in some respects, beneficial, especially to the above sensitivities, given that:

- The duration of the project is not expected to exceed 45 days;
- No permanent structures will be installed or used above the sea-level;
- A wellhead will be left protruding above the seabed by approximately 4 metres.
- The significant distance of the Block (70km) from coastal and onshore environmental and social sensitivities.

Oil spill modelling has been commissioned for this exploration drilling operation. The outcome of spill modelling results has been incorporated into response planning (treated under Section 8.3) to mitigate any potential spill, and to protect the environment and artisanal fishing activities. Other safeguards and management measures provided to prevent any major negative environmental or social impacts from the project include:

- Emergency response plan;
- Oil spill contingency plan;
- Waste management plan; as well as others; and
- Safe practices and procedures and physical controls.

1.6 Report Organization

The PER is organized into nine (9) main chapters as listed below, followed by references and a separate Appendices report:

- Chapter One: Introduction;
- Chapter Two: Policy, Legal and Institutional Framework;
- Chapter Three: Project Description;
- Chapter Four: Project Alternatives;
- Chapter Five: Baseline Environment and Social Information;
- Chapter Six: Stakeholder Involvement;
- Chapter Seven: Assessment of Potential Environmental and Social Impacts;

- Chapter Eight: Environmental and Social Mitigation Measures; and
- Chapter Nine: Provisional Environmental and Social Management Plan.

CHAPTER TWO

Policy, Legal and Institutional Framework

- National Legislation and Institution Requirements
- International Conventions and Agreements
- Industry Standards and Guidelines
- World Bank Policies and IFC Performance Standards
- Environmental Quality Standards

2.0 POLICY AND REGULATORY FRAMEWORK

The relevant legal and institutional frameworks that govern sound development and management in the Oil and Gas sector broadly include the following:

- Petroleum development legislation;
- Environmental and sustainability requirements;
- Pollution prevention legislation;
- Fisheries and aquaculture legislation;
- Maritime legislation;
- Environmental Protection Agency Act;
- Ghana National Petroleum Company;
- Ministry of Fisheries and Aquaculture Development; and
- Petroleum Commission.

2.1 Petroleum Development Legislation

2.1.1 Petroleum (Exploration and Production) Act, 2016 (Act 919)

The current petroleum exploration and production legislation is The Petroleum (Exploration and Production) Act, 2016 (Act 919). It replaced the Petroleum (Exploration and Production) Law (1984) which has been repealed.

The Act 919 applies to petroleum activities in Ghana including activities in territorial lands, inland waters, territorial sea, exclusive economic zone and its continental shelf. The objective of the Act is to provide for and ensure safe, secure, sustainable and efficient petroleum activities for the benefit and welfare of the people of Ghana.

Under the Act, a contractor shall submit an application to the Commission for a permit to undertake exploration drilling and shall commence drilling after receipt of the permit. The exploration drilling shall commence only after compliance with relevant statutory environmental requirements prescribed by EPA Act, 1994 (Act 490) and other enactments. Each well or field shall be identified by a unique designation assigned by the Commission; the designation, status or classification of a well or field cannot be changed without written approval.

2.2 Environmental and Sustainability Requirements

2.2.1 Sustainable Development Goals

The Sustainable Development Goals (SDGs), otherwise known as the Global Goals, are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. (www.gh.undp.org). As part of a new sustainable development agenda up to the year 2030, the two SDGs which relate to the sustainable use of marine resources, fisheries employment and livelihoods are:

- Goal 8 – Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all; and
- Goal 14 – Conserve and sustainably use the oceans, seas and marine resources for sustainable development (https://en.m.wikipedia.org/sustainabledevelopmentgoals).

2.2.2 Environmental Protection Agency Act (1994)

The Act 1994 was established to enable EPA to assume responsibility for issuing environmental permits and pollution abatement notices, for controlling the volume, types, constituents and effects of discharges, emissions, waste deposits or other sources of pollutants and substances which are hazardous or potentially dangerous to the quality of the environment, as well as for prescribing environmental standards and guidelines. It gives a mandate to the Agency to ensure relevant investments and undertakings comply with the laid down Environmental Assessment (EA) procedures in the planning and execution of development projects.

The Chemicals Control and Management Centre (CCMC) of EPA plays a vital role in the management of chemicals with the primary objective to protect human health and the environment from adverse chemical effects. The CCMC issues chemical clearance permits to importers of industrial chemicals. The oil and gas drilling project will import and use an extensive range of chemicals, which would have to be approved by the CCMC.

2.2.3 Environmental Assessment Regulations (1999)

The Environmental Assessment Regulations (1999) require that all activities likely to have a significant adverse effect on the environment must be subject to environmental assessment (according to the Schedule of the undertaking), and be issued with an environmental permit, before commencement of the activity. The EA requirements also provide for the operational phase of environmental management stewardship and certification through Environmental Management Plans (EMPs).

Petroleum activities are among the Schedule 2 listed undertakings, which include oil and gas field developments, construction of offshore and onshore pipelines, construction of oil and gas separation, processing, handling and storage facilities, etc. Drilling activities, however, fall under Schedule 1, which requires registration (by filling out Form PO1), and preparation of a preliminary Environmental Report (PER) for the issuance of an environmental permit (Figure 2.1)

2.2.4 Hazardous and Electronic Waste Control and Management Act, 2016, Act 917

The management of hazardous waste has been on the international environmental agenda since the early 1980s, when it was first included as one of the three priority areas in the United Nations Environment Programme's (UNEP), Montevideo Programme of Environmental Law in 1981.

The passage of the Act was in fulfilment of Ghana's obligations under the Basel Convention on the Control of Transboundary Movement of Hazardous Waste, the Rotterdam Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade as well as the Stockholm Convention on Persistent Organic Pollutants.

The Act provides for the control, management and disposal of hazardous waste, electrical and electronic waste and for related purposes in the country. Hazardous waste generally refers to waste with properties that make it potentially dangerous or harmful to human health or the environment and they include liquids, solids or gases which cannot be treated or disposed of by common means. The Act also ensures that harmful elements associated with hazardous and other waste products are captured and processed safely to preserve critical ecological components such as the soil, groundwater, flora and fauna.

Further, the Act prohibits the importation, exportation, transportation, selling, purchasing or dealing in or depositing of hazardous waste or other waste on any land in the country or in the territorial waters of Ghana. It deals with hazardous waste and other waste and seeks to domesticate the Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their disposal, prescribes the Electrical and Electronic Waste levy and establishes a Fund as well as an Electronic Waste Recycling Plant.

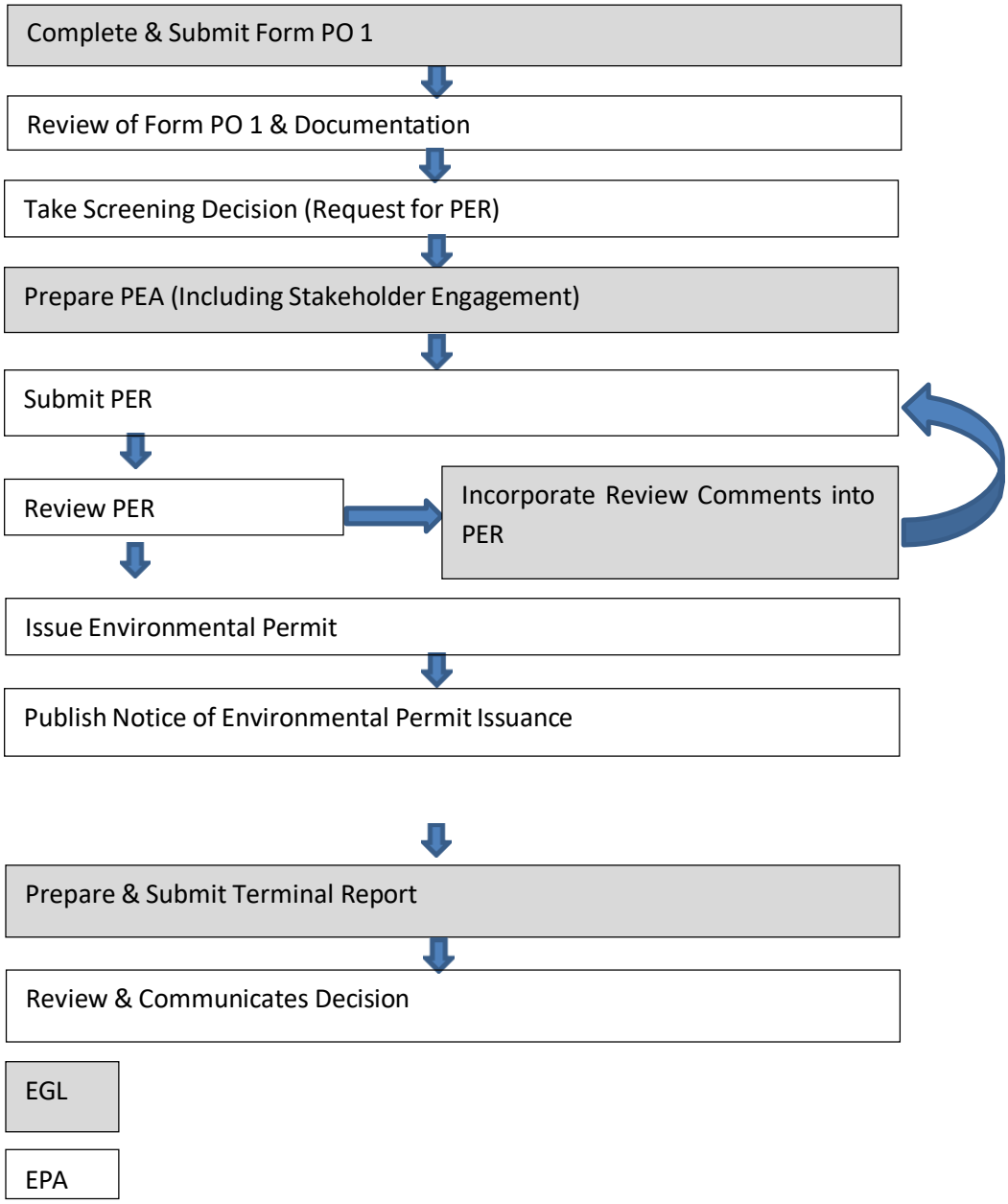


Figure 2.1: Permit Process for Exploratory Well Drilling

2.3 Pollution Prevention Legislation

2.3.1 Marine Pollution Act, 2016 (Act 932) (Maritime Pollution Act)

The Marine Pollution Act provides a new legal framework for hydrocarbon exploration and production, and for the prevention of pollution by oil, noxious liquid substances in bulk, harmful substances carried by sea, sewage, and garbage and pollution from ships. The Act incorporates provisions of international conventions, including:

- United Nations Convention on the Law of the Sea, 1982 (UNCLOS Part XII) for the Protection and Preservation of the Marine Environment;
- Protocol to the Convention on the Prevention of Marine Pollution by Dumping Waste and Other Matter,1996; and
- International Convention on Civil Liability for Oil Pollution, 1992.

Other conventions reflected in the Act include the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1992 and the International Convention on Oil Pollution Preparedness, Response and Co-operation (adopted in 1990).

2.3.2 Ghana Maritime Authority (Amendment) Act 2011, (Act 825)

The Ghana Maritime Authority Act (2002) established the Ghana Maritime Authority (GMA) as responsible for the regulation and coordination of activities in the maritime industry and the implementation of the provisions of enactments on shipping.

Due to the discovery of oil within Ghanaian waters, the GMA was confronted with many new challenges. It became necessary to develop the necessary policy, administrative, legislative and human capacity to support offshore oil and gas development.

Thus, the objective of this amendment is to make specific provisions for the Minister to promulgate regulations to fix specific levies, fees and charges, to cover the administrative costs associated with the discharge of the functions and duties specified in the Ghana Maritime Authority Act, 2002.

2.3.3 Dispersant Use Policy

The policy is a national oil spill response tool formulated to respond to spill emergencies. The policy:

- Focuses on regulating the use of dispersants in an environmentally friendly manner;
- Takes into account the latest advances in oil spill response and dispersant usage;
- Complies with requirements and recommendations of international agreements; and
- Defines dispersant-permit application and issuance procedures.

The purpose of the policy is to address the pre-authorization of the use of chemical dispersants in responding to oil spills in the territorial waters of Ghana, as a means of reducing the overall impact of such spills on the marine ecosystem. The policy delineates the waters on which the dispersant is applied into two zones - conditional approved and pre-authorised zones.

a) The conditionally approved zone requires approval, and in line with restrictions outlined in the latest National Oil and Hazardous Substances Pollution Contingency Plan, unless otherwise pre-authorised, before using any chemical agent to combat oil spill in the territorial waters of Ghana, within 2nm of the mainland or in a mean low water depth of less than 12m.
b) The pre-authorised zone is seaward, 2nm of the mainland with a mean low water depth greater than 25m under the supervision of the Pre-designated On-Scene Commander with restrictions for the importation of

and dispersant use set forth below, among others:

- Special Consideration Areas (SCAs) may be designated and described in writing by EPA; and
- SCAs will be made up of restrictions guiding the use of dispersants for a specific geographic area

2.3.4 Oil Navigable Waters Act (1964)

The Act gives effect to the International Convention for the Prevention of Pollution of the Sea by Oil (1954). It also provides for the protection of inland navigable waters, and the sea within the seaward limits of the territorial waters of Ghana against the discharges of oil and oily mixtures from onshore and offshore installations.

2.4 Fisheries and Aquaculture Legislation

2.4.1 Fisheries Act 625, 2002

Act 625 empowers the Minister to request personnel from other departments, agencies of state and other competent bodies or organizations to assist the Fisheries Enforcement Unit (FEU), which comprises personnel from the Ghana Navy, Ghana Air Force and the Secretariat of the Fisheries Commission. These personnel are given Police and other powers under the Act when they perform their duties within the Ghanaian EEZ and beyond the limit of the EEZ when the need arises

2.4.2 Fisheries Regulations, 2010 (LI 1968)

The L.I. (1968) sets up specific rules and regulations for the implementation of the Fisheries Act. It addresses prohibited fishing methods (e.g. light fishing, explosives and poisons and pair trawling), fishing within the exclusion zones oil and gas infrastructure, minimum mesh sizes, the use of Fish Aggregating Devices (FADs), and fishing vessel-licensing requirements. The Directorate of Fisheries has developed fishery management plans for marine fisheries.

2.4.3 Fisheries (Amendment) Act, 2014 (Act 880)

This Act amends the Fisheries Act, of 2002 (Act 625). It provides for international conservation and management obligations (Section 45A) and empowers the Minister to make Regulations to combat illegal, unreported and unregulated fishing (88A), in accordance with international obligations.

2.5 Maritime Legislation

2.5.1 Maritime Zones (Delimitation) Law

The Maritime Zones (Delimitation) Law (PNDCL No. 159 of 1986) defines the extent of the territorial waters and Economic Exclusion Zone (EEZ) of Ghana. The territorial waters are within 12nm of the low waterline of the sea. The Act defines EEZ as 'the area beyond and adjacent to the territorial sea up to 200nm from the low waterline. The Act grants the right to the government of Ghana, to the extent as permitted by international law, for the purposes of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters super adjacent to the sea bed and of the sea-bed and its subsoil, and with regard to any other activities for the economic exploration and exploitation of the zone.

2.5.2 Ghana Shipping (Amendment) Act, 2011 (Act 826)

The object of the amendment is to extend the definition of Ghanaian waters to include the waters within the 500m safety zone generated automatically under the United Nations Convention on the Law of the Sea (UNCLOS) around installations in the EEZ and beyond the territorial sea.

2.5.3 Ghana Shipping Regulations, 2012 (LI 2010)

The Ghana Shipping (Protection of Offshore Operations and Assets) Regulations, 2012 (LI 2010) were made under the Ghana Shipping (Amendment) Act to:

- Enable the establishment of safety zones and protected areas around offshore installations and subsea pipelines respectively;
- Prohibit the entry into and remaining in safety zones without prior authorization;
- Specify the circumstances under which people may enter these zones (such as to provide services for the installation, to transport people or goods to or from the installation); and
- Impose penalties for entry into safety zones and protected areas in circumstances contrary to the law.

The regulations provide for Mobile Offshore Drilling Units (MODUs), which are used in the exploration phase and frequently move internationally and conduct operations independently from any existing production facilities. The LI also provides for the creation of temporary exclusion zones in the interest of safety and security and to avoid potential accidents or environmental incidents.

2.6 Ghana National Petroleum Corporation (GNPC)

GNPC was established in 1983 by the Ghana National Petroleum Corporation Act (Act 64), as a corporate body to promote, explore, and develop Ghana's hydrocarbon resources. GNPC is empowered to conduct petroleum operations and partner with foreign investors to promote the economic development of Ghana. The Corporation also has the mandate to advise the Minister of Energy on matters related to petroleum operations and is a Partner in Deepwater Tano Cape Three Points West Block.

2.7 Ministry of Fisheries and Aquaculture Development (MoFAD)

MoFAD is responsible for the formulation of appropriate fisheries and aquaculture policies, planning and coordination, monitoring and evaluation. The Directorate of Fisheries and the Fisheries Commission fall under the Ministry. The Marine Fisheries Advisory Committee (MFAC) was established on July 8, 2015, to play a lead role in ensuring the strategic co-existence of the oil and gas and fisheries sectors, harmonious utilization of the marine space and seabed as well as support the MoFAD in its inter-sectoral and integrative approaches in managing and safeguarding marine resources. MFAC is also:

- To recommend research priorities and advise on the impact of Oil and Gas activities on marine resources and implementation challenges with existing laws and regulations; and
- To evaluate and recommend priorities and programs to meet the needs of fishermen and other industries that utilize marine resources.

2.8 Petroleum Commission (PC)

The Commission was established in 2011 to monitor compliance with national policies, laws, regulations, and agreements on health, safety and environmental standards in the upstream petroleum sector. The Commission is also responsible for enforcing local content provisions for oil and gas exploration and production operations in Ghana.

2.9 International Conventions and Agreements

Ghana has signed and/or ratified a number of conventions/agreements relating to the environment, both regionally and globally. Table 2.1 show a list of these applicable conventions.

Table 2.1: Relevant International Conventions on the Environment

Convention / Protocol	Accession/ Ratification
Convention for Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (Abidjan Convention); and Protocol,1981	20 July 1989
Gulf of Guinea Large Marine Ecosystem (GOG-LME) Treaty	December 1999
Convention on the Conservation of Migratory Species of Wild Animals, Bonn, 1979	19 January 1988
United Nations Convention on the Law of the Sea, Montego Bay, 1982.	7 June 1983
International Convention for the Prevention of Pollution from Ships; and the Protocol (MARPOL 73/78)	3 September 1991
Basel Protocol on Liability and Compensation for Damage Resulting from the Transboundary Movement of Hazardous Wastes and their Disposal, Basel, 1989	9 June 2005
Basel Protocol on Liability and Compensation, 1999	30 May 2003
Convention of Fisheries Cooperation among African States Bordering the Atlantic Ocean, 1995	1995
United Nations Framework Convention on Climate Change, New York, 1992	6 September, 1994
Convention on Fishing and Conservation of the Living Resources of the Seas, Geneva, 1958 29 April,	1958
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Causalities, Brussels, 1969	20 April 1978
International Convention of Oil Preparedness, Response and Co-operation (OPRC), 1990.	1995
Convention on the Continental Shelf, Geneva, 1958	29 April 1958

2.9.1 Abidjan Convention

The 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 came into force in 1984. In consonance with a number of other regional conventions, the Abidjan Convention deals with pollution from ships via incidental discharges and dumping, by referring the contracting parties to the applicable global conventions.

2.9.2 Gulf of Guinea Large Marine Ecosystem (GOG-LME) Treaty

The Gulf of Guinea Large Marine Ecosystem regional treaty aims at improving the status of the marine environment along the west coast of Africa influenced by the Guinea Current. The GOG-LME came into existence in December 1999 and was signed by Benin, Ghana and Nigeria. Assessing, preventing and/or mitigating environmental pollution in order to safeguard the biodiversity of the offshore ecosystem is a key focus of the project.

2.9.3 Convention on the Conservation of Migratory Species of Wild Animals

The Bonn Convention, which was concluded under the aegis of the United Nations Environment Programme (UNEP), aims to conserve terrestrial, marine and avian migratory species (those that regularly cross international boundaries, including international waters).

2.9.4 United Nations Convention on the Law of the Sea (UNCLOS), 1982

Ghana is a signatory to the United Nations Convention on the Laws of the Sea (UNCLOS), 1982. The Convention provides for the extension of Ghana's sovereign territorial waters to a maximum of 12nm beyond its coast, however, foreign vessels are granted the right of innocent passage through this zone. The passage is innocent as long as a ship refrains from engaging in certain prohibited activities, including weapons testing, spying, smuggling, serious pollution, fishing, or scientific research.

Beyond its territorial waters, every coastal country may establish an exclusive economic zone (EEZ) extending 200nm from shore. Within the EEZ the coastal state has the right to exploit and regulate fisheries, construct artificial islands and installations, and for other economic use purposes and scientific research. Clearance for project vessels travelling into the territorial waters (e.g. to and from the onshore base) must be obtained from the Ghana Maritime Authority (GMA) and notification should also be made to the Ghanaian Navy.

2.9.5 International Convention for the Prevention of Pollution from Ships (MARPOL)

The MARPOL Convention, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) provides regulations aimed at preventing and minimizing pollution from ships; as summarized in Table 2.2 (the MARPOL 73/78 regulations applicable to offshore exploration activities).

Table 2.2: Relevant MARPOL Provisions on the Environment

Environmental Aspect	Provisions of MARPOL 73/78
Drainage water	Ship/installation must be proceeding en route, not within a 'special area', and oil must not exceed 15ppm (without dilution). Vessels must be equipped with an oil filtering system, automatic cut-off, and an oil retention system.
Transfer of oil-contaminated wastes	Oil loading terminals and repair or other ports must have shore facilities for the reception of oily wastes. Facilities are required to meet the needs of the ship without causing undue delay.
Bulked chemicals	Prohibits the discharge of noxious liquid substances, pollution hazard substances, and associated tank washings. Vessels are required to undergo periodic inspections to ensure compliance. All vessels must carry a Procedures and Arrangements Manual and Cargo Record Book.
Dangerous goods	Packaging, storage, marking, and labelling in accordance with internationally recognized codes.
Accidental oil discharge	Oil Spill Contingency Plan is required for drilling units and vessels.
Sewage discharge	Discharge of sewage is permitted only if the vessel/installation has approved sewage treatment facilities, the test result of the facilities are documented, and the effluent shall not produce visible floating solids nor cause discolouration of the surrounding water.
Garbage	Discharge of any garbage is prohibited apart from food waste ground to 25-mm mesh for facilities more than 12 nautical miles from land.
Air pollutant emissions	Sets limits on sulphur oxide and nitrogen oxide emissions and prohibits deliberate emissions of ozone-depleting substances including halons and chlorofluorocarbons. Prohibits incineration of certain products on board such as contaminated packaging materials and polychlorinated biphenyls.

The MARPOL Convention initially comprised regulations for the Prevention of Pollution by Oil (Annex I) and Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (Annex II). Another four annexes have subsequently been added. Ratified parties must accept Annexes I and II, but the other four are voluntary. Ghana has ratified Annexes I and II only and the Marine Pollution Act (2010) has adopted the remaining four annexes of the MARPOL standards into Ghanaian legislation.

2.9.6 Basel Convention

The Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention) establishes a framework of control over the transboundary movements of hazardous wastes. It aims to protect human health and the environment against the adverse effects resulting from the generation, management, movement and disposal of hazardous waste. The Convention regulates the transboundary movement of hazardous waste using the Prior Informed Consent Procedure such that shipments without prior consent are illegal.

The Convention obliges producers of hazardous waste to dispose of their waste in an environmentally responsible manner close to where it is generated. Strong controls on the movement, storage, transport, treatment, reuse, recycling, recovery and final disposal of hazardous waste are imposed. Transboundary movements would generally be approved, if:

- The state of export does not have the capability of managing or disposing of the waste in an environmentally sound manner, unlike the case in Ghana, or
- The receiving state has appropriate, environmentally sound facilities, and agrees to accept the waste, as is the case in Ghana.

Annexes I, VIII and IX of the Convention list those wastes that are classified as hazardous and subject to the control procedures under the Convention. Annex II of the Convention identifies those wastes that require special consideration (known as 'other wastes', and which primarily refer to household wastes).

2.9.7 Bamako Convention

Ghana is a signatory to the Convention on the Ban of Import into Africa and the Control of Transboundary Movement of Hazardous Wastes within Africa (Bamako Convention). This convention is supplementary to the Basel Convention and covers the movement of hazardous waste into or between signatory African countries. The Convention has many provisions virtually identical, or analogous, to the Basel Convention provisions.

2.9.8 Kyoto Protocol and UNFCCC

The Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) has 191 parties and aims to reduce net emissions of greenhouse gases. Ghana is one of the Non-annex I parties - a group of developing countries. Certain groups of developing countries are recognized by the Convention as being especially vulnerable to the adverse impacts of climate change, including countries with low-lying coastal areas and those prone to desertification and drought. Others (such as countries that rely heavily on income from fossil fuel production and commerce) feel more vulnerable to the potential economic impacts of climate change response measures. The Convention emphasizes activities that promise to answer the special needs and concerns of these vulnerable countries, such as investment, insurance and technology transfer.

2.10 Industry Standards and Guidelines

The key oil and gas industry standards and guidelines have been introduced by the International Association of Oil and Gas Producers (OGP) and the International Petroleum Industry Environmental Conservation Association (IPIECA) as well as local guidelines developed by the EPA. These include:

- IPIECA Guidance on improving social and environmental performance: good practice guidance for the oil and gas industry;
- OGP Environmental-Social-Health Risk and Impact Management Process (2007);
- OGP Guide to Health Impact Assessments in the Oil and Gas Industry (2005);
- IPIECA Guide to Social Impact Assessment in the Oil and Gas Industry (2004);
- Report on Key Questions in Managing Social Issues in Oil and Gas Projects (2002);
- Environmental Assessment and Management Guidelines for Offshore Oil and Gas Development (2011);
- Enforcement Policy Guidelines for Petroleum Sector Operation (2013); and
- Oil Spill Dispersants Guidelines (2008).

2.10.1 IPIECA Guidance on improving social and environmental performance

This guide provides a summary of all IPIECA's good practice publications for the oil and gas industry.

2.10.2 OGP Environmental-Social-Health Risk and Impact Management Process

This report is designed to deliver additional value in oil and gas projects through enhanced quality, consistency and industry alignment and by integrating social, environmental and health good practices into the HSE management system and the overall project decision-making process.

2.10.3 OGP Guide to Health Impact Assessments in the Oil and Gas Industry

This guide aims to describe the overall HIA process as it is currently understood and practised. Experience within the oil and gas industry suggests that health is a critical issue both for the project workforce and the surrounding communities. The oil and gas industry faces a complex agenda that increasingly requires an evaluation of health, social and environmental impacts throughout all of its operations.

2.10.4 IPIECA Guide to Social Impact Assessment in the Oil and Gas Industry

This IPIECA guide outlines the use of Social Impact Assessments (SIAs) by the oil and gas industry. It provides managers of existing oil and gas operations or new projects with an understanding of how to make the best use of SIAs. Information on more detailed resources is contained at the end of this guide.

2.10.5 Report on Key Questions in Managing Social Issues in Oil and Gas Projects

This joint OGP and IPIECA report (2002) is designed as a manual for conducting Social Impact Assessment. At the centre of the report is a group of 'Lists of Questions', which are the key questions that may need to be asked and answered in considering the social dimension of oil and gas projects.

2.10.6 Environmental Assessment and Management Guidelines for Offshore Oil & Gas Development

These guidelines detail the requirement to consider the effects on the ecosystem (the environment), the well-being of the people involved in the oil and gas operations (health and safety) and those affected by the proposed development directly or indirectly (community issues). Both Environmental Assessment Regulations 1999 and EPA Guidelines 2011 establish the need for Oil and Gas industry to submit a Preliminary Environmental Report (less comprehensive EIA) for all exploration activities (i.e. seismic acquisition and drilling).

2.10.7 Enforcement Policy Guidelines for Petroleum Sector Operation (2013)

These policy guidelines apply to all oil and gas installations operating in connection with the exploration, development or production, transportation, bulk distribution and refining of petroleum that come within the scope of the laws.

Enforcement, including prosecution, has three key purposes to ensure that those, such as Permit Holders and Operators, who have duties under the law take preventive or remedial measures to prevent pollution; put in place measures to achieve compliance; and are held to account when failures to comply occur.

The scope of enforcement includes but is not limited to the alleged or likely contraventions that are stipulated as offences of the statutory instruments that make up the regulatory regime. Enforcement can arise from inspections and investigations. or other regulatory activities where in the opinion of the Agency, there is or there is likely to be, a contravention of laws. The methods of enforcement include letters; enforcement notices; cessation or prohibition notices; revocation of a permit; and prosecution.

Different methods of enforcement may be selected at different stages during and after regulatory intervention. EPA is committed to communicating the outcomes of regulatory interventions to ensure that there is no uncertainty as to the approach its inspectors are pursuing. Two methods for dealing with complaints or comments include a formal system using the Courts, and local arrangements involving EPA senior management.

2.10.8 Oil Spill Dispersants Guidelines (2008)

These guidelines cover the importation, transport, storage, use and disposal of oil dispersant concentrate for use in Ghanaian waters.

2.11 World Bank Policies and IFC Performance Standards

The World Bank/ International Finance Corporation's guidelines and standards aim to provide a sustainable management framework for managing social and environmental risks and impacts of new and expanding developments. These guidelines and performance standards (Table 2.3) are considered the best international practice for the Oil and Gas industry.

Table 2.3: Relevant IFC Policies and Guidelines

Policies & Guidelines	Description and Potential Relevance to the Project
Performance Standards on Social and Environmental Sustainability (2012)	
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts	Performance Standard 1 establishes the importance of: (i) Integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) The client's management of environmental and social performance throughout the life of the project. The Standard specifies the stages of the ESIA process, discusses their objectives and lists requirements for each stage.
Performance Standard 2: Labour and Working Conditions Performance Standard 3: Resource Efficiency and Pollution Prevention Performance Standard 4: Community Health, Safety, and Security Performance Standard 5: Land Acquisition and Involuntary Resettlement Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources Performance Standard 8: Cultural Heritage	Performance Standards 2 through 8 establish objectives and requirements to avoid, minimize, and where residual impacts remain, compensate/ offset for risks and impacts to workers, affected communities, and the environment. While all relevant environmental and social risks and potential impacts should be considered as part of the assessment, Performance Standards 2 through 8 describe potential environmental and social risks and impacts that require particular attention. Where environmental or social risks and impacts are identified, the client is required to manage them through its Environmental and Social Management System (ESMS) consistent with Performance Standard 1.
IFC Applicable Guideline for the O&G Sector	

General Environmental, Health, and Safety Guidelines (2007)	The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines as detailed below.
Environmental, Health, and Safety Guidelines for Offshore Oil & Gas Development (2007)	The EHS Guidelines for Offshore Oil and Gas Development include information relevant to seismic exploration, exploratory and production drilling, development and production activities, pipeline operations, transportation, tanker loading and unloading, ancillary and support operations, and decommissioning. It also addresses potential offshore impacts that may result from oil and gas activities.
IFC Access to Information Policy (2012)	This Policy reflects the various capacities in which the IFC operates, the nature of the information that it receives and prepares in connection with those diverse activities, and the level of disclosure applicable to different types of information As part of the process of managing the risks and impacts of their investment projects, IFC requires its clients to engage with communities affected by their projects, including through the disclosure of information, in a manner that is consistent with IFC's Policy and Performance Standards on Environmental and Social Sustainability.

2.12 Environmental Quality Standards

This section provides an overview of the environmental quality standards enforced by the Ghanaian EPA and the obligations of the various International protocols to which Ghana is a signatory or recommended by various international standards (e.g. the World Bank/IFC).

The EPA has published standards for industrial or facility effluents, air quality and noise levels:

- Environmental Quality Guidelines for Ambient Air (EPA) provides advice on maximum permissible levels of a variety of air pollutants;
- Sector Specific Effluent Quality Guidelines for Discharges into Natural Water Bodies (EPA) provide maximum permissible effluent discharge concentrations for a number of parameters; and
- General Environmental Quality Standards for Industrial or Facility Effluents, Air Quality and Noise Levels.

2.12.1 Water quality

Ghanaian regulations adopt MARPOL and IFC standards applied to effluent levels from offshore oil and gas development as shown in Table 2.4. (Environmental, health, and safety guidelines for offshore oil and gas development – documents.worldbank.org)

Table 2.4: Effluent Guidelines for EA and EM in Offshore Oil and Gas Development

Non-aqueous Drilling Fluids (NADF) and Cuttings	1) NADF – re-inject or ship-to-shore, no discharge to sea. 2) Drilled cuttings – re-inject or ship-to-shore, no discharge to sea except: • Oil concentration lower than 1% by weight on dry cuttings • Hg – max 1 mg/kg dry weight in stock barite • Cd - max 3 mg/kg dry weight in stock barite • Discharge via a caisson at least 15 m below sea surface: Water depth: 0 – <500m No discharge >500m 3% maximum by weight on dry cuttings
Water-based Drilling Fluids (WBDF) and Cuttings	1) WBDF – re-inject or ship-to-shore, no discharge to sea except: • In compliance with 96 hr. LC-50 * of SPP-3% vol. toxicity test first for drilling fluids or testing based on standard toxicity assessment species (preferably site-specific species); 2) WBDF, fluids and cuttings– re-inject or ship-to-shore, no discharge to sea except: • Hg – 1 mg/kg dry weight in stock barite • Cd - 3 mg/kg dry weight in stock barite • Maximum chloride concentration must be less than four time's ambient concentration of fresh or brackish receiving water • Discharge via a caisson at least 15 m below the sea surface

Completion and workover fluids	Ship-to-shore or re-inject. No discharge to sea except: • Maximum one-day oil and grease discharge should not exceed 40 mg/L; 30 days average should not exceed 29 mg/L • Neutralize to attain a pH of 6 or more
Cooling water	The effluent should result in a temperature increase of no more than 3°C at the edge of the zone where initial mixing and dilution take place. Where the zone is not defined, use 100 m from the point of discharge.
Produced water	Re-inject. Discharge to sea maximum one-day oil and grease discharge should not exceed 40 mg/l; 30 days average should not exceed 29 mg/L.
Produced sand	Ship-to-shore or re-inject. No discharge to sea except when oil concentration is lower than 1% by weight on dry sand.
Hydrotest Water	• Send to shore for treatment and disposal • Discharge offshore following environmental risk analysis, careful selection of chemicals • Reduce the use of chemicals
Sewage	Treat with an approved marine sanitation unit (achieves no floating solids, no discolouration of surrounding water) as per MARPOL Annex IV requirements. Minimum residual chlorine of 1 mg/l as per IFC EHS Guidelines.
Food Waste	Macerate to acceptable levels and discharge in compliance with MARPOL 73/78 Annex V requirements.
Deck Drainage	Treat to 15 ppm oil concentration as per MARPOL 73/78 Annex I requirements.
Other wastes	Compliance with MARPOL 73/78

Note: * 96-hr LC-50: Concentration in parts per million (ppm) or per cent of the Suspended Particulate Phase (SPP) from a sample that is lethal to 50 percent of the test organism exposed to that concentration for a continuous period of 96 hours.

The EPA water discharge guidelines for other pollutants are specified in Table 2.5, and a comparison is provided with the World Bank effluent standards.

Table 2.5: Ghana EPA Water Quality Guidelines and World Bank Effluent Standards

Parameter	EPA Water Quality Guideline	World Bank Effluent Standard
pH value	6.0 – 9.0	6.0 – 9.0
Biochemical oxygen demand (at 20°C)	50 mg/L	50 mg/L
Chemical oxygen demand	250 mg/L	100 mg/L
Escherichia coli (E. coli)	10 MPN/100 mL	-
Oil and grease	10 mg/L	-
Total suspended solids	50 mg/L	50 mg/L
Arsenic	-	0.1 mg/L
Cadmium	0.1 mg/L	0.02 mg/L
Chromium, hexavalent (Cr^{+6})	0.1 mg/L	0.05 mg/L
Copper	5.0 mg/L	-
Lead	0.1 mg/L	-
Mercury	0.005 mg/L	0.05 mg/L

2.12.2 Air quality

In accordance with the EPA Guidelines for Environmental Assessment and Management in Offshore Oil and Gas Development, the operator must obtain a permit for emission into the air. Key provisions of the IFC EHS guidelines relevant to atmospheric emissions from offshore oil and gas developments are outlined in Table 2.6.

Table 2.6: IFC guidelines for point source air emissions (IFC, 2007)

General	All reasonable attempts should be made to maximise energy efficiency and design facilities for the lowest energy use. The overall objective should be to reduce air emissions and evaluate cost-effective options for reducing emissions that are technically feasible.
Exhaust gases	Exhaust gases Guidance for the management of small combustion sources with a capacity of up to 50-megawatt hours, including standards for exhaust emissions, is provided in the IFC's General EHS Guidelines. For engines using liquid fuels: • Particulate matter: 50 mg/m3 (up to 100 if justified by project-specific conditions) (approximately 24 and 49 ppm respectively). • Sulphur dioxide: 1.5% of sulphur (up to 3% if justified by project-specific conditions). Consideration to using low sulphur fuels or secondary treatment to meet 1.5% sulphur. • Nitrogen oxides: 1,460 mg/m3 if bore size diameter <400 mm (up to 1,600 mg/m3 if justified to maintain high energy efficiency) and 1,850 mg/m3 if bore size diameter >400 mm. (These normalised gas concentrations equate to approximately 711, 779 and 901 ppm respectively). • Dry gas, excess oxygen content: 15% For gas-fired engines: • Nitrogen oxides: 200 mg/m3 for spark ignition, 400 mg/m3 for dual fuel and 1,600 mg/m3 for compression ignition. • Dry gas, excess oxygen content: 15%
Venting & flaring	Significant (>100,000 tons CO_2 equivalent per year) greenhouse gas (GHG) emissions from all facilities and offshore support activities should be quantified annually as aggregate emissions in accordance with internationally recognized methodologies and reporting procedures.
Venting and Flaring	Measures consistent with the Global Gas Flaring and Venting Reduction Voluntary Standard (part of the World Bank Group's Global Gas Flaring Reduction Public-Private Partnership should be adopted when considering venting and flaring options for offshore activities). The standard provides guidance on how to eliminate or achieve reductions in the flaring and venting of natural gas. Continuous venting of associated gas is not considered current good practice and should be avoided.

Well testing	During well testing, flaring of produced hydrocarbons should be avoided, especially in environmentally sensitive areas. Feasible alternatives should be evaluated for the recovery of these test fluids, while considering the safety of handling volatile hydrocarbons, for transfer to a processing facility or other alternative disposal options. An evaluation of alternatives for produced hydrocarbons should be adequately documented and recorded.
Fugitive emissions	Methods for controlling and reducing fugitive emissions should be considered and implemented in the design, operation, and maintenance of offshore facilities. The selection of appropriate equipment should consider safety and suitability requirements as well as their capacity to reduce gas leaks and fugitive emissions.

2.12.3 Noise Levels

The EPA noise standards are generally relevant for onshore developments. Offshore, the noise standards will mostly apply to the protection of workers rather than the public at large. The IFC Guidelines for Offshore Oil and Gas Production state that personnel must use hearing protection when exposed to noise levels above 85 dB.

There are IFC guidelines for minimizing underwater noise applicable to offshore oil and gas production operations (drilling and production activities, offshore and near shore structural installation, e.g., pile driving, construction activities, and marine traffic). Recommended measures to reduce the risk of noise impact from offshore exploration operations on marine species include:

- Identifying areas sensitive to marine life such as feeding, breeding, calving, and spawning areas;
- Planning activities around sensitive times of the year (e.g. breeding season);
- Reducing operation times, where possible;
- Identifying fishing areas and reducing disturbance to these areas by planning for seismic surveys and construction activities to be undertaken at less productive times of the year, where possible; and
- If sensitive species are anticipated in the area, their presence should be monitored before the onset of noise-creating activities. In areas where significant impacts to sensitive species are anticipated, experienced observers should be used.

CHAPTER THREE

Project Description

- Project Site/Block
- Overview of Project Components and Activities
- Site Preparation
- Drilling
- Well Testing
- Site Restoration (Demobilization)
- Estimation of Human Resources Waste
- Management Provision

3.0 PROJECT DESCRIPTION

This chapter provides a description of the activities that will be carried out to execute the proposed exploratory and appraisal well drilling in the Deepwater Cape Three Points (DWCTPW) Block by EGL. Specific information on the following aspects of the project is provided:

- Project site;
- Project components and activities; and
- Schedule of proposed activities.

Eco Atlantic Ghana Limited (Operator) is preparing to drill up to three (3) vertical exploration wells in the Deep-Water Cape Three Points Offshore West (DWCTPW) license area.

The first of the three (3) wells known as the 'Fan Prospect' is an exploration well, and is planned to be drilled between September and December 2023. Following successful drilling, an analysis will be carried out, and it is possible that up to two further wells will be drilled in the license area to explore new targets and/or assess the viability of the Fan prospect in producing oil in commercial quantities.

EGL and its partners in the project (Ghana National Petroleum Corporation and Explorco) plan to execute the oil and gas exploration program in the DWCTPW Block under the terms of a Petroleum Contract with the Petroleum Commission (PC). The Contract requires the drilling of an exploration well to identify and evaluate potential hydrocarbon resources within the Block.

3.1 Project Site/Block

The project area is the Deepwater Cape Three Points (DWCTPW) Block (Figure 3.1, arrowed in red), which occupies water depths ranging from 500 meters to over 2300m deep, and about 95km offshore the nearest coast of Ghana. The area of the DWCTPW Block is approximately 950 km^2.

The new exploratory well(s) will be drilled in either of the approximate envelopes shown in Figure 3.2.

Fan Prospect and Footwall Prospect (both still to receive official well names from the Petroleum Commission) are both exploration well targets. As exploration wells, there are no plans for testing these target reservoirs.

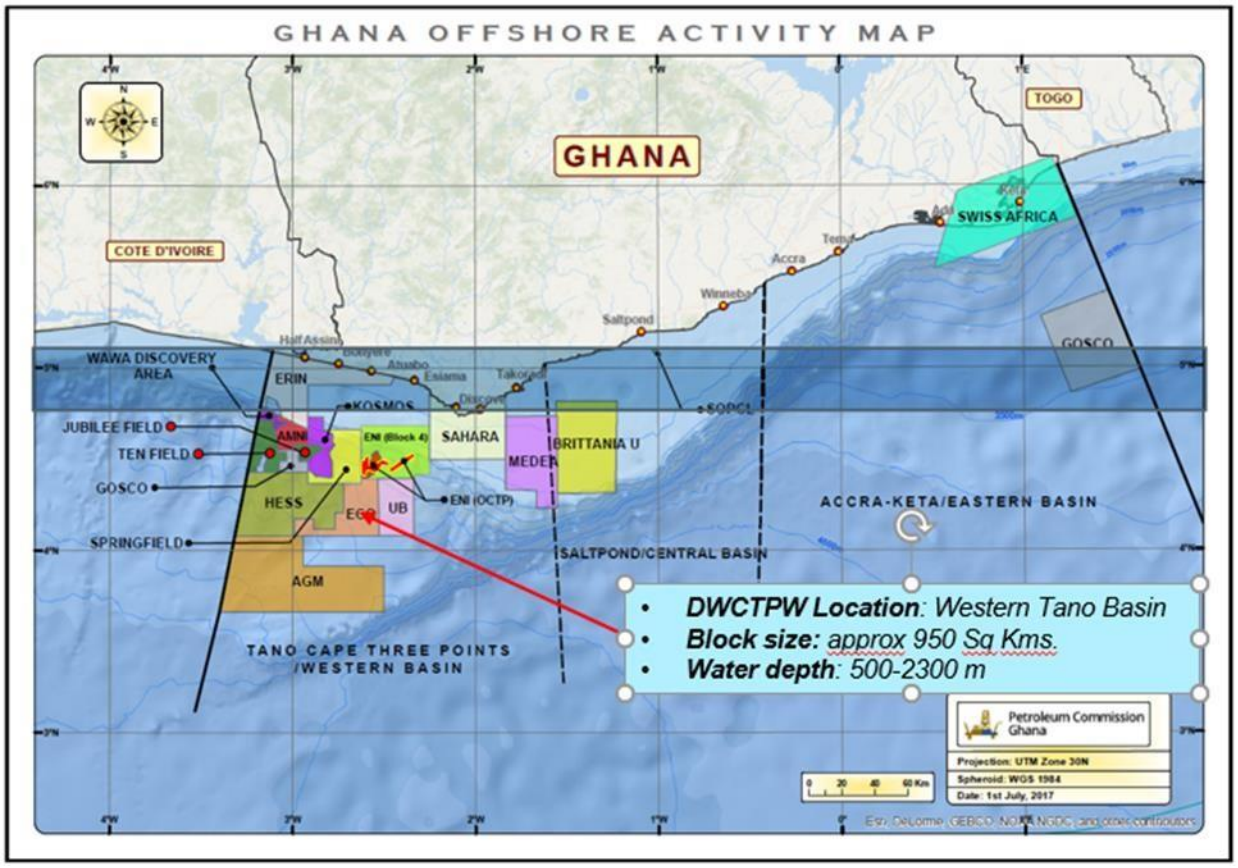


Figure 3.1: DWCTPW Block

The preliminary locations of the planned wells are listed in Table 3.1.

Table 3. 1: Preliminary Coordinates of Planned Well Locations

Well	Well Name	X	Y
1	Fan Prospect	509375	458206
2	Footwall prospect	529583	463089
3	Northern Prospect	tbc	tbc

A total of up to three wells may be drilled in the approximate locations shown in Figure 3.2. The approximate coordinates of the planned wells are shown in Table 3.1.

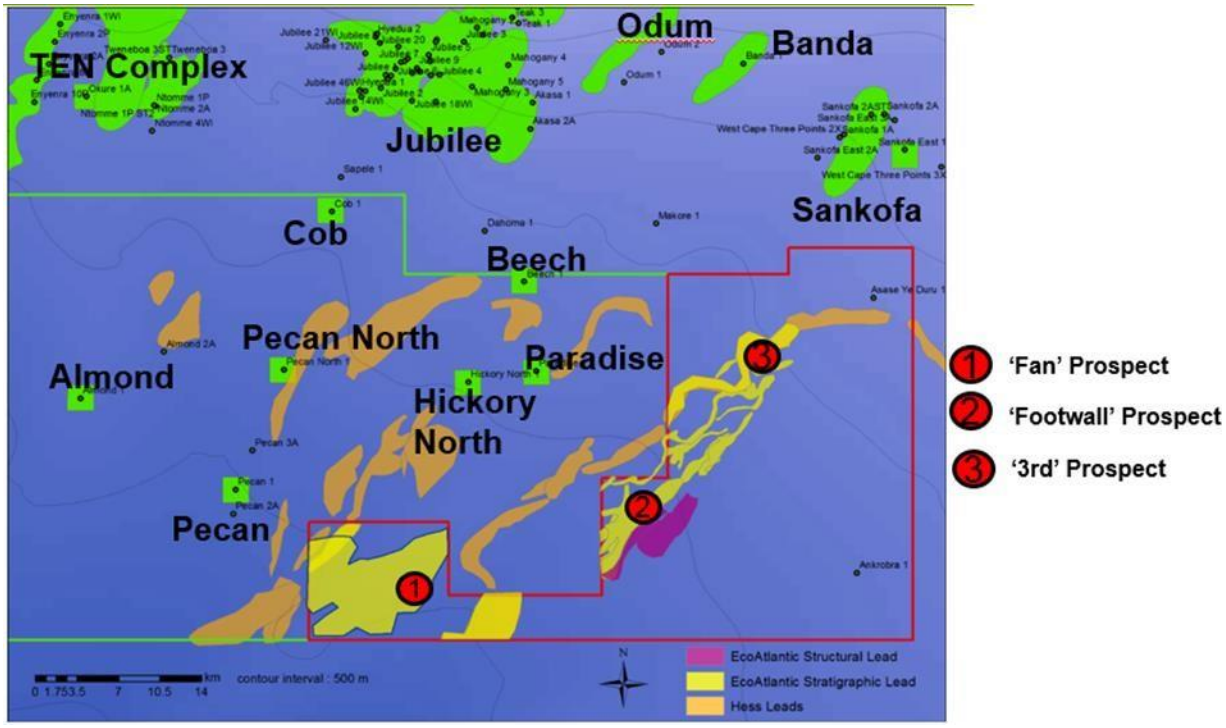


Figure 3.2: Approximate Location of Well Site Target Areas

3.2 Overview of Project Components and Activities

This section provides an overview of the exploratory and appraisal drilling program. Drilling and evaluation of the proposed exploratory and appraisal wells will provide more specific information on the properties of potential hydrocarbon reservoirs. This will enable EGL and its partners to determine whether it is commercially viable to develop production from any such reservoirs.

The proposed drilling program will be executed in three general phases:

- Site preparation (or mobilization);
- Drilling;
- Well Testing (not envisaged);
- Site restoration (or demobilization).

3.3 Site Preparation

Site Preparation activities will involve the following:

- Move in and rig up the drillship;
- Position the drillship; and
- Build and pick up Bottom-Hole drilling assembly.

The drillship will be mobilized from within Ghanaian waters (previously working in the Aker Energy Deepwater Tano Cape Three Points). The rig will already be imported and cleared to work in Ghana. From the previous well location, it will proceed to the first EGL well site and will be operationally supported by two support vessels and one Emergency Response Vessel (ERV), as well as helicopter services. The marine support vessels will restock supplies at Takoradi or Sekondi.

3.3.1 Move In and Rig Up the Drillship

The exploratory drilling will be performed using a specially-designed drillship that is equipped to drill and evaluate reservoir hydrocarbon potential from wells deep below the seafloor. It is planned to contract Maersk Drilling A/S to perform the drilling using the drillship 'Maersk Venturer' (Figure 3.3). The Drillship specifications are provided in Table 3.2.

Figure 3. 3: Maersk Venturer

Source: Maersk

The Viking drillship to carry a crew size of up to 180 during drilling operations, although the Viking can accommodate 230 persons. The schedule of crew changes is likely to be either every 14 or 28 days with personnel departing from Takoradi to the drillship and back by helicopter.

Table 3.2: Drillship Specifications

Dimensions	Metric	Imperial
Length overall	228m	748ft
Width overall	42m	138ft
Depth	19m	62ft
Moonpool opening	25.6m x 12.5m	84ft x 41ft
Particulars	Metric	Imperial
Rated drilling depth	12,000m	40,000ft
Displacement operational	96,000t	211,650,000lbs
Displacement transit	66500t	146,600,000lbs
Total payload (max/transit)	20,000t/16,500t	44,100,000lbs/36,350,000lbs
Riser tensioner load	1,633t	3,600,000lbs
Vertical DP/CS6 setback load	1,200t	2,650,000lbs
Horizontal riser rack area	135 x 27.4m	135 x 90ft
Horizontal pipe rack area	1600m^2	17,000ft^2
Weather/Design Criteria (Survival)	Metric	Imperial
Water depth	3,600m	12,000ft
Wind speed	51.5m/sec	100 knots
Wave height	14.4m	47ft
Wave period	17sec	17sec
Surface current	0.6m/sec	1.1knots
Capacities	Metric	Imperial
Drill water	2,400m^3	84,755ft^3
Potable water	1,200m^3	42,377ft^3
Fuel oil	6,000m^3	211,888ft^3
Brine	750m^3	26,486ft^3
Base oil	990m^3	34,961ft^3
Liquid mud (active)	960m^3	6,030bbl
Liquid mud (reserve)	950m^3	5,980bbl
Bulk mud	452m^3	15,962ft^3
Bulk cement	452m^3	15,962ft^3
Waste mud (slop tank)	480m^3	16,880ft^3
Accommodation	230 people	230 people

Source: https://www.maerskdrilling.com/~/media/drilling%20rigs/documents/maersk-viking.pdf

Two support vessels and one ERV guard vessel will be used to support the well drilling by transporting materials, equipment and personnel to and from the drillship. An example of a typical support vessel to be used is shown in Figure 3.4. Table 3.3 provide information on a typical support vessel (final support vessel to be confirmed).

The ERV is a smaller vessel used to ensure no unauthorized vessels approach the drillship. The specific vessel will be approximately 25m in length and fully equipped to operate with the support of the Ghana Navy. The vessel will have rescue crew facilities, navigation, radar, communications and safety equipment.

Figure 3.4: Typical Supply Vessel

Table 3.3: Typical Supply Vessel Specifications

Parameter	Typical Vessel
Principal Dimensions / Operating Parameters	
Length	73,40 m
Breadth	16,60 m
Depth	7,60 m
Ocean transit draft	6,42 m
Transit speed	14 knots
Accommodations	34 Persons
Capacities	
Bulk liquid	1 070 m^3
Fuel	1 070 m^3

Parameter	Typical Vessel
Power Generation	
Propeller	2 x adjustable blade propeller
Main diesel Engines	2 x Caterpillar 3606
Additional Engines	2 x Caterpillar 3406
Generators	2 x 1300 kW

The drillship will be equipped with the following principal components:

- Derrick, draw-works and top drive;
- Casing and pipe racks;
- Normal use and emergency generators;
- Mud circulation and solids removal equipment;
- Bulk storage containers for fuel, mud, cement, fresh water, brine, mineral oil, etc.;
- Safety and fire-fighting equipment;
- Potable water system;
- Sewage treatment system;
- Personnel accommodations and support facilities; and
- Navigation and communications equipment, including radar, radio, internet, etc.

Power for the drillship will be supplied by six diesel engines capable of operating at 7,248 kilowatts continuous power output, while power for the drilling activities will be supplied by six electric generators with similar output. The generators will power five mud pumps for the circulation of drilling fluid, cuttings and fluids, as well as air compressors used to drive various tools. Secondary well control (to avoid an uncontrolled release of hydrocarbons from the sub-surface reservoir) will be achieved using blow-out preventers (BOP). The drilling activity will be continually monitored using a system of instruments, gauges and sensors.

3.3.2 Position Drillship

The drillship will be equipped with a moon pool or area on the deck that is open to the sea through which the drilling occurs. A number of sensors (typically 6 to 8) will be placed on the seabed around each site. These will be triangulated by GPS and will facilitate the drillship's DP system. Using the networked geographic positioning system (GPS) will allow the DP to automatically maintain the rig's position and heading with its own propellers and thrusters. Given the great water depth in the DWCTPW Block, the drillship will not utilize anchors.

3.3.3 Build and Pick Up Bottom-Hole Drilling Assembly

Just prior to entering the drilling phase, the bottom-hole drilling assembly will be prepared and put into position. Movement of equipment and fluids onto and around the drillship is done using various capacity cranes, hoists, winches, hoses, pipes and pumps.

3.4 Drilling

Once the drill rig is on station and the drilling assembly is prepared, the drilling phase begins. The key considerations for an environmental assessment of this phase of activity are:

- Well, design and drilling program;
- Drilling fluids;
- Drill cuttings;
- Wastewater and assimilated and domestic waste;
- Cooling water;
- Emissions;
- Commitment to environment, health and safety;
- Well control and spill prevention and response; and
- Logistics and utilities.

3.4.1 Well Design and Drilling Program

The initial step of drilling a well in deep water involves jetting in a 36" structural ('conductor') pipe to support the load of the well control equipment and subsequent casing strings. The process is called 'jetting' where drilling fluid (usually sea water or 'sweeps', a sea water-based mix) is pumped through the holes (jets) in the drill bit causing most of the disintegration of the sediment and rock to be penetrated. As drilling advances, a well is cased to prevent the hole from collapsing. This initial casing is known as conductor casing. Following the jetting of the 36" conductor to depth, a 26" hole will be drilled which will be cased with a 20" casing run with high-pressure wellhead housing. The wellhead (high-pressure wellhead housing) equipment, will be installed when the 20" casing is installed and cemented into place.

The subsea well control equipment, including the BOP, will be run on the riser and latched to the high-pressure housing. The marine riser is a steel tube that conveys drilling fluids down from the drillship and will return drilling fluids and cuttings up from the well, isolating them from the sea to the drillship. Drilling will proceed with a 17.5" hole drilled before the intermediate 13-3/8" casing is set. Then a 12-1/4" hole will be drilled to the final depth. Based on the presence of hydrocarbons, the well will be logged. After logging, the well may be cased with 9-5/8" casing and temporarily suspended or permanently abandoned (without running the 9 5/8" casing). Figures 3.5 and 3.6 provide diagrams of typical well structure drilling mechanics.

A proposed wellbore diagram (schematics) for the first well is presented in Figure 3.5. Standard drilling technologies will be used, though there will be room for minor changes (as necessary) in the drilling program. No significant changes are, however, anticipated.

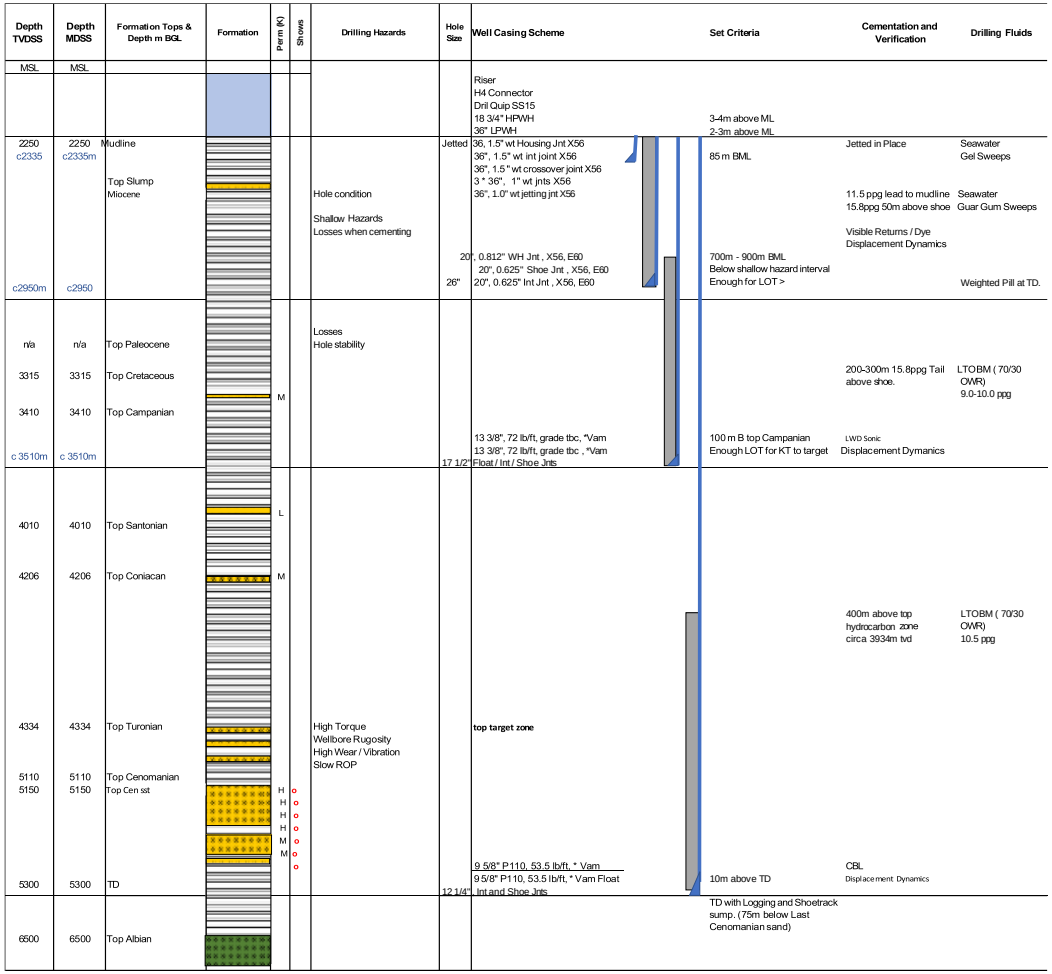


Figure 3. 5: Fan Prospect Wellbore Schematic

3.4.2 Drilling Fluids

The primary functions of drilling fluids are to:

- Assist in the jetting (disintegration) of formation rock, and creation of drill cuttings;
- Carry cuttings out of the wellbore;
- Lubricate, cool and clean the drill bit;
- Reduce friction between the drill string and the wellbore;
- Prevent the inflow of formation fluids by adjusting the density of the drilling fluid;
- Form a filter layer to seal off the formation and maintain the integrity of the wellbore until it is cased.

It is intended to use Shell's environmentally-friendly drilling fluid Saraline 185v for this program. Saraline 185v is a synthetic (non-aqueous) based drilling fluid (NADF) with low aromatic content that has been approved for use by the Ghana EPA. The fluid contains emulsifier oil for lubricating the well, water and calcium chloride (salt) to create a brine solution, lime to control alkalinity, barite to provide weighting for well control, and other components.

Drilling fluids include a number of elements, including weighting agents, loss of circulation materials, viscosity agents and other components. The composition of the drilling fluid (often referred to as 'mud') depends on the geologic conditions in which the well is to be drilled and the depth of the well. Table 3.4 shows some of the different materials that will be used in drilling to adjust the properties of the drilling fluid according to the conditions encountered.

Table 3.4: Materials used in Drilling one well

Product	Hazard Category	Planned Quantity (where established)
1. Aquagel Goldseal (viscosifier)	Yellow	106 MT
2. Barazan (viscosifier)	Green	7.5 MT
3. Barite (weighting agent)	Green	200 MT
4. Bentonite (thickener)	Red	50 MT
5. Baroid	Red	726 ST
6. Calcium chloride powder	Yellow	
7. Caustic soda	Red	
8. Guar gum	Green	

9. Saraline 185-V (NABF)	Yellow	6,000bbl
10. Soda ash	Yellow	1MT
11. Visplus (suspension agent)	Green	4MT
12. Calcium chloride brine	Yellow	1,500bbl
13. Barium Chloride	Yellow	2,000ml
14. Cement Class H	Green	
15. Cement Class G	Green	1,500MT
16. Calcium Chloride Liquid	Green	3,800L
17. CFR 3L (dispersant)	Green	3,800L
18. D-Air 3000L (de-foamer)	Green	5,000L
19. Econolite Liquid (additive)	Green	40,000L
20. Halad 344EXP (additive)	Green	20,000L
21. Tuned Spacer III (additive)	Red	80,000lb
Legend: MT = Metric ton ST = Short ton (2,000lb) bbl. = barrel (42 US gal)		

The hazard category of chemicals used in drilling is assigned a colour to aid the identification of the environmental risks associated with each material. The colour code is shown in Table 3.5. The project will not use any of the highest risk categories of materials.

Table 3.5: Colour Codes of Environmental Risks of Drilling Materials

Colour Code	Environment
Black	Unacceptable: • Chemical not on US EPA TSCA chemical substance inventory list. (US operating assets) • Ozone-depleting substances (halons, chlorofluorocarbons, hydro-chlorofluorocarbons • REACH prohibited list
Red	Red shall be prioritized for substitution: • Black "HOCNF" Chemicals • Very toxic and harmful to aquatic organisms • May cause long-term adverse effects on the aquatic environment • 31 Priority Chemicals from US EPA National Waste Minimization Program • Biodegradability < 60%, log Pow > 3, EC50 or LC50 < 10 MG/L
Yellow	Yellow chemicals are chemicals which do not fall under the Red or Green category
Green	Chemicals are PLONOR; "HOCNF" – Green
Legend	TSCA = Toxic Substances Control Act REACH = Registration, Evaluation, Authorization and Restriction of Chemicals (EC 1907/2006) HOCNF = Harmonized Offshore Chemical Notification Format (OSPAR 2010/13) PLONOR = Pose Little Or No Risk (to the environment)

3.4.3 Drill Cuttings

At the start of drilling, seawater will be used to jet in the conductor casing. This will be done before the riser is installed on the wellhead. Water-based mud likely will be used to drill the upper sections of the well before the riser is installed. During this time, both drilling fluids and cuttings from water-based muds will be discharged to the seabed before installation of the marine riser.

After the riser has been installed, drilling fluid will flow down through the drill string to the bit, then back up the riser to the drillship. With the riser in place, mud and cuttings will no longer be discharged to the sea floor but will travel up to the drillship where they will be treated in a solids control system, such as the one shown in Figure 3.6. Prior to release, cuttings will be passed through the solids control equipment to remove the majority of drilling fluids before being discharged to the sea (to meet the discharge limit established by EPA for oil on cuttings before discharge). Table 3.6 shows the expected volumes during different stages of drilling for the first well to be drilled by Maersk in the DWCTPW Block.

Table 3.6: Expected Cutting Volumes for DWCTPW Block Wells

Drilling Stage	Anticipated Section Length	Radius	Volume of Cylinder ($\pi \times r^2 \times h$)	Anticipated Volume of Cuttings	Type of Muds to be Used
Jetting 36" pipe	88m	33 inches ID = 0.4191 m rad	$\pi \times 0{,}4572^2 \times 85 = 57\ m^3$	47 m^3	Seawater
Drilling 26" hole	615 m	0.3302 m	$\pi \times 0{,}3302^2 \times 615 = 210\ m^3$	210 m^3	Seawater and Sweeps
Drilling 17/1/2" hole	560 m	0.2032 m	$\pi \times 0{,}2032^2 \times 560 = 73\ m^3$	73 m^3	NABF
Drilling 12-1/4" hole	1,790 m	0.1556 m	$\pi \times 0{,}1556^2 \times 1790 = 9\ m^3$	136 m^3	NABF
Total	**3050m**			**466 m^3**	

For all of the drilling campaigns, cuttings generated during the jetting of the 36" pipe and drilling of 26" hole sections will be discharged to the seabed. During the drilling of the 17-1/2" and 12-1/4" holes, which will be drilled with NABF, the cuttings will be removed, and mud reconditioned and re-circulated. Drill cuttings and fluids will pass through solids control equipment to remove most (estimated up to 98%) of the drilling fluids from the cuttings.

The drillship will be equipped with solids control equipment called shale shakers. Shale shakers remove drilled solids from mud by passing the material through a wire-cloth screen that vibrates while drilling fluid flows on top of it. Larger solids are retained on the screen, passed through the cuttings dryer and discharged. The liquid phase of mud and solids smaller than the wire mesh pass through the screen and are sent to a centrifuge. Solids from the centrifuges are discharged and clean drilling fluid is reused. Figure 3.6 depicts typical drilling fluid solids control equipment, including shale shakers.

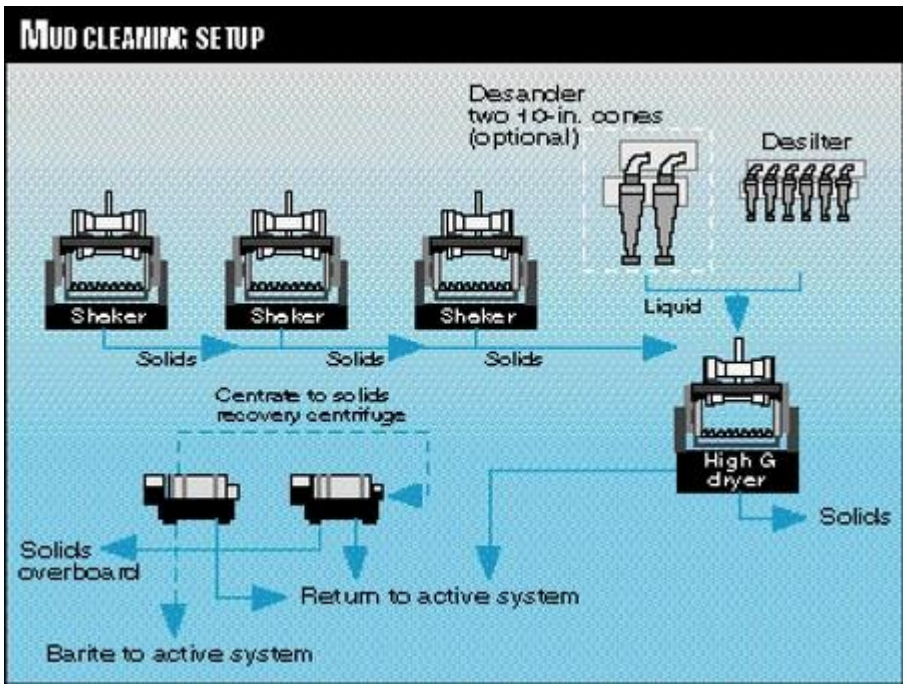


Figure 3.6: Solids Control System for NABFs

3.4.4 Wastewater, Assimilated and Domestic Waste

The project will generate both non-hazardous and hazardous wastes. Non-hazardous wastes will include paper, cardboard, wood, plastic and glass containers, and packing materials. Hazardous wastes may include used drums, filters, used oil and air filters, spent batteries, light bulbs, cables, rags, electronic equipment and medical waste as well as treated drill cuttings and any excess drilling fluid that cannot be re-used. These wastes will be packaged and transported to an EPA-approved waste management company in the Shama District for approved end-point disposal or recycling.

The drillship will be equipped with a domestic wastewater treatment system, drainage system, and a bilge water separator. Sanitary waste from the drillship will be treated to MARPOL 73/78 and Ghanaian standards in the onboard Hamworthy/ST1AC sewage treatment plant before being discharged. The Hamworthy system uses biological treatment to break down and sanitize sewage. Discharges will have no floating solids, will not cause discolouration of the surrounding waters and will have less than 1mg/l of residual chlorine. The bilge water separator will receive the deck drainage and grey water.

Discharged bilge water will have not more than the approved Ghanaian discharge limit of 15ppm (MARPOL 73/78 Annex I, Regulation 9(1)(b) hydrocarbons, and will not have a sheen on the water surface. Water to be discharged will be re-circulated through the treatment system until it meets these conditions, or it will be back-loaded to onshore for treatment and disposal.

Table 3.7 lists the estimated quantities of solid wastes and recyclable materials generated during the drilling program.

Table 3.7: Estimated Quantities of Wastes Generated

		Waste Type	Source	Unit of measurement	Total Waste per well Estimate
NON HAZARDOUS	Landfill	General Waste – Domestic Waste (blue Bins, package, bin waste)	blue bins	pe Metric Tonne	500
		Plastic (non-contaminated and not including drums and chem containers)	Bottles, cups wrapping	per Kg	1000
		Glass	Jars, Bottles	per Kg	300
		Paper & Cardboard	Domestic	per m3	2
		Polystyrene	packaging	per Kg	250
		Rubber (tyres and others)	rubber goods	per Kg	300
		Composite Materials	packaging	per Kg	300
	Recycle	Cooking Oil & Grease	Kitchen oils and grease trap	per Kg	700
		Electrical goods	Broken items	per Kg	1000
		Wood (uncontaminated)	Pallets, packaging	per Kg	4000
		Ferrous & Non-Ferrous metals	Scrap metals	per Kg	3000
HAZARDOUS	Hazardous	Waste Oily Water	Slops, Tank Cleaning slops	per bbl	500
		Hydrocarbon Contaminated Sludge and Slops	Slops, Tank Cleaning slops	per bbl	100
		Tank cleaning slops	Tank Cleaning slops	per bbl	1500
		Waste Oil Based Mud	Mud waste	per bbl	20
		Waste Water Based Mud	Mud Waste	per bbl	20
		Waste Cement Slurry Mixes	Mud Waste	per bbl	200
		Contaminated Brine	Mud Waste	per bbl	300
		Waste Oils -engine/base/hydraulic	Engines	per 200L Drum	3
		Oily Rags	Engines	per 200L Drum	6
		Oil Filters	Engines	per 200L Drum	2
		Flammable Liquids	Thinners, volatiles	per 200L Drum	1
		Batteries	Lead Acid, Lithium Ion etc	per Kg	300
		Paints and Empty Paint Containers	Paints	Per Kg	200
		Dry Bulks	Bulks	per 1 TONNE BIG BAG	50
		Wood (contaminated)	Pallets, packaging	per Kg	1000
		Empty Hazardous Plastic Chemical Containers	Mud chemicals, other products	per IBC	5
				per 200 litre	40
				per 20 litre	20
				per 5 litre	120
		Empty Hazardous Metal Chemical Containers	Mud chemicals, other products	per 200 litre	50
				per 20 litre	100
				per 5 litre	0
		Aerosol Spray Can	Paints	per Kg	30
		Bulbs and Fluorescent Tubes	Bulbs and tubes	per Kg	20
		Sanitation & Clinical Waste Bins	Swabs, dressings	per Kg	20
		Medical Containers	Swabs, dressings	per Kg	30
		Radioactive Waste	NORM	per Kg	0
		Residue Acidic Waste	muds	per bbl	20
		Residue Alkaline Waste	muds	per bbl	20

3.4.5 Cooling water

The DP system used by the drillship to maintain the station above the well being drilled uses a considerable quantity of raw seawater to cool motors and non-contact water in its thrusters. This water does not come into contact with any chemical agents and is simply taken into the system through sea chests located in the hull, run through the system one time and then discharged, adding only some heat from the cooling or thrusting activity. It is not therefore regarded as 'wastewater and is subject only to a limitation of the temperature at which it is discharged back to the sea. The Ghana EPA limit is up to 3˚C above ambient sea temperature within 100m of the discharge point.

3.4.6 Emissions

The drillship is powered by diesel engines and generators that have air emissions including Carbon Monoxide (CO), Nitrogen Oxides (NOx), Sulfur Oxides (SOx), volatile organic compounds (VOCs) and particulate matter (PM). While the drillship has six main engines, usually not more than three will be running at any one time. Table 3.8 outlines projected emissions for an individual well. Emissions factors are based on AP42 – 3.4. For impact calculations, all sources are assumed to operate at 50% capacity, 24 hours/day for 45 days per well. The emissions calculation method is based on the table of air emissions 'BOEM Form 0138' of the Bureau of Ocean Energy Management, a US Federal Agency, overseen by the Department of the Interior of the United States.[1]

Table 3.8:Estimated Emissions (in Tons) Generated Drilling a Well

Source	Days	PM	SOx	NOx	VOCs	CO	Methane	CO_2
Drillship Diesel Generators	45 (Drilling Only)	7.34	168.4	252.5	7.57	55.12	6.24	19.9

Note: Assumption that fuel would have a sulphur content of 2%[2] (expecting to source low sulphur at 0.5%)

[1] See the BOEM website: http://www.boem.gov/BOEM-0138-instructions/ and http://www.boem.gov/BOEM-0138/

[2] United States Environmental Protection Agency. 2011. Emissions Factors & AP 42, *Compilation of Air Pollutant Emission Factors.* Accessed from the EPA website: http://www.epa.gov/ttnchie1/ap42/

Table 3.9 presents atmospheric emissions from typical support vessels that would be used for the drilling program. The method of calculation is based on an 85m vessel consuming 28 m^3 of fuel per day (assuming the density of the fuel is 0.85 kg/L).

Table 3.9: Estimated Emissions from Support Vessels

Source	Days	Fuel consumption	Emission factors			Emissions (tonnes)		
			NOx	CO_2	SO_2	NOx	CO_2	SO_2
2 Support Vessels	45 (drilling only, per well)	1428 tonnes	53 kg/tonne of fuel	2925 kg/ tonne of fuel	(21,0 x S) – 2,1 kg/tonne of fuel or S represented by sulfur content in fuel	75	4,176	2.1

Table 3.10 presents atmospheric emissions from helicopters. These calculations assumed three round trips per day, five days a week, for a total of 20 days of operations in the 30 days of the drilling campaign.

Table 3. 10: Estimated Emissions from Helicopters

Operation	Fuel consumption (tonnes)	Emission per Operation (kg)				
		Unburned hydrocarbons	CO	(NO_x)	Carbon particulates	(SO_2)
Lift-off	1.26	0.056	4.8	9.73	41.71	0.2
In-flight	10.3	1.24	41.55	59.82	332.42	1.63
Final approach	1.21	0.081	6.35	6.71	24.4	0.2
Waiting (engine off)	0	0	0	0	0	0
Total		1.37	52.7	76.26	398.5	2.0

Current plans do not include any other significant air emission sources.

3.4.7 Well Control

Each well will be equipped with a BOP and associated well control equipment installed on the wellhead. These systems are designed to shut off the flow of the column of fluids in the well in order to control it. To control subsea blowouts, the BOP will have the following components:

- Hydraulic wellhead connector and lower marine riser connector;
- Safety valves for kill lines and choke;
- Double annular preventer;
- Flexible joint; and
- Six BOP rams with lateral outlets, dressed with blind/shear rams, super shear rams, and variable bore rams.

Similarly, there will be a system operated from the drillship to activate and control the BOP equipment functions. The control system will have:

- BOP control and operation system;
- Remote control stations for operating the BOPs; and
- Remote acoustic control system.

The Remotely Operated Vehicle (ROV) will also be configured to operate the BOP. The BOP and associated equipment will be subject to routine periodic testing to ensure it will work if or when needed.

3.4.8 Spill Prevention and Response

The drillship and supply vessels will be equipped with a variety of small-scale (Tier 1) spill response equipment stored at strategic locations on the vessel, including items such as absorbent rolls, absorbent pads, absorbent socks, absorbent booms, drain covers, absorbent bags, absorbent gloves, goggles, Tyvek suits, signage and plastic waste bags. The crew will be trained in the use of onboard equipment in the event of a spill.

The company will establish a global Associate Membership contract with Oil Spill Response Limited (OSRL) out of Southampton, England to mobilize for any Tier 2 or 3 spill response activities (for spills requiring additional equipment or resources beyond the onsite Tier 1 resources).

Maersk will maintain a Shipboard Oil Pollution Emergency Plan (SOPEP) and an Emergency Response Plan (ERP) for the drillship. Maersk will also have set protocols in place for conducting refuelling in order to prevent spills.

3.4.9 Logistics and Utilities

One or more helicopters will transport personnel to and from the Takoradi Airport. The route of transport will be a direct line between the Airport and the offshore drilling locations. This route is essentially a direct line to the shore, and helicopters involved will avoid passing along sensitive, quiet coastal areas. The only activities proposed at the port are the docking and passage of the supply vessels, the transfer of fuel, water, materials and personnel to these vessels. Wastes and used materials that cannot be recycled or macerated on board will be segregated, packaged and shipped to the onshore treatment facility via the port. Also, small quantities of medical

waste generated will be segregated and stored safely on board for eventual transfer to the onshore disposal facility.

The drillship will have the capacity to store up to 2,400m^3 of drill water and up to 1,400m^3 of potable water. Typically, about 60,000m^3 of seawater might be used during drilling, plus up to approximately roughly 165,000m^3 per day for cooling intake/discharge. Potable water usage is estimated to be approximately 0.08m^3 per person per day and approximately 483m^3 for the 30-day drilling period.

The Venturer's capacity for fuel storage is 6,000m^3. The estimated fuel usage of a drillship such as the Venturer is estimated at roughly 50m^3 per day or approximately 1500m^3 per 45-day well. Re-fuelling of the drillship will be done at sea, following strict protocols for the transfers.

3.5 Well Testing

Well Testing is not envisaged for the exploration scope of work on DWCTPW Block.

3.6 Site Restoration (Demobilization)

Following drilling, each well will likely be temporarily or permanently abandoned, depending on the findings. The activities involved in completing the wells include:

- Plug and abandon wells;
- Inspect the well location with a remotely operated vehicle (ROV); and
- Recover the DP transponders and release rig.

Additionally, support activities may be performed by supply vessels to remove wastes and prepare the drillship to depart the site.

3.6.1 Plug and Abandon Wells

Once a well has been drilled to total depth and evaluated, well suspension or abandonment will be performed in accordance with generally accepted international industry practices for offshore wells. The drill string, riser and BOP equipment will be removed from the hole while cement and/or mechanical plugs will be used to isolate any hydrocarbon-bearing zones. Specifically, a 150m cement plug barrier will be set and tested to isolate any hydrocarbon-bearing zones. An environmental plug will be set close to the mud line. The wellhead will be left in situ since the water depth (more than 2,000m) is below the depth used for trawling for fish. The well suspension or abandonment program will be designed to prevent contamination of potential aquifers by hydrocarbons and the potential flow of hydrocarbons or other fluids within the wellbore or to the surface and may permit future well utility (subject to approvals) at a later date.

3.6.2 Recover Seafloor Equipment and Release Rig

Once the well has been secured, the well site will be inspected using an ROV that will recover any equipment/debris that may need to be retrieved from the seafloor (including the DP transponders), the drillship will be prepared for movement to the next drill destination.

3.7 Estimation of Human Resources

A crew of up to 180 is expected on the drillship. Given the complex nature of deep-water drilling activities and the associated need for demonstrated experience, the great majority of workers who will be involved in this project will be employees or contractors of the Drilling Contractor, the Service Companies and the Operator Supervisory team. The size of the crew is not anticipated to change significantly during the different phases of the project. In addition to the offshore crew, EGL will engage a small number of its own employees and contractors in Ghana during the drilling program, some of whom will be retained after the drilling to maintain contractual obligations and manage stakeholder engagement/community investment programs required. It is possible that a few temporary hires may be made to manage storage and maintenance at the port facility.

The operator will utilize in-country resources and contractors whenever possible and in accordance with Ghana's Local Content Regulation (LI 2204). Additional human and local resources required for support activities may include workers at:

- Waste management facilities;
- Port facilities engaged in loading and unloading materials to and from supply vessels at the port; and
- Local hotels, restaurants, drivers and security personnel utilized by in-country staff and offshore staff during any crew changes.

The use of local resources might change depending on local availability and contractual arrangements at the time of drilling.

CHAPTER FOUR

Alternatives

- No Action Alternative
- Well Locations
- Type of Drilling Units
- Types of Drilling Fluids
- Cuttings Disposal

4.0 ALTERNATIVES

Evaluating the alternatives to proposed projects is an important aspect of the PER Process. For drilling campaigns, potential alternatives are often limited because of technical requirements for drilling programs. These include the requirement to locate a well above or near a target hydrocarbon reservoir, the requirement to use specific types of equipment, materials (e.g., drilling fluids) and techniques based on the water depth and geology of the drill site, and the requirement to carefully schedule a drillship far in advance.

Alternatives considered for the project are described below.

4.1 "No Action" Alternative

Environmental assessments typically evaluate the option of not proceeding with the proposed project (a "No Action" Alternative). If the project did not take place, the potentially adverse impacts described in Chapter 4 would not occur. However, nor would the net positive benefits occur, such as increased revenue to the Government of Ghana and the indirect (although minimal) benefit to the businesses surrounding the port facilities in the Western Region that will be needed to support the project. This would also preclude further development and revenue for the area that could result if the drilling program reveals that the targeted hydrocarbon reservoirs are commercially viable. Based on the manageable potential adverse impacts and the potential benefits of the drilling program, the "No-Action" alternative is not considered viable.

4.2 Well Locations

The location of the well envelopes shown in Figure 3.2 has been selected based on initial review and interpretation of geophysical data. The location of specific well sites will be determined after further review of geophysical data. The evaluation of potential impacts presented later in this PER indicates that there are no significant environmental sensitivities within the Block, particularly given its distance from shore, with the exception of regional whale migrations. For this reason, it is not expected that alternative well locations would need to be considered for environmental or social impact considerations.

4.3 Type of Drilling Unit

The Maersk Venturer drillship has conducted deep-water drilling operations successfully since its construction in 2013 and has experienced safe performance. Maersk and its subcontractors will follow the same practices and procedures for mitigating potential impacts of the project regardless of the rig and drilling method used. However, given the depth of the water in the DWCTPW Block, using a jack-up drillship instead of a drillship such as the Viking would not be feasible. Given the water depth, only a DP-type vessel is technically acceptable.

4.4 Types of Drilling Fluids

There are three major types of drilling fluids:

- Water-based drilling fluids (WBDF),
- Synthetic-based fluids (NABF), and
- Oil-based fluids (OBF).

Seawater with water-based fluids will be used in initial hole sizes 36" and 26". For drilling deeper sections 17½" and 12 ¼", a non-aqueous-based fluid (NABF) – synthetic or oil-based fluid - is needed. In this case, EGL will use synthetic-based fluids due to their environmental benefits over oil-based fluids. Associated cuttings will be treated to levels consistent with good international industry practice before discharge.

4.5 Cuttings Disposal

There are numerous methods for the disposal of drill cuttings associated with drilling. The three main disposal options include:

- Offshore discharge after treatment (as discussed in Section 8.1.2)
- Ship to shore for onshore treatment
- Cuttings reinjection

Different approaches for the treatment and disposal of drill cuttings are applied in various countries depending on the type of drilling fluids used (i.e., water-, oil- or synthetic-based), environmental conditions (i.e., water depth, proximity to sensitive habitats, etc.) and regulatory regimes. In most countries, treatment and discharge of cuttings to the sea is the preferred alternative to shipping to shore, and reinjection is typically unfeasible for an exploration or appraisal well.

The offshore treatment and control of the discharge of cuttings to the sea is a viable and responsible approach to managing and minimizing air, water and solid waste discharges from offshore drilling operations.

Ship-to-shore transportation to onshore treatment processes adds consequential effects of additional transport effects and treatment effects.

The cuttings re-injection option will not be technically possible for the exploration well project.

Considering that the EGL project is at a distance greater than 95 km from shore, it is considered that offshore treatment and disposal at sea, within the guidelines of the EPA permit restrictions, is the recommended approach.

CHAPTER FIVE

Environmental and Social Baseline Information

- Physical Environment
- Biological Environment
- Socio-Economic Baseline Information

5.0 ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

This chapter provides a description of the environmental, social and heritage baselines against which the potential impacts of the Project have been assessed. The description covers the area in which the Project will take place as well as areas that may be directly or indirectly affected, as defined below.

Definition of Terms

The following terms have been used to describe different areas described in the environmental and social baseline.

- Contract Area refers to the broader DWT/CTP license area to which Eco Atlantic Ghana Limited and its partners hold exploration rights. The term is also used when describing baseline conditions at a regional level.
- Project Area refers to the area immediately surrounding the installed Project components, i.e., the Project footprint as well as marine transit routes to and from Takoradi Harbour, the helicopter flight paths from the Air Force base to the FPSO/MODU and the road transport routes between supply bases and the port facilities.
- Area of Influence refers to the area likely to be affected by the Project directly (i.e., from activities at project sites directly owned, operated or managed by the Operator), from unplanned but predictable developments caused by the Project, and indirectly (i.e., on biodiversity or on ecosystem services upon which affected communities' livelihoods depend). This includes cumulative impacts from the incremental impact on areas or resources used or directly impacted by the Project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

The following broad areas are covered under the general project environmental and social baseline information:

- Physical environment;
- Biological environment;
- Social environment;
- Oil and Gas Activities;
- Education;

5.1 Physical Environment

5.1.1 Geographic Location

The Western Region spans an area of 23,921 km^2, constituting approximately 10% of Ghana's total land surface. It is located in the south-western part of Ghana, bordered by Ivory Coast to the west, Central Region to the east, Ashanti and Brong-Ahafo Regions to the North, and to the south by 192km coastline of the Gulf of Guinea.

5.1.2 Climate and Meteorology

The general climate is governed by the latitudinal displacement of the Inter-Tropical Convergence Zone (ITCZ). Regional climactic conditions are influenced by two air masses: one over the Sahara Desert (tropical continental) and the other over the Atlantic Ocean (maritime). These two air masses meet at the Intertropical Convergence Zone (ITCZ) and the characteristics of weather and climate in the region are influenced by the seasonal movement of the ITCZ (see Figure 5.1). In general, two seasons are characteristic of the climate in the region, namely the dry and wet seasons. The occurrence of these seasons corresponds with periods when the tropical continental and maritime air masses, and their associated winds, influence the region (see Table 5.1). Climate variability is linked to changes in the movement and intensity of the ITCZ as well as variations in the timing and intensity of the West African Monsoon, which is influenced by the El Niño Southern Oscillation (ENSO). El Niño is connected to below-normal rainfall in West Africa (USAID 2017).

Table 5.1: Climate and Meteorology in the Western Region of Ghana

Variable	Details
Wet season	From April to July and again between September and November
Dry season	From July to August and December to March
Annual rainfall	From 1,100 mm to 2,100 mm
Annual percentage of rainy days	60%
Diurnal temperature range	26°C and 33°C
Annual variation in temperature ranges	2°C and 4°C

Source: USAID 2017

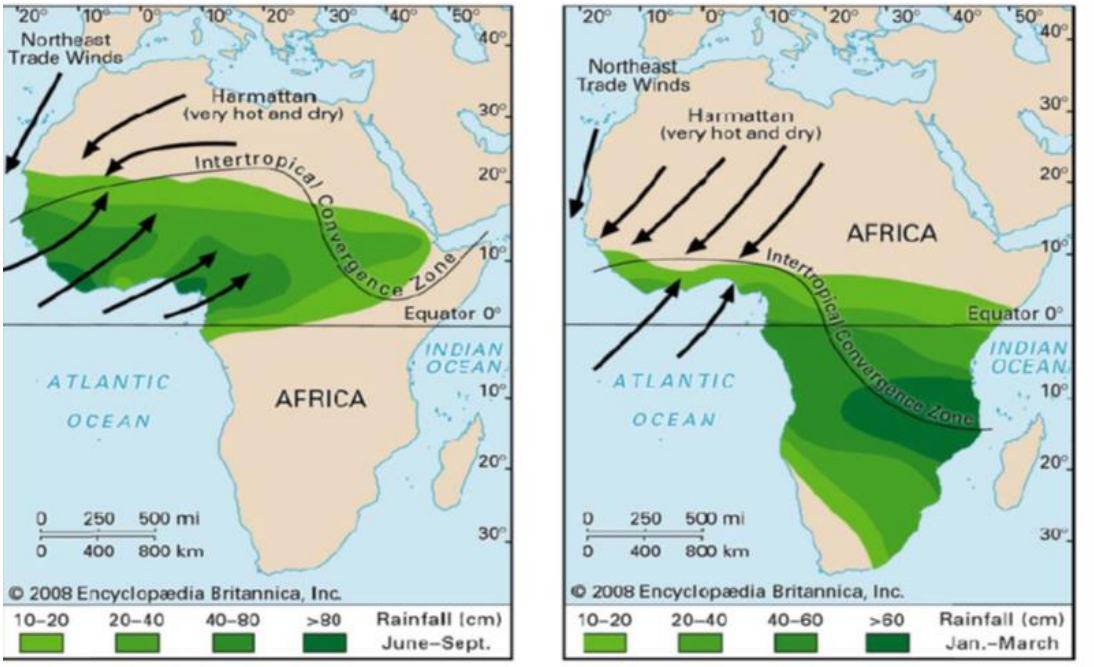


Figure 5.1: West Africa Monsoon

5.1.2.1 Rainfall Pattern

The major rainy season generally occurs from May to July (Figure 5.2). During this wet period, the direction of the humid air is northward. The minor dry season, which is usually dry and cool occurs between July and August. The minor wet season appears between September and November when the direction of the humid air is southward. Rainfall is usually between 1,100 and 2,100mm per year and represents 60 % of the total rainfall in the Western Region annually. The major dry and hot season occurs between December and March (See Table 5.1).

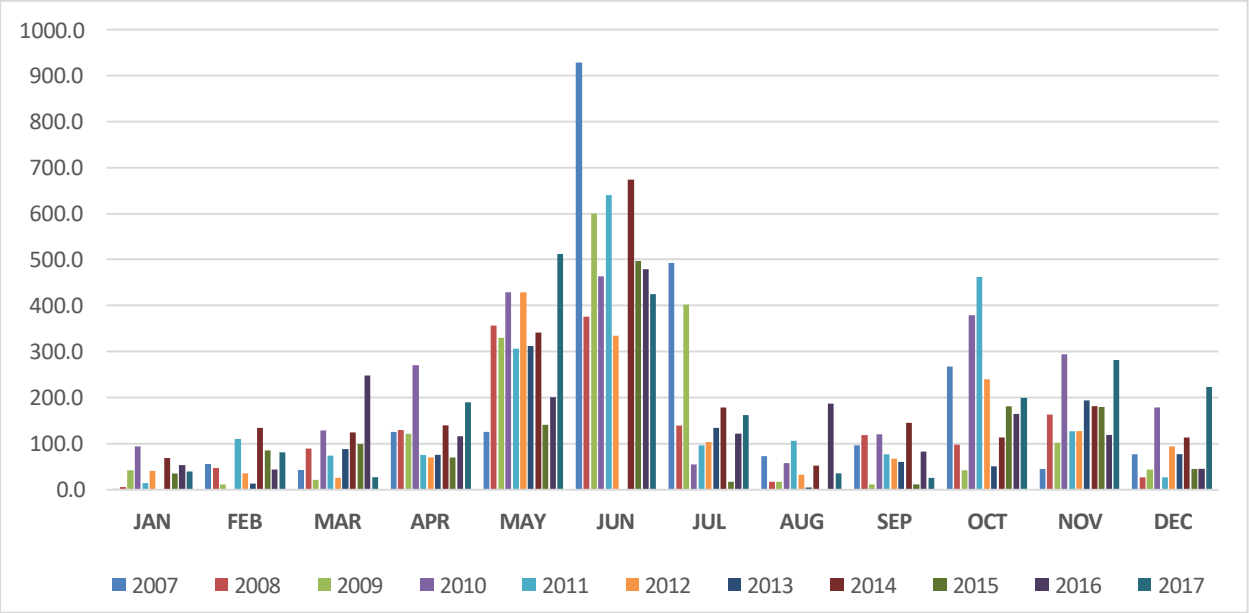


Figure 5.2: Monthly Rainfall Patterns for Axim (2007-2017)

Source: Ghana Meteorological Agency

5.1.2.2 Temperature Patterns

The average minimum and maximum temperature for the project area are about 24.1°C and 29.6°C respectively. Generally, temperature patterns are similar throughout the year (Figure 5.3 - 5.4). Monsoon trade winds blow for ten months a year from the southwest and south-south-west. They are generally weak (three to four metres per second), regular and characterized by a daily cycle. Their speed can increase during the boreal summer (four to six meters per second).

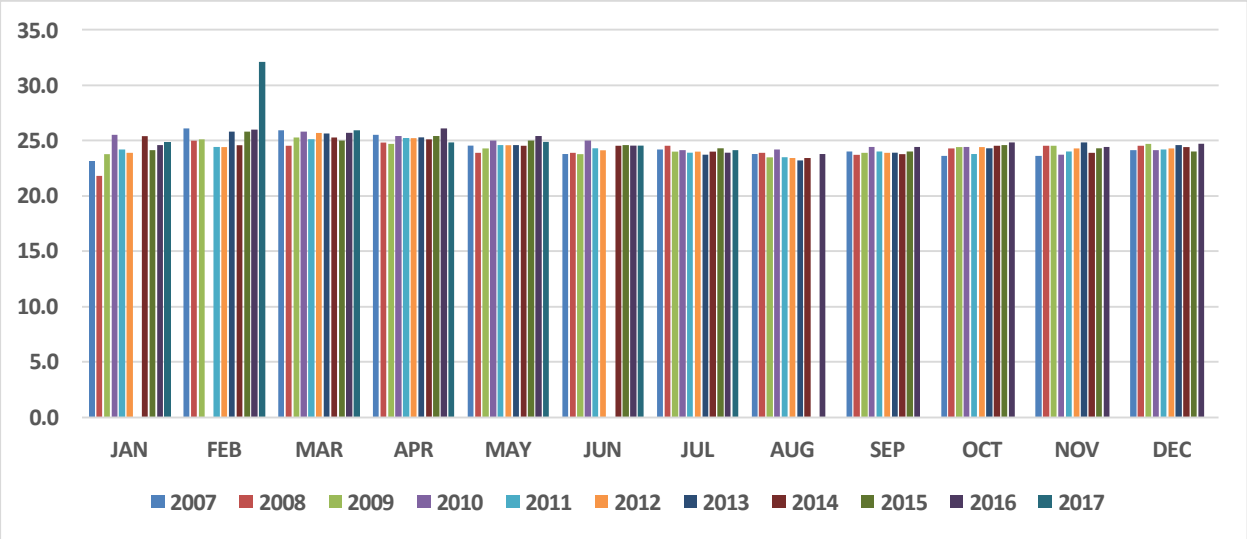


Figure 5.3: Minimum Temperature for Axim (2007-2017)

Source: Ghana Meteorological Agency

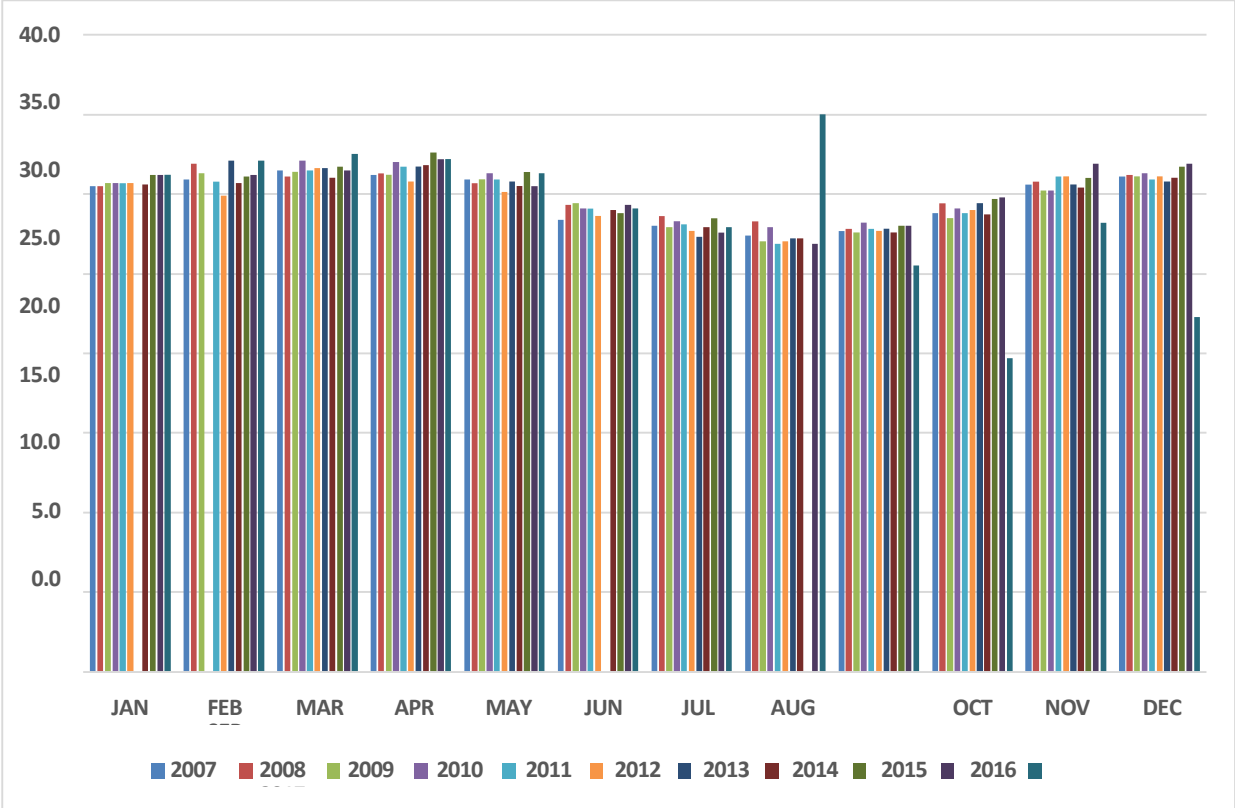


Figure 5.4: Maximum Temperature for Axim (2007-2017)

Source: Ghana Meteorological Agency

5.1.3 Hydrography and Oceanography

The oceanography of the Gulf of Guinea comprises the principal water types of the South Atlantic but is largely influenced by the meteorological and oceanographic processes of the South and North Atlantic Oceans, principally oceanic gyral currents (Fontaine *et al* 1999, Merle and Arnault 1985). The continental shelf water off the Ghana coast is situated in the western Gulf of Guinea subsystem of the Guinea Current Large Marine Ecosystem. The current regime is dominated by two current systems: the Guinean Current (GC) flowing eastward between 0 and 30m depth, average velocity of 0.26m/s and maximum velocity of 1.03m/s; and the Ivorian Undercurrent (IU) running westward at subsurface layer with an average velocity of 0.21m/s (Figure 5.5). The volumetric current flows are 100,000 and 200,000m^3/s for the GC and the IU respectively. The mean flow of the GC reaches its maximum in April and May, and the IU reaches a maximum in June and July and a minimum from January to March. Both are permanent current systems inducing a powerful coastal drift. However, their surface circulation is spatially and temporally variable (Demarcq *et al*., 2003).

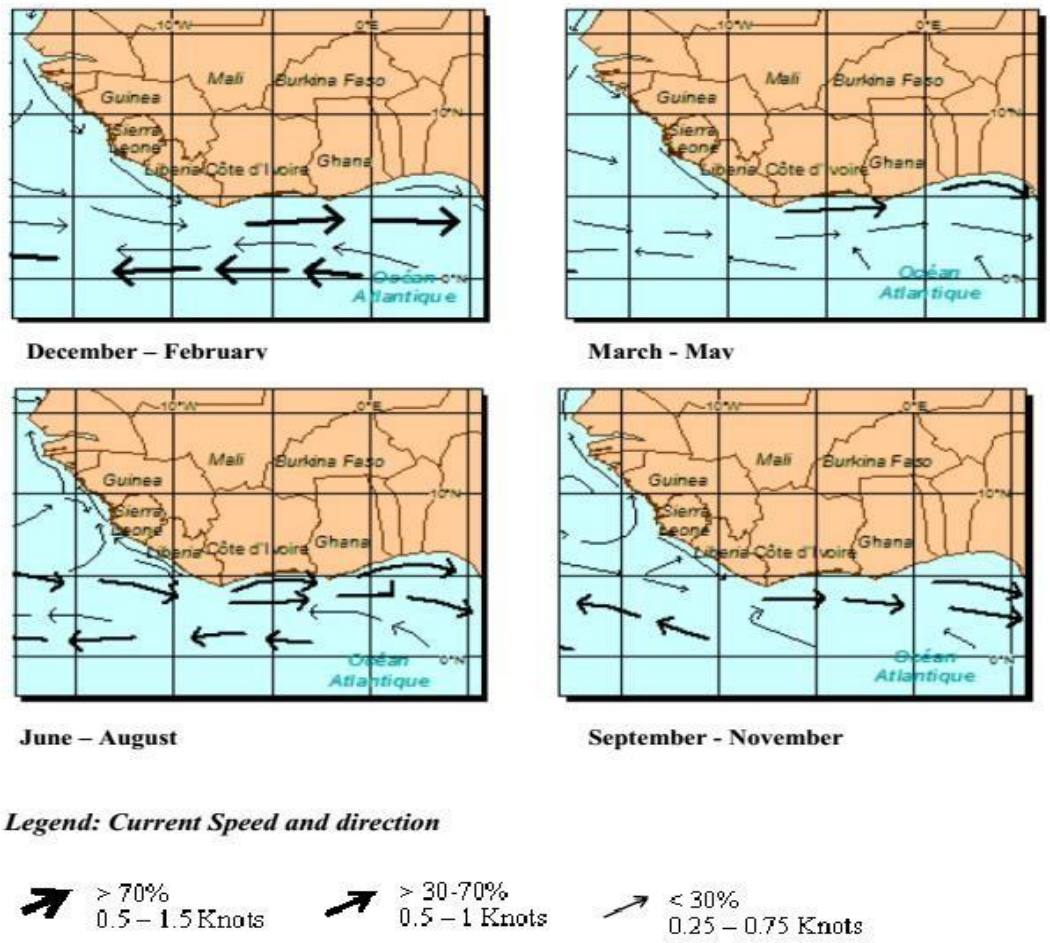


Figure 5.5: Oceanic Currents off the Coast of Ghana

Source: Hydrographer of the Navy 1982.

5.1.3.1 Stratification of Water Masses

Water masses offshore the Ghanaian coast consist of five principal layers (Giresse & Wiewióra, 2001), The topmost layer is the Tropical Surface Water (TSW), warm and of variable salinity which extends down to a maximum of about 45m depending on the seasonal position of the thermocline. Below the thermocline (which varies from 5 to 35m) occurs the South Atlantic Central Water (SACW, cool and high salinity) down to a depth of about 700m. Below this are consecutive, three cold layers, namely the Antarctic Deep Water (ADW, 700-1,500m), the North Atlantic Deep Water (NADW, 1,500-3,500m) and the Antarctic Bottom Water (ABW, 3,500-3,800). Sea surface temperature typically varies between 27 and 29°C, although strong seasonal cooling occurs during the season related to coastal upwelling processes.

5.1.3.2 Sea Temperature

Sea surface temperature (SST) variation is minimal throughout the year (Figure 5.6), with the lowest temperatures of 25°C being recorded in June and rising to a peak of between 28 and 29°C from January to April (Hydrographer of the Navy, 2006; WMO, 2012).

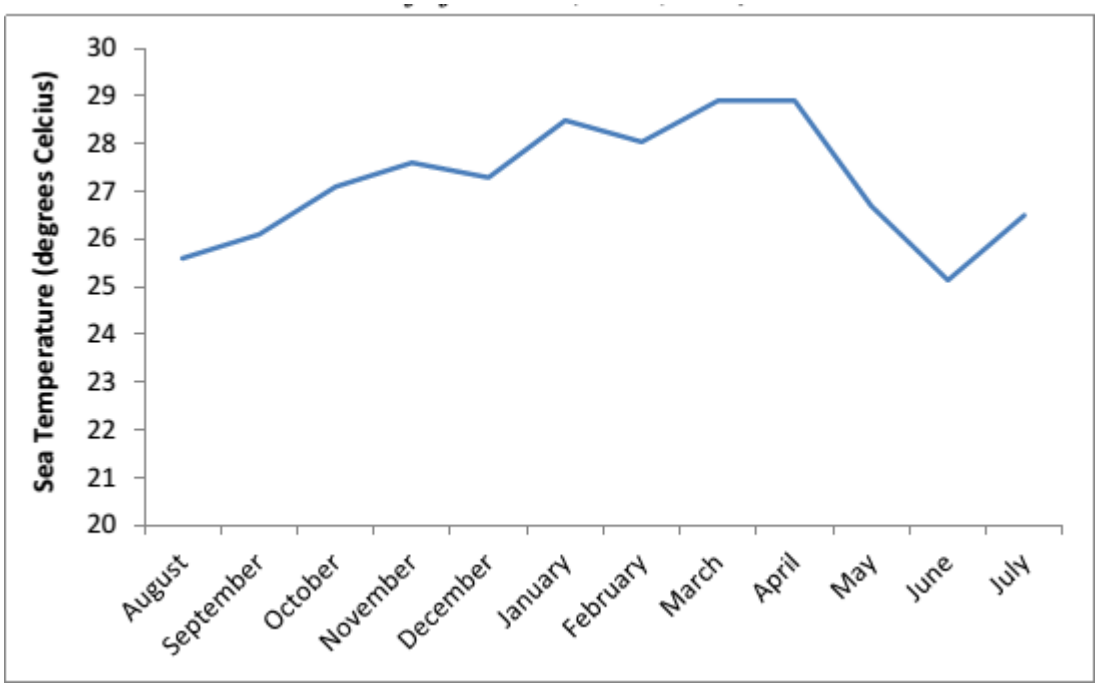


Figure 5.6: Average Sea Water Temperature 20m below the Surface

Source: WMO, 2012

Argo floats (semi-autonomous measurement devices) move through the water column taking measurements of sea temperature and salinity globally and relay the data back to satellites. Several of these Argo floats have been deployed in the Gulf of Guinea and have found a thermal water column structure typical of an oceanic water column where water temperature decreases with increasing depth. Water depths beyond 1,000m generally

decrease to less than 5°C. There is little variation in temperature throughout the year.

5.1.3.3 Upwelling

There are two seasonal coastal upwellings each year, one major and one minor, with differing durations and intensities. Upwelling results in decreased sea surface temperature (SST) and dissolved oxygen, and increased surface salinity (Mensah & Koranteng, 1988). The major upwelling occurs between June and September when SST falls below 25◦C. The minor upwelling normally lasts for about a month (occurring anytime between December and March). In between are warm seasons during which SST is relatively high and a strong thermocline is formed in continental shelf waters. The upwelling is known to have considerable influence on local and sub-regional fisheries.

The upwelling influences the migratory patterns of pelagic fishes and is linked with the marine fish catch in Ghana (Armah and Amlalo, 1998). The position and dynamics of the upwelling are variable. The thermocline moves upward due to the combined action of winds and currents. The zonal wind along the Gulf of Guinea shoreline intensifies, giving rise to a Kelvin wave trapped at the Equator. This is reflected by the eastern border of the basin as secondary Rosby and Kelvin waves, which induce upward movement of the thermocline. Local wind speed increases during the Northern Hemisphere summer, with a slight rotation eastward (more parallel to the coast). These conditions, with simultaneous increasing GC surface speed, result in upwelling. Coastal morphology and dynamic processes locally enhance this phenomenon (known as the cape effect). Inter-annual variability of these events is high, and therefore the associated nutrient enrichment varies considerably (Arfi *et al.,1993*). The region is part of a large coastal ecosystem, generally open to the Atlantic Ocean, but is driven by local forces. An annual cycle of ecological parameters and relevant aspects for offshore waters can therefore be defined. Upwelling of deep water occurs at the beginning of each year during the short cold Harmattan period which coincides with the minor upwelling event, continuing between January and May. A thermocline becomes well-established in coastal waters from mid-May to June and may extend to offshore surface waters. The major upwelling event from July to September brings subtropical waters to the surface, which induces a sharp temperature decrease and surface salinity increase. A thermocline again becomes well-defined from October to December. The period is comparable to the sequence in May and June, but the extension offshore is less likely.

Turbidity is higher from June to October (average Secchi disk value 9m) and lower from November to May (Secchi disk value 18m). During the period of high turbidity (coinciding with the major upwelling), the euphotic layer is between 20 and 25m and nutrient enrichment (nitrates and phosphates) occurs. During the period of low turbidity, the euphotic layer is deeper (between 35 and 40m). From mid-December to mid-January transient incursion of nutrient-rich water above 30m water depth is observed. Nutrient levels are generally stable deeper than 50m with no obvious seasonal cycle, but a cycle is clear between 20 and 50m, with a marked concentration increase from mid-June to mid-October. This increase is also significant in January at 50m depths. Typically, therefore, upwelling causes higher nutrient concentrations in the euphotic layer. In coastal waters, ammonia shows an opposite pattern to nitrates and phosphates reflecting active mineralization processes in the water column occurring simultaneously with the input of continental organic matter.

5.1.3.4 Tides

The tides in the Gulf of Guinea and specifically on the coasts of Ghana are regular and semi-diurnal with two almost equal high tides and two low tides each day (Noble-Denton 2008). The tidal amplitude ranges from 0.4 to 1.5m. It is low in January and from July to September, and higher between May and June and from October to November. The average range varies along the coast, as shown in Table 5.2 for the main cities. The average range of Neap and Spring tides increases from west to east. Tidal currents are low and have an insignificant influence on coastal processes except within tidal inlets. Other possible sources of intermittent increases in local water levels include line squalls and the transfer of energy from internal to surface tides. These processes could result in additional increases of about 0.30m.

Table 5.2: Tidal Range for Coast of Ghana

Location	Tidal Range (m)		
	Neap	Mean	Spring
Takoradi	0.58	0.9	1.22
Accra	0.62	0.94	1.26
Tema	0.64	0.96	1.28
Aflao	0.68	1.00	1.32

5.1.3.5 Bathymetry and Topography

The DWCTPW concession is located on the continental shelf offshore Ghana in water depths ranging between 1,800 to 2,500m. The continental shelf at about 200 m water depth off the coast of the Western Region of Ghana is at its narrowest off Cape St Paul in the east (20 km wide) and at its widest between Takoradi and Cape Coast in the west (90 km). The area of the continental shelf is approximately 23,700 km^2, with a steep drop-off notable after the 75m depth contour (Koranteng, *1998*). The continental slope is steep, and the depths increase sharply from approximately 100 m on the shelf and drop to approximately 1,600 m at the deepest part of the slope.

5.1.3.6 Sediments

Down to a depth of approximately 30 m off the coast, the sediment is mainly soft and muddy after which it changes into mixed substrate, and is generally rocky in a carbonated, muddy fine sand matrix between 75 m and 120 m, although the western areas of coastline remain relatively soft down to depths of more than 100 m (AECOM, 2014).

Sediment samples analysed from the EBS (Gardline 2014) showed that sediments across the Project Area were found to be generally similar. These sediments were determined to be poorly to very poorly sorted and either fine or medium silt. Total Organic Matter (TOM) ranged between 9.5% and 14.2% and Total Organic Carbon (TOC) ranged between 1.48% and 2.36%. The Total Petroleum Hydrocarbons (TPH) concentrations ranged from 5.9 $\mu g g^{-1}$ to 18.4 $\mu g g^{-1}$.

Fugro (2021) undertook an EBS to obtain further physical and chemical data from the Pecan field. The survey was undertaken between 22 May and 28 June 2021. In total 18 stations were sampled for geotechnical evaluation and from 4 of these stations, samples were also collected for physical and chemical analysis.

The following analysis was undertaken on the sediment samples.

- Sediment particle size distribution
- Sediment Total Organic Matter (TOM) and Total Organic Carbon (TOC)

- Total hydrocarbon content (THC)
- 2 to 6 ring aromatic hydrocarbons (US EPA 16 priority PAHs);
- Suite of metals (Aluminium, arsenic, barium, cadmium, chromium, copper, iron, mercury, lithium, nickel, lead, vanadium and zinc).

The results of the analysis showed that the sediment within the survey area was similar to the wider regional area being dominated by fine silts (>90%), with a smaller proportion of sand. The low variability observed in the sand and fines fractions suggests the presence of a relatively homogenous sediment type throughout the survey area. The sediment characteristics were broadly comparable to previous surveys at the Almond and Pecan fields in 2013 (Gardline, 2014) suggesting no obvious temporal changes in the physical sediment characteristics. Low variability was observed in the total organic matter (TOM) and total organic carbon (TOC) content, with no spatial patterns observed.

The total hydrocarbon content (THC) values displayed low variability between stations and were broadly comparable to the previous surveys in the area. The PAH concentrations from sediment samples were similar and typical of background levels, as indicated in the Gardline (2014) survey. The majority of PAHs were interpreted as coming from pyrolytic sources. Such sources are often associated with fuel emissions, i.e., from vessel engines.

The variability in metals concentrations was low for the majority of analytes and concentrations were generally comparable to the 2014 survey, suggesting these were typical of the wider area.

The data from the 2014 and 2021 surveys indicate a stable environment, as would be expected for deep water locations. The distribution and diversity of benthic species associated with these sedimentary habitats are therefore expected to be similar to those identified from the previous 2014 survey.

5.1.4 Coastal Zone

The Ghanaian coast can be divided into three areas with definitive characteristics (*COWI, 2004*):

- West of Cape Three Points: the coastline comprises sheltered, gently sloping, wide beaches, backed by coastal lagoons. The wave height is generally low in this area.
- Between Cape Three Points and Tema: the coast consists of rock headlands and sandbars (or spits) enclosing coastal lagoons, embayed coast, subject to medium to high wave energy. The wave heights often exceed 1m. The south-westerly prevailing winds cause an oblique wave approach to the shoreline, which generates an eastward littoral sediment transport.
- East of Tema: shoreline is sandy and characterized by the eroding Volta delta. Wave and sediment dynamics are similar to those between Cape Three Points and Tema.

A series of coastal sensitivity maps have been drawn up based on information provided in the Ghana Coastal Sensitivity Atlas (Armah *et al* 2004). These are presented as follows.

- Figure 5.7: International Bird Areas.
- Figure 5.8: Sensitive bird habitats.
- Figure 5.9: Turtle nesting beaches.

The stretch of coastline west of Cape Three Points consists mainly of sandy beaches (Esiama Beach), rocky beaches (Axim and Cape Three Points), coastal lagoons (Domini Lagoon, Amansuri Lagoon, Ehnuli Lagoon) and estuarine wetlands (Ankobra estuary). The various sensitivities of each are summarised below.

Species diversity on sandy beaches is typically low, especially on beaches with coarse sand and steep slopes. On such beaches only one species is normally encountered, the ghost crab (*Ocypoda cursa*) which is active when the tide is low and retires to its burrow on the beach when the tide rises. However, sandy beaches serve as important nesting sites for sea turtles and in some cases (such as Esiama Beach) are important sites for coastal bird species.

- Rocky shores occur as outcrops alternating with sandy bays. These shores support a wide variety of species of macroalgae, barnacles and snails. Ecologically, algae mats on rocky shores serve as important micro-habitats for epifauna (crustaceans, macro-invertebrates) and fish. In the Western Region, rocky shores are restricted to the area between Axim and Tema, supporting a wide range of organisms in the intertidal zone.

- The coastal lagoon habitats are particularly important ecosystems. They support mangrove habitats and significant populations of fish, shrimps, crabs and mollusc species; in addition, they are important nursery sites for many fish species. Coastal lagoon habitats also support significant numbers of waterfowl species. The amount of annual rainfall has an important effect on the nature of the coastal lagoons. Westwards from Takoradi, where the rainfall is higher, all the coastal lagoons have a permanent opening to the sea. East of Takoradi, only four rivers the Pra, Kakum, Densu, and the Volta, have a sufficient volume of water at all seasons to maintain a permanent outflow from the coastal lagoons at their mouths. Lagoons of importance in the Western Region are Tano/Aby/Ehy Lagoon (410

km^2) and Amanzule Lagoon (2.5 km^2) near Benyin both in Jomoro District. The latter has been proposed for designation as a Ramsar Site. There are also a series of freshwater wetlands in the Western Region (Finlayson et al, 2000).

- Estuaries are present along the Ghanaian coastline where large rivers enter the sea. The main rivers in the west of Ghana are the Tano, Ankobra and Pra rivers. The estuary and wetlands of Ankobra estuary, in the west of Ghana, support over 1,000 km^2 of marshland habitat. These areas are generally exposed when the tide is out and are seasonally inundated during the rainy season. They support stands of mangroves and other species typical of swamp forests and are an important nursery habitat for fish and feeding areas for waterfowl. Red mangroves (*Rhizophora harrisonii*, *Rhizophora mangle* and *Rhizophora racemosa*) with their distinct prop roots are common in these estuarine wetlands where there is a mixing of fresh and saline waters (USAID, 2010).

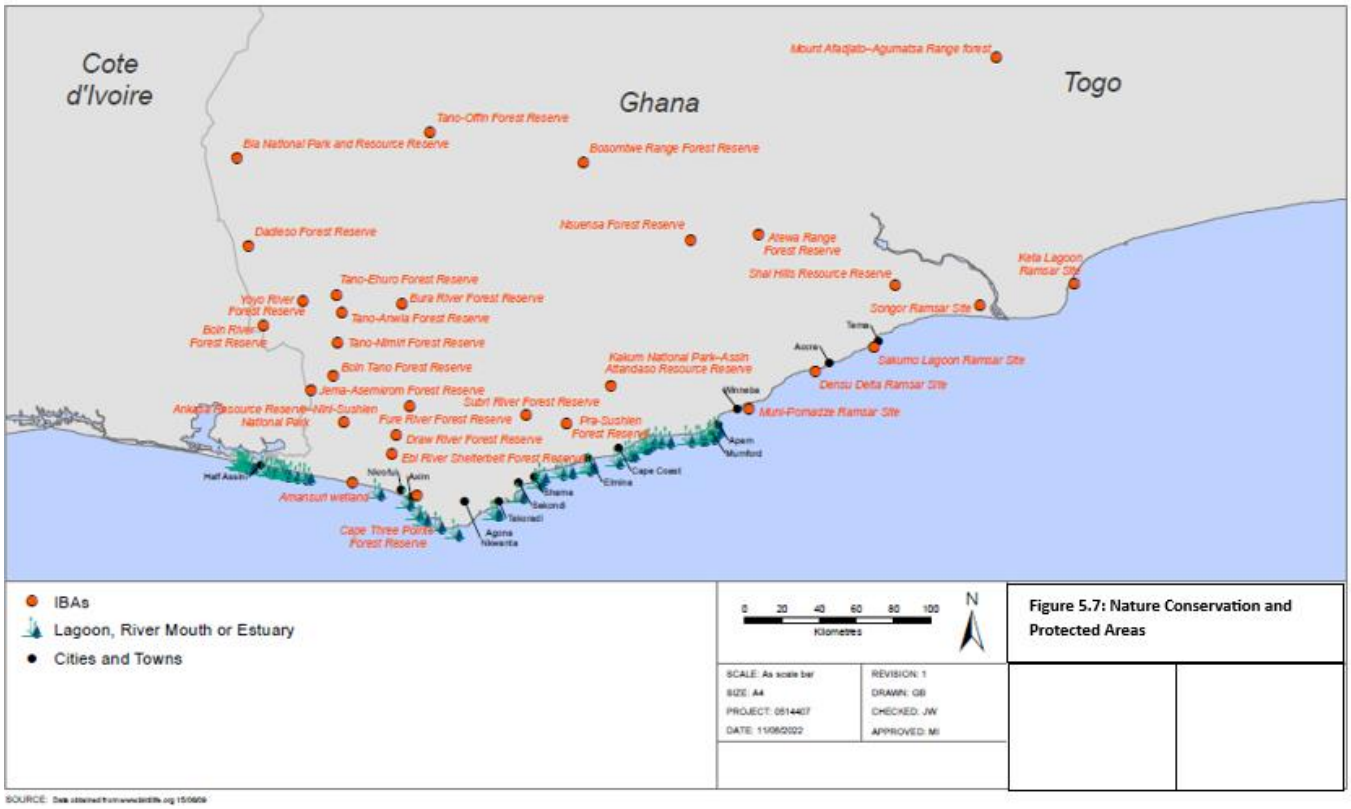


Figure 5.7: Nature Conservation and Protected Areas

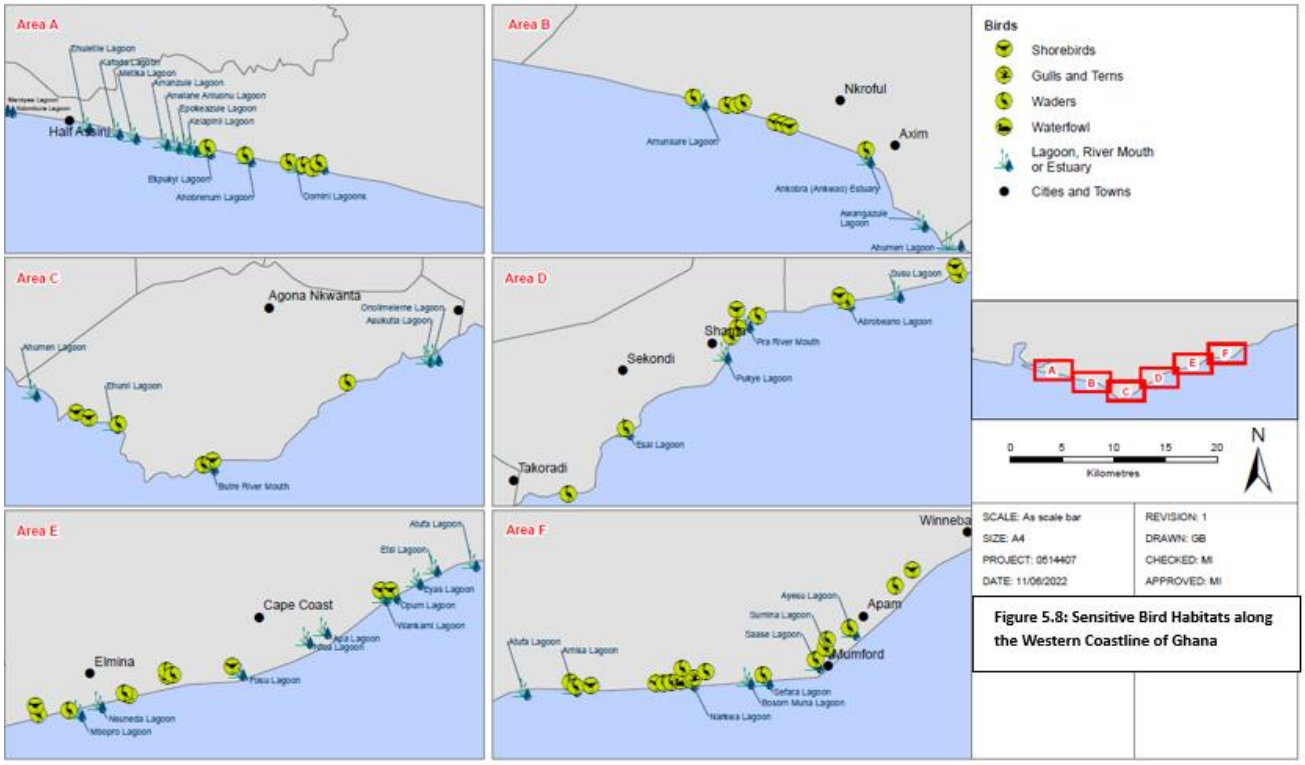


Figure 5.8: Sensitive Bird Habitats along the Western Coastline of Ghana

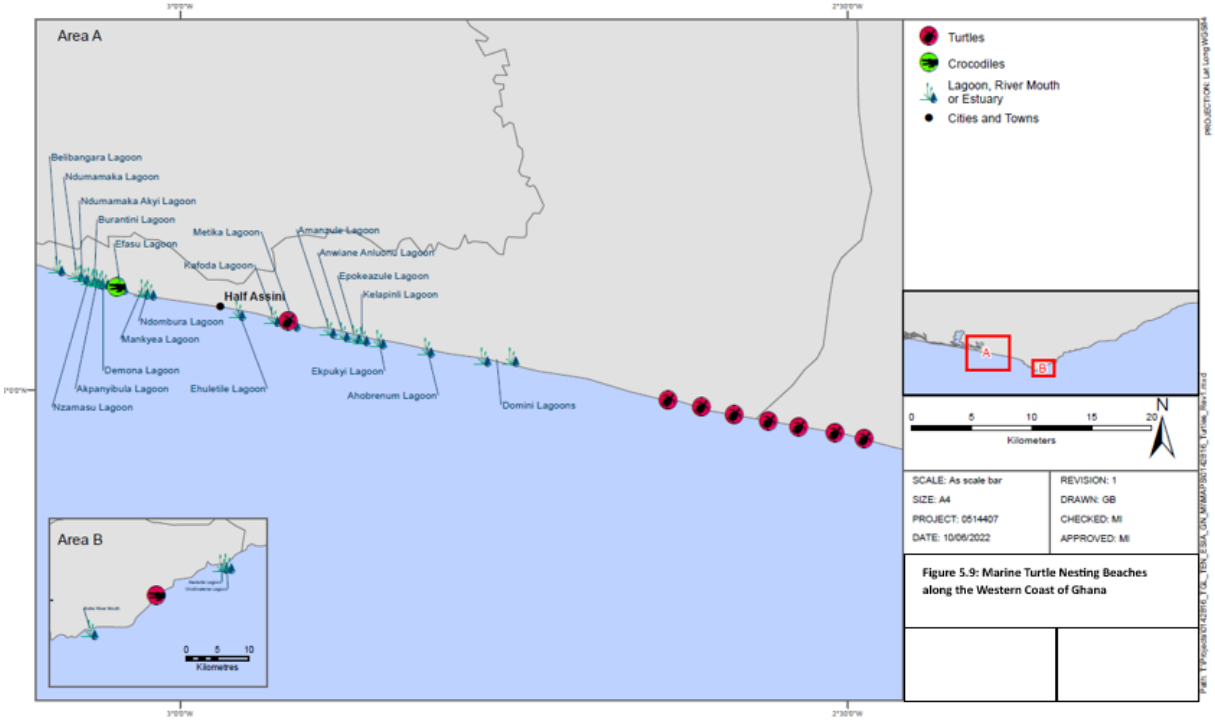


Figure 5.9: Marine Turtle Nesting Beaches along the Western Coast of Ghana

5.2 Biological Environment

5.2.1 Plankton

5.2.1.1 Phytoplankton

The plankton, including phytoplankton and zooplankton, constitutes the basis of trophic chains in marine ecosystems. Phytoplankton organisms are microscopic and range between 30 µm and 60 µm in size, and their abundance increases with increased nutrient availability because of an upwelling event.

The composition and abundance of plankton are variable throughout the year and depend mainly on water circulation patterns, light, temperature, salinity and nutrients (Nybakken 1992 and Odum 1971). However, the main limiting factor influencing the development of phytoplankton is the presence of nutrients, especially nitrate and phosphate (Nybakken 1992). On the coasts of Ghana, it is known that phytoplankton abundance increases during upwelling events when nutrient availability increases.

The EBS found the abundance of phytoplankton in the Contract Area to be low during the survey period which means that there was limited evidence of any upwelling event during the survey (December and January) (Gardline 2014). Previous studies have determined primary production in the Gulf of Guinea to be about 4,305 to 5,956 mg Cm^{-3} per day as seen in Figure 5.10 (Sea Around Us Project 2008).

Green algae blooms of non-toxic marine green algae (*Enteromorpha flexuosa*) occur seasonally and are expected to be a result of over-fertilisation of soils alongside rivers draining into the sea, as well as the outflow of untreated sewage into rivers and the sea (CRC-URI, 2010). These blooms usually appear between August and October and may remain in the inshore region for several months or even a year, with impacts on local fishing activities.

In recent years, Ghana has experienced an unprecedented increase in the presence of seaweed known as *Sargassum* (a genus of free-floating algae). The *Sargassum* has been particularly present in the Western Region where it has affected the livelihoods of fishers and other community members (Ghana EPA 2014b). The increase in *Sargassum* along Ghana's shores is part of a regional and global trend. The reason for the migration of *Sargassum* from the Gulf of Mexico may be related to climate change, changes in Atlantic current patterns and changes in the productivity of marine habitat on a regional scale.

5.2.1.2 Zooplankton

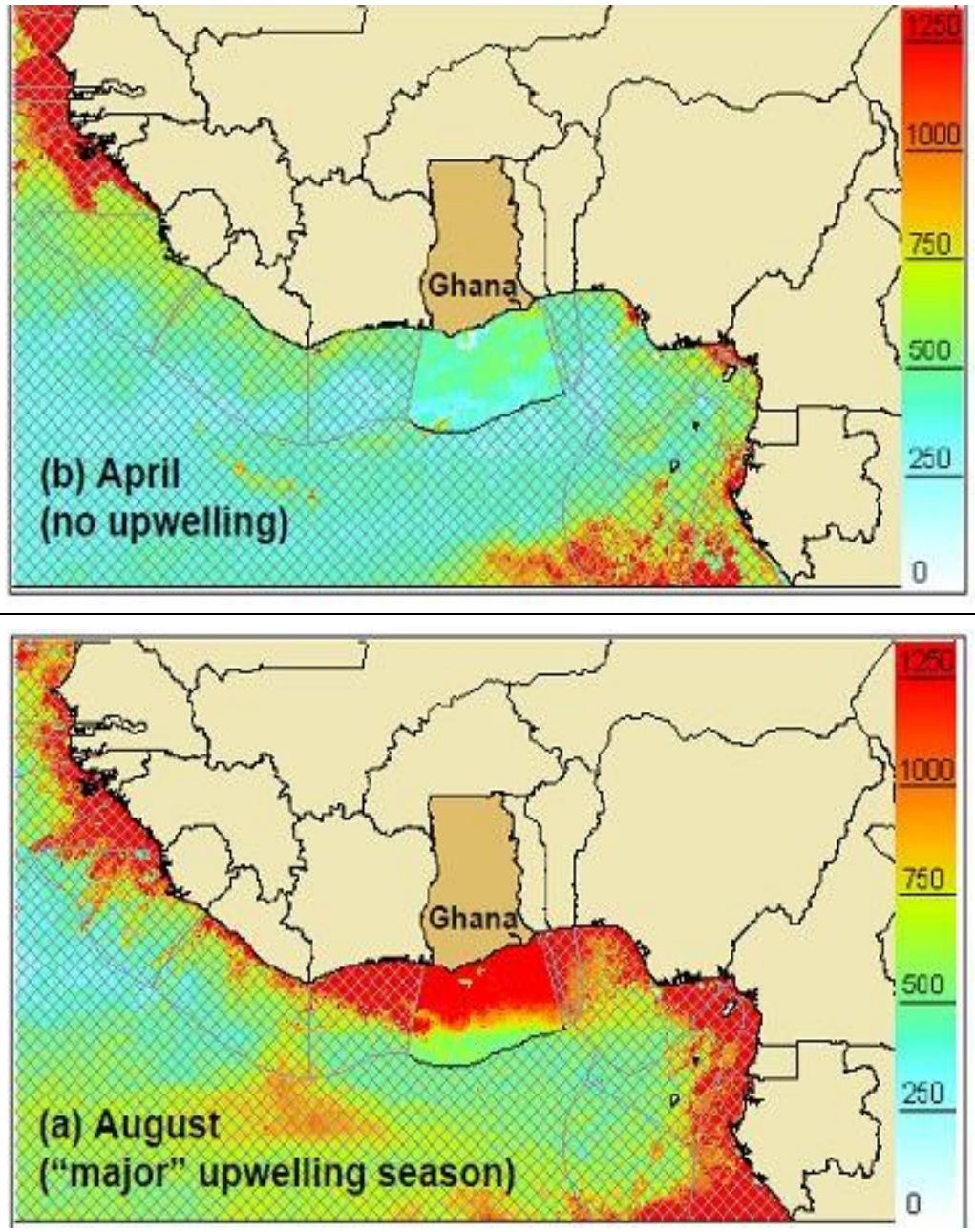
Zooplankton organisms are heterotrophic and rely on phytoplankton as a food source, becoming the first consumer in the food chain. Zooplankton includes a range of organism sizes including small protozoans and large metazoans. It includes holoplanktonic organisms, whose complete life cycle lies within the plankton, as well as meroplanktonic organisms that spend only part of their lives in the plankton (e.g., fish eggs).

Offshore Ghana zooplankton assemblages are generally dominated by copepods, followed by Ostracods[1], Appendicularians[2] and Chaetognaths[3].

Maximum zooplankton abundance usually takes place during the major upwelling event (June to October) and to a minor extent during the minor upwelling event (December to February) following the increase in primary productivity by phytoplankton. The EBS conducted in the Contract Area found high numbers of zooplankton in

[1] Ostracoda is a class of the Crustacea, sometimes known as the seed shrimp because of their appearance.
[2] Larvaceans (Class Appendicularia) are solitary, free-swimming underwater saclike filter feeders found throughout the world's oceans.
[3] Chaetognatha is a phylum of predatory marine worms that are a major component of plankton worldwide.

the top 200 m of the water column. The zooplankton community was dominated by copepods with the predominant species the cyclopoid copepod *Oncaea* (Gardline 2014).



Source: Sea Around Us Project 2008.

Figure 5.10: Primary Productivity (mg Cm^{-3} per day) Offshore Ghana during August and April

5.2.2 Benthic Invertebrates

Benthic fauna forms an important part of the marine ecosystem, providing a food source for other invertebrates and fish as well as cycling nutrients and materials between the water column and underlying sediments. Benthic fauna are relatively long-lived and sedentary and they exhibit different tolerances to stress, making them useful indicators of environmental conditions. The macrobenthos of offshore Ghana has not been extensively studied, particularly in deeper waters.

The Gardline (2014) EBS found that the macrofaunal community in the Contract Area has a low abundance but proportionally high diversity. Many of the sites exhibited a high level of bioturbation indicating burying fauna. Polychaetes, arthropods, crustaceans, and molluscs dominated species composition and abundance, with relatively few echinoderms or other taxa present in the samples (Figure 5.11).

The results indicate an absence of contamination, under which circumstances only a few tolerant and highly abundant taxa might be expected to be present. No potentially sensitive or threatened species were observed during the survey (Gardline 2014).

Fix: 282 E: 495808 N: 462264 Depth: 2546

Fix282: Silt with occasional shell fragments, Echinodermata (Scotoplanes sp.)

Fix: 286 E: 495801 N: 462271 Depth: 2546

Fix286: Silt with occasional shell fragments Mollusca (Scaphopoda), Bioturbation

Fix: 343 E:494285 N:462266 Depth: 2575

Box Core: Fine silt with clay, no visible live fauna

Fix: 343 E:494285 N:462266 Retention: MFA

Sieve: Sand, shell fragments and small clay aggregates Fauna, no visible live fauna

Source: Gardline (2014).

Figure 5.11: Sampling and Seabed Photograph from Pecan-A

5.2.3 Corals

Corals have very restricted ranges due to their requirements for specific thermal regimes, salinities, water depths, sedimentation, and other physical and chemical characteristics. True coral reefs do not occur along the West African coast or in the vicinity of the Gulf of Guinea archipelagos, although mature coral communities are found at some discrete locations such as the oceanic islands and rocky mainland coasts; Cape Verde Islands, Gulf of Guinea Islands, Ghana, Gabon and Cameroon (Wells and Bleakley 2003). Deepwater corals, dominated by the cold-water coral *Lophelia pertusa*, but also potentially including other cold-water corals (*Madrepora oculata*) have been recorded on the West African coast (Rogers, 2004).

During the R/V Dr Fridtjof Nansen survey in 2013 of the DWT Block, north-west of the TEN Project Area, a deepwater area offshore Ghana, a zone of coral was identified at a depth of approximately 500 m (IMR, 2010 and 2012). No corals were observed in the 2014 Gardline EBS (2014) and in the detailed seabed mapping by Fugro in 2021, which is to be expected in deep water offshore fine sediment environments.

5.2.4 Molluscs and Crustaceans

A variety of molluscs and crustaceans are known to be present within the Deep Water Tano (DWT) and West Cape Three Points (WCTP) blocks (ERM 2009). These mostly occupy the closer-to-shore, shallower waters and are not found in the water depths at the Pecan field, however, are described here due to their importance to coastal fisheries. These include the common cuttlefish, pink cuttlefish (*Sepia orbignyana*), common squid (*Loligo vulgaris*), common octopus (*Octopus vulgaris*) and the royal spiny lobster (*Panulirus regius*), deep-sea rose shrimp (*Parapenaeus longirostris*) and other shrimps (mainly southern pink shrimp *Penaeus notialis*, caramote prawn *Penaeus kerathurus* and Guinea shrimp *Parapenaeopsis atlantica*).

Further details of these key species are provided below, principally from the online FAO Marine Resource Fact Sheets on each species, unless listed otherwise. The cuttlefish species, including the common cuttlefish and the pink cuttlefish, are both caught in Ghanaian waters and are both eastern Atlantic species. However, the latter is restricted to a distribution from 17 °S to 55 °N within the Eastern Atlantic, whereas the distribution of common cuttlefish is more widespread, from the Baltic Sea and the North Sea to South Africa. Prey items consist of small molluscs, crabs, shrimps, other cuttlefish and juvenile demersal fishes. Predators of common cuttlefish include sharks, seabreams (Sparidae) and other demersal fish and cuttlefish.

The common cuttlefish is a demersal, shallow coast waters species occurring predominantly on sandy to muddy bottoms from the coastline to about 200 m depth, but most abundant in the upper 100 m. Larger individuals are encountered in the deeper part of the range. Seasonal migrations (mainly vertical) have been shown to occur in all stocks. Spawning occurs in shallow waters, throughout the year, with peaks at water temperatures from 13 to 15°C off Senegal and on the Sahara Banks in the eastern Atlantic off Morocco, between January and April (primarily large adults); there is a second minor spawning peak of medium and small-sized individuals in late summer and early autumn.

The pink cuttlefish is a free-swimming species occurring over muddy and detritus-rich continental shelves and slope areas between 50 and 450 m in depth but is most abundant between 80 and 150 m. No onshore spawning migrations have been reported. Spawning occurs from early June to November.

The common squid lives between depths of approximately 0 to 500 m but is most abundant between the 20 to 250 m depth. It is known to migrate vertically and horizontally in response to changes in environmental conditions. The stock

near Ghana overwinters in deeper offshore waters and migrates onshore for spawning with juveniles appearing in February and March and between July and September.

The common octopus occurs in depths from 0 to 200 m and is inactive in waters of 7°C and colder. It is known to undertake limited seasonal migrations, usually overwintering in deeper waters and occurring in shallower waters during warmer summer months. There are two main spawning events each year, the first around May/June and the second, more important, in September.

The deep-sea rose shrimp is found on the continental shelf and upper slope, between 50 and 400 m depth over sandy seabed. The size of individuals increases with depth. It is found from Portugal to Angola in the east, and from Massachusetts, USA, to French Guiana in the west. It spawns throughout the year, with peaks in July and December. Eggs are demersal and the larvae are planktonic. Juveniles are concentrated between depths of 50 and 70 m, where recruitment into the adult population takes place.

The other shrimp species, southern pink shrimp, caramote prawn and Guinea shrimp, constitute the majority of the shrimp catch in Ghanaian waters. They are generally associated with sandy and muddy bottoms on the continental shelf, southern pink shrimp to a depth of 100 m, caramote prawn to 75 m, and Guinea shrimp to 60 m. Each species is found throughout the west coast of Africa. The biology of these species, in comparison to the rose prawn, is less well understood and little is known of their spawning grounds or seasons. The royal spiny lobster species inhabits shallow water down to depths of 40 m but is mostly found between 5 and 15 m. Although it inhabits a variety of habitats, it appears to prefer rocky bottoms (Holthuis, 1991).

5.2.5 Fish Species

The fish species found in Ghanaian waters can be divided into four main groups:

- Small pelagic species;
- Large pelagic species (tuna and billfish);
- Demersal (bottom-dwelling) species; and
- Deep-sea species.

Most of the fish species discussed below have spawning grounds offshore Ghana and spawning of different species takes place throughout the year, typically with a peak from April to November which will coincide with the proposed drilling period.

5.2.5.1 Small Pelagic Species

The pelagic fish are those that live in the water column and consist of species exploited commercially. The distribution and quantity of each population largely depend on hydrological conditions, with each species distributed according to the optimum temperature and salinity required for growth and reproduction.

Most of the fish species discussed below have spawning grounds offshore Ghana and spawning of different species takes place throughout the year, typically with a peak from April to November. The pelagic fish assemblage consists of a number of species that are exploited commercially but are also important members of the pelagic ecosystem, providing food for some large predators, particularly large pelagic fish such as tuna, billfish and sharks. The most important pelagic fish species found in the coastal and offshore waters of Ghana are:

- Round sardinella (*Sardinella aurita)*;
- Flat sardinella (*S. maderensis)*;
- European anchovy (*Engraulis encrasicolus)*; and
- Chub mackerel (*Scomber japonicus*).

These species are important commercially as they represent approximately 80 percent of the total catch landed in the country (approximately 200,000 tonnes per annum). In terms of biomass, acoustic surveys have shown that the two sardinella species and the European anchovy represent almost 60 percent of the total biomass in Ghanaian waters (*FAO, 2010*). Other pelagic species found in Ghanaian water which are commercially important to local fisheries include:

- Horse mackerel (*Trachurus* sp.);
- Little tunny (Euthynnus alletteratus);
- Bonga shad (Ethmalosa fimbriata);
- African moonfish (*Selene dorsalis*);
- West African Ilisha (*Ilisha africana*);
- Largehead hairtail (*Triciurus lepturus*);
- Crevalle jack (*Caranx hippos*);
- Atlantic bumper (*Chloroscombrus chrysurus*); and
- Barracuda (*Sphyraena* sp.).

5.2.5.2 Large Pelagic Species

Large pelagic fish stocks off the coast of Ghana include tuna, billfish and some sharks. These species are highly migratory and occupy the surface waters of the entire tropical and sub-tropical Atlantic Ocean. They are important species in the ecosystem as both predators and prey for sharks, other tuna and cetaceans as well as providing an important commercial resource for industrial fisheries. The tuna species are:

- Skip-jack tuna (*Katsuwonus pelamis*);
- Yellow-fin tuna (*Thunnus albacares*); and
- Big-eye tuna (*Thunnus obesus)*.

Billfish species occur in much lower numbers and comprise:

- Swordfish (Xiphias gladius);
- Atlantic blue marlin (*Makaira nigricans*); and
- Atlantic sailfish (*Istiophorus albicans*).

5.2.5.3 Demersal Species

Demersal fish species are those that live on or near the seabed. They are usually found over the continental shelf and the continental slope. Their distribution and composition are influenced by oceanographic conditions and specifically by the upwelling that results in changes in the bathymetric extension suitable for different species.

This can also be observed by the differences recorded between the communities found above the thermocline, above 40 m depth and dominated by sciaenid species, and those living below (Koranteng, 1998). The density of demersal species is higher on shallower waters up to 50 m depth.

Trawl surveys conducted between 1956 and 1992 have shown that demersal fish are widespread on the continental shelf along the entire length of the Ghanaian coastline (Koranteng, 2001). Species composition is a typical tropical assemblage including the following families.

- Porgies or Seabreams (Sparidae) (e.g. blue-spotted seabream *Pagrus caeruleostictus*, Angola dentex *Dentex angolensis*, Congo dentex *Dentex congoensis*, Canary dentex *Dentex canariensis* and pink dentex *Dentex gibbosus*).
- Grunts (Haemulidae) (e.g., bigeye grunt *Brachydeuterus auritus* and to a lesser degree, sompat grunt *Pomadasys jubelini* and bastard grunt *Pomadasys incisus*).
- Croakers or drums (Sciaenidae) (e.g., red pandora *Pellagus bellottii*, Cassava croaker *Pseudotolithus senegalensis*).
- Goatfishes (Mullidae) (e.g., West African goatfish/red mullet *Pseudupeneus prayensis*).
- Snappers (Lutjanidae) (golden African snapper *Lutjanus fulgens*, Goreean Snapper *Lutjanus goreensis*).
- Groupers (Serranidae) (e.g., white grouper *Epinephelus aeneus*).
- Threadfins (Polynemidae) (e.g., lesser African threadfin *Galeoides decadactylus*).
- Emperors (Lethrinidae) (e.g., Atlantic emperor *Lethrinus atlanticus*).
- Triggerfish (e.g., grey triggerfish *Balistes capriscus*).

The demersal species that are most important in terms of catch volumes are Sparidae or porgies (mainly *Pagellus bellottii*, *Dentex canariensis* and *Pagrus caeruleostictus*), Haemulidae or grunts, (e.g., *Pomadasys jubelini* and *Brachydeuterus auritus*); Sciaenidae or croakers (e.g., *Pseudotolithus* spp. or cassava croaker) and Lutjanidae or snappers (e.g., *Lutjanus fulgens*). Others are Mullidae or mullets, (e.g., *Pseudupeneus prayensis*); Serranidae or groupers (e.g., *Epinephelus aeneus*) and Polynemidae or threadfins (e.g., *Galeoides decadactylus*, Nunoo et al, 2014).

Trawl surveys have shown that demersal fish are widespread on the continental shelf along the entire length of Ghana's coastline. Species composition is a typical tropical assemblage including the following families:

- Three Porgies or seabreams (Sparidae), eg Pagellus bellottii, Pagrus caeruleostictus, Dentex canariensis, Dentex gibbosus, Dentex angolensis and Dentex congoensis;
- Two Grunts (Haemulidae), eg Pomadasys incisus, P. jubelini and Brachydeuterus auritus;
- One Croakers or drums (Sciaenidae), eg *Pseudotolithus senegalensis*;
- Goatfishes (Mullidae), eg *Pseudupeneus prayensis*;

- Snappers (Lutjanidae), eg *Lutjanus fulgens* and *L. goreensis*;
- Groupers (Serranidae), eg *Epinephelus aeneus*;
- Threadfins (Polynemidae), eg *Galeoides decadactylus*; and
- Emperors (Lethrinidae), eg *Lethrinus atlanticus*.

The seasonal upwelling of cold and saline waters over the Ghanaian shelf provokes changes in the geographical distribution of many of the demersal fish species. During the upwelling season, the bathymetric extension of the croakers is reduced to a minimum, while the deep water porgies are found nearer the coast than at other times of the year. The demersal species that are most important commercially (in terms of catch volumes) are cassava croaker (*Pseudotolithus senegalensis*), bigeye grunt (*Brachydeuterus auritus*), red pandora (*Pellagus bellottii*), Angola dentex (*Dentex angolensis*), Congo dentex (*Dentex congoensis*) and West African Goatfish (*Pseudupeneus prayensis*).

Densities of demersal fish show temporal and spatial variation. For example, triggerfish (Balistes capriscus) dominated this ecosystem for nearly twenty years (from the early 1970s to the late 1980s) displacing bigeye grunt (Brachydeuterus auritus) as the most abundant species. The density of this species subsequently declined and by 1990, it had virtually disappeared from the study area (*Koranteng, 1998*). Spatially, higher densities appear to occur reasonably consistently in water deeper than 50 m.

5.2.5.4 Deep Sea Species

Deepwater sea species are those that inhabit areas beyond and below the depth of the continental shelf. These can be pelagic or demersal. Over 180 deepwater species have been reported off Ghana (Froese and Pauly, 2010), including approximately 110 that are principally pelagic, 60 that are principally demersal and 10 that frequently migrate between the bottom and higher layer of the seabed. Of these deepwater species, 89 were from 28 families, including Alepocephalidae, Gonostomatidae, Myctophodae and Stomiidae, that are likely to be found in Ghanaian waters at depths over 1,000 m and have been reported to have been found within the depth range in the Pecan (1,000 and 2,000 m). There is little detailed information on the distribution of these species within the project area and within Ghanaian waters generally.

Some studies have been conducted around the TEN FPSO and other oil and gas structures elsewhere in West Africa. The SERPENT project for example uses Remotely Operated Vehicles (ROVs) around oil and gas installations to investigate deep-sea fauna. In the TEN field octopus (*Muusoctopus* sp and cirrate), comb jellies (ctenophores), eelpout (Zoarcidae) and blobfish (*Psychrolutes* sp) have been observed. In Nigerian waters, sharks (Squalidae), chimaeras (Chimaeridae), grenadiers (Macrouridae), rays (Rajidae) and jellynose (*Guentherus altivela*) of the Ateleopodidae family, have been observed in deep water. In Angola, Portuguese dogfish (*Centroscymnus coelolepis*), arrowtooth eel (*Synaphobranchus kaupii*), white-head hagfish (*Myxine ios*), several species of snailfish, snub-nosed eel (*Simenchelys parasitica*) and eelpout (*Pachycara crassiceps*) have been recorded.

5.2.5.5 Protected or Endangered Species

The sensitive fish species in offshore Ghana according to the IUCN Red List (IUCN 2022) and in the Project's Area of Influence according to the IBAT database are presented in Table 5.3. The main fish species of concern are angle sharks as they are considered critically endangered and Shortfin Mako, Longfin Mako and Whale Sharks as they are endangered.

Other species are subject to commercial fishing and to international regulations and monitoring, as is the case of all tuna species by the International Commission for the Conservation of Atlantic Tunas (ICCAT). Sharks are one of the groups most represented within the list.

Local enforcement of protection programmes for fish is through the Fisheries Commission which monitors and inspects fish catch. Tuna fishing is monitored through onboard fishing inspectors that monitor activities in accordance with the International Commission for the Conservation of Atlantic Tunas programme requirements.

Table 5.3: IUCN Red-Listed Fish Species That Could Occur in the Project's AOI

Scientific Name	Common Name	Red List Category	Range
Carcharhinus longimanus	Oceanic Whitetip Shark	Critically Endangered	One of the most widespread shark species, ranging across entire oceans in tropical and subtropical waters, usually found far offshore between about 30°N and 35°S in all oceans.
Squatina oculata	Smooth back Angelshark	Critically Endangered	Although historically this species occurred throughout the west coast of Africa and the Mediterranean Sea, it has undergone severe declines since the mid-1980s. FAO records confirm the continued occurrence of the species in Ghana.
Manta birostris	Giant Manta Ray	Endangered	Circumglobal in tropical and temperate waters, this species has a widespread distribution.
Centrophorus granulosus	Gulper Shark	Endangered	*Centrophorus acus* is a poorly known deepwater shark with a limited understood distribution in the Western Pacific. It is also nominally recorded from the Western Central Atlantic and the relationship between these forms needs taxonomic resolution when more specimens are available.
Isurus oxyrinchus	Shortfin Mako	Endangered	The Shortfin Mako is a large pelagic shark, widespread in temperate and tropical oceans to depths of 888 m.
Isurus paucus	Longfin Mako	Endangered	The Longfin Mako is a large widely distributed but infrequently encountered, pelagic oceanic shark. It usually occurs to depths of 760 m but has been reported to be 1,752 m.
Rhincodon typus	Whale Shark	Endangered	Found in all tropical and warm temperate seas except the Mediterranean. Their core distribution is between approximately 30°N and 35°S, with occasional seasonal penetration to the north and south. Whale Shark

Scientific Name	Common Name	Red List Category	Range
			distribution is likely to be temperature limited, as they are rarely sighted in surface temperatures of less than 21°C.
Epinephelus itajara	Goliath Grouper	Vulnerable	Found in the Atlantic Ocean in the west from northeastern Florida, south along the U.S., throughout the Gulf of Mexico and Caribbean Sea, and along South America to Santa Catarina, Brazil (Hostim-Silva et al. 2005) and in the east along West Africa from Senegal to Cabinda, Angola.
Epinephelus marginatus	Dusky Grouper	Vulnerable	Found in the northeastern Atlantic Ocean from the southern English Channel, south along the coasts of western Spain and Portugal, throughout the Mediterranean Sea and Macaronesian islands and south along West Africa to southern Angola and possibly northern Namibia at the Cunene River. In the southwestern Atlantic Ocean, it is distributed from the mouth of the Rio Doce in the state of Espírito Santo in Brazil south to northern Patagonia in Argentina. Its depth range is zero to 300 metres.
Thunnus obesus	Bigeye Tuna	Vulnerable	Distributed globally in tropical and temperate seas, except the Mediterranean.
Alopias superciliosus	Bigeye Thresher Shark	Vulnerable	A highly migratory, oceanic and coastal species found circumglobally in tropical and temperate seas.
Alopias vulpinus	Common Thresher Shark	Vulnerable	Found circumglobally, with a noted tolerance for cold waters.
Carcharhinus falciformis	Silky Shark	Vulnerable	Found circumglobally in tropical waters.
Carcharodon carcharias	Great White Shark	Vulnerable	Found in most seas and oceans with concentrations in temperate coastal seas. It is principally known as a pelagic dweller of temperate continental shelf waters but also ranges into the open ocean far from land and near oceanic islands, the cold boreal and austral (sub-Antarctic) seas and the coastal tropics. It is found from the surf-line and the intertidal zone to offshore, and from the surface down to depths over 250 m.
Dalatias licha	Kitefin Shark	Vulnerable	Found on continental and insular shelves and slopes in warm-temperate and tropical areas. This species is found in the western and eastern Atlantic, western Indian Ocean, western Pacific and around the Hawaiian Islands. The Kitefin Shark has a widespread yet patchy distribution in the Atlantic and Indo-West and Central Pacific Oceans. It has been recorded on continental and insular shelves and slopes at depths of 37 to 1,800 m, but mainly >200 m.

Scientific Name	Common Name	Red List Category	Range
Kajikia albida	White Marlin	Vulnerable	Found throughout warm waters of the Atlantic from 45°N to 45°S including the Gulf of Mexico, Caribbean Sea, and Mediterranean.
Epinephelus aeneus	White Grouper	Near Threatened	Found throughout the southern and eastern waters of the Mediterranean Sea, the southern Atlantic coasts of Portugal and Spain, and southwards along the Atlantic coast of West Africa as far as southern Angola, including the islands of the Gulf of Guinea. Its depth range is 20 to 200 metres.
Prionace glauca	Blue Shark	Near Threatened	One of the widest-ranging of all sharks, being found throughout tropical and temperate seas from latitudes of about 60°N'50°S. It is oceanic and pelagic, found from the surface to about 350 m depth; occasionally it occurs close inshore where the continental shelf is narrow. The Blue Shark prefers temperatures of 12-20°C and is found at greater depths in tropical waters.
Thunnus albacares	Yellowfin tuna	Least Concern	Found worldwide in tropical and subtropical seas.
Pseudocarcharias kamoharai	Crocodile Shark	Least Concern	An oceanic and circumtropical species that occur at the surface to at least 590 m depth, usually found offshore and far from land but sometimes occurring inshore and near the bottom.

Source: IUCN 2022

5.2.5.6 Marine Mammals

The water of the Gulf of Guinea and offshore Ghana is considered favourable to the presence of marine mammals, especially due to the seasonal upwelling, which boosts productivity and therefore ensures food availability for these species. However, there is a lack of knowledge on the distribution, population estimate and ecology of cetaceans in the region. The majority of data are based on opportunistic sightings, incidental catches and strandings and species abundance in the Gulf of Guinea (Van Waerebeek et al 2009; Weir 2010; and ERM, 2015a). Marine mammal species observed in the waters surrounding Ghana and potentially to occur within the Project Area are listed in Table 5.4. The main marine mammals of concern are **Sei Whales** as they are considered endangered and **Sperm Whales**, as they are classed as vulnerable.

During a seismic survey of areas in the *Contract Area* carried out from November 2013 to April 2014, marine mammal observations were recorded by Marine Mammal Observers (MMO) accompanying the survey vessels (EPI Group 2014). The following species were recorded: Sperm Whale, Bryde's whale, Short-finned pilot whale, Clymene dolphin, Bottlenose dolphin, Melon-headed whale, Fraser's dolphin, Spinner dolphin and Pantropical spotted dolphin.

Table 5.4: Whales and Dolphins of Ghana, IUCN Conservation Status

#	Species	IUCN Status
Delphinidae		
1	Common bottlenose dolphin (*Tursiops truncatus*)	Least Concern
2	Clymene dolphin (*Stenella clymene)*	Least Concern
3	Spinner dolphin (Stenella longirostris)	Data Deficient
4	Pantropical spotted dolphin (*Stenella attenuate)*	Least Concern
5	Atlantic spotted dolphin (*Stenella frontalis*) (G. Cuvier, 1829)	Least Concern
6	Long-beaked common dolphin (*Delphinus capensis*)	Data Deficient
7	Fraser's dolphin (Lagenodelphis hosei)	Least Concern
8	Rough-toothed dolphin (*Steno bredanensis*)	Least Concern
9	Risso's dolphin (*Grampus griseus*)	Least Concern
10	Melon-headed whale (*Peponocephala electra*)	Least Concern
11	Pygmy killer whale (*Feresa attenuata*)	Least Concern
12	Short-finned pilot whale (*Globicephala macrorhynchus*)	Least Concern
13	Killer whale (*Orcinus orca*)	Data Deficient
14	False killer whale (*Pseudorca crassidens*)	Near Threatened
Ziphiidae (beaked whales)		
15	Cuvier's beaked whale (*Ziphius cavirostris*)	Least Concern
Kogiidae (pygmy sperm whales)		
16	Dwarf sperm whale (*Kogia sima*)	Data Deficient
Physeteridae (sperm whales)		
17	Sperm whale (Physeter macrocephalus or Physeter catodon)	Vulnerable
Balaenopteridae (rorquals)		

#	Species	IUCN Status
18	Humpback whale (Megaptera novaeangliae)	Least Concern
19	Sei whale (Balaenoptera borealis)	Endangered
20	Bryde's Whale (Balaenoptera edeni)	Least Concern

Source: IUCN (2022)

5.2.5.7 Marine Turtles

Relatively little is known about the migration patterns, genetic variation, or nesting behaviour of sea turtles along the approximate 560 km long coast of Ghana (Tanner 2013). Currently, olive ridley (*Lepidochelys olivacea*), green (*Chelonia mydas*) and leatherback (*Dermochelys coriacea*) sea turtles are known to nest in Ghana regularly, and hawksbills (*Eretmochelys imbricata*) are thought to have nested historically along the coast (Doak 2009) (see Table 5.5).

Table 5.5: Sea Turtles Nest Site Records in Ghana

Author, year	Leatherback	Olive Ridley	Green
Amiteye, 2002	46	412	32
Agyemang, 2005	30	190	10
Allman, 2007	418	134	0
Agyekumhene, 2009	74	103	0
Average	142	210	21

There are records of loggerhead turtles (*Caretta caretta*) nesting on one beach. Over the last 30 years, two loggerheads were observed in December 1998 and a single loggerhead was observed nesting in January 2013 (Allman, Barbour and Agyekumhene, 2015). It is noted that consistent nesting surveys were only conducted on this beach from August 1998 to April 2000.

The IUCN Red List classifies hawksbill turtles as Critically Endangered, green turtles and loggerhead turtles as Endangered and olive ridley and leatherback turtles as Vulnerable (IUCN, 2019). These species are also listed as protected species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on Migratory Species (CMS).

In Ghana, the coastal habitat is favourable and turtle nesting may occur all along the sandy coast of the country, including the beaches from Keta to Half-Assini which are important nesting areas for marine turtles. Approximately 70% of Ghana's coastline is found suitable as nesting habitat for marine turtles (Armah *et al* 1997; Amiteye 2002). The olive ridley is the most abundant nesting marine turtle species in Ghana. The nesting period

stretches from July to December, with a peak in November (Armah *et al,* 1997) (ERM, 2015a).

During a seismic survey of areas in the Project Area carried out from November 2013 to April 2014, sea turtle observations were recorded by Marine Mammal Observers (MMO) accompanying the survey vessels (EPI Group, 2014). The following species were recorded: leatherback turtle, olive ridley turtle and hawksbill turtle.

5.2.5.8 Sea Birds

The west coast of Africa forms an important section of the East Atlantic Flyway, an internationally important migration route for a range of bird species, especially shore birds and seabirds (Boere *et al,* 2006; Flegg, 2004).

A number of species breed in higher northern latitudes winter along the West African coast and many fly along the coast on migration. Seabirds known to follow this migration route include some tern species (*Sterna* sp), skuas (*Stercorarius* and *Catharacta* spp) and petrels (Hydrobatidae).

The distance of the migration routes of these species from the shore depends on prey distribution and availability (*e.g.,* the abundance and distribution of shoals of anchovies or sardines) (Flegg, 2004). The highest concentrations of seabirds are experienced during the spring and autumn migrations, around March and April, and September and October.

The marine birds of Ghana include storm petrels (*Oceanodroma castro*) and Ascension frigate birds (*Fregata aquila*). Records dating back to the 1960s reveal only limited sightings of a few species (Elgood *et al* 1994). The rarity of oceanic birds may be attributable to the absence of suitable breeding sites (*e.g.,* remote islands and rocky cliffs) off the Ghana coast and in the Gulf of Guinea. Waders are present during the winter months between October and March. Species of waders known to migrate along the flyway include sanderling (*Calidris alba*) and knott (*Calidris canuta*).

5.3 Socio-Economic Baseline

5.3.1 Introduction

This section provides a description of the relevant baseline socio-economic, health and human rights baseline conditions in the socio-economic Area of Influence (AoI) defined for the Eco Atlantic Offshore Drilling project in the Western Region of Ghana. This is intended to support the identification of key socio-economic sensitivities to inform the assessment of social impacts related to the Project.

Information presented in this section has been collected from available secondary data, including the following main sources.

- Ghana Statistical Service (2019). Ghana Living Standards Survey (GLSS) Round 7, Main Report, June 2019. The data collection was for 12 months (22nd October 2016 to 17th October 2017) when Ghana was still organised in 10 regions.
- *Final Draft 2018-2021 Medium-Term Development Plans* of the coastal districts (Jomoro, Ellembelle, Nzema East, Ahanta West, Sekondi-Takoradi Metropolitan Assembly, Shama) in the Western Region of Ghana[4].

District Analytical Reports (Jomoro, Ellembelle, Nzema East, Ahanta West, Sekondi-Takoradi Metropolitan Assembly and Shama) developed based on the 2010 Population and Housing Census results by the Ghana Statistical Service, October 2014, and 2021 Population and Housing Census (General Report Volume 3A) partial results by the Ghana Statistical Service, November 2021.

- Jomoro District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, October 2014. http://www2.statsghana.gov.gh/docfiles/2010_District_Report/Western/JOMORO.pdf and accessed on 1 April 2020.
- Ellembelle District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, October 2014. http://www2.statsghana.gov.gh/docfiles/2010_District_Report/Western/Ellembelle.pdf and accessed on 1 April 2020.
- Nzema East Municipality District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, October 2014. http://www2.statsghana.gov.gh/docfiles/2010_District_Report/Western/NZEMA%20EAST.pdf and accessed on 1 April 2020.
- Ahanta West District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, October 2014. https://new-ndpc-static1.s3.amazonaws.com/CACHES/PUBLICATIONS/2016/06/06/Ahanta+West+2010PHC pdf and accessed on 1 April 2020.
- STMA District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical

[4] Information presented in these Development Plans were not systematically presented so certain types of data and information are not consistently described for all the districts. The Development Plans are yet to be updated

Service, October 2014. http://www2.statsghana.gov.gh/docfiles/2010_District_Report/Western/STMA.pdf and accessed on 3 April 2020.

- Shama District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, October 2014. http://www2.statsghana.gov.gh/docfiles/2010_District_Report/Western/Shama.pdf and accessed on 3 April 2020.
- Coastal District Profiles published by the Western Regional Coastal Foundation (WRCF)[5].
- Kennedy Atong Achakoma et al: Labour Migration Study in Ghana, 2016. ISBN: 9988-572-71-9[6].
- Sam B and Buckle F 2017. The Implications of Infrastructure Investments on Land and Livelihoods-Experience from the Western Coastal Region of Ghana, Paper prepared for presentation at the 2017 World Bank Conference on Land and Poverty; The World Bank - Washington DC, March 20-24, 2017.
- Charlie J. Gardner, Opportunities for Oil & Gas Corporate Social Investment in the Fisheries Sector of Ghana's Western Region, Full Scoping Report, Western Region Coastal Foundation, December 2016.
- Ghana Country Report on Human Rights Practices for 2018, United States Department of State Bureau of Democracy, Human Rights, and Labour[7].

Information is presented, as available, at various geographic levels, with a particular focus at the district level, and covers the following aspects.

- Administrative Structure;
- Planning and Development;
- Human Rights Context;
- Demographics;
- Land Tenure and Use;
- Economy and Livelihoods;
- Education;

5.3.2 Overview of Districts in the Area of Influence

The Project socio-economic AoI includes the local fishing communities that operate in the six coastal districts located within the Western Region, as these are located nearest to the offshore Pecan Field (the closest well site is approximately 92 km from the nearest coast). The coastal districts include, from west to east, Jomoro Municipal, Ellembelle District, Nzema East Municipal, Ahanta West Municipal, Sekondi-Takoradi Metropolis and Shama District[8]. A new administrative unit, the Effia-Kwesimintsim Municipal which has no coastline, was carved-out from Sekondi–Takoradi Metropolitan Assembly as one of the 38 newly created and upgraded District Assemblies in 2018.

[5] available at http://wrcfghana.org/archives/publication-category/information -about-the-western-region, accessed on 9 March 2020
[6] available at http://www.fesghana.org/index.php?page=new-publications, accessed on 9 March 2020
[7] Available at https://www.state.gov/wp-content/uploads/2019/03/Ghana-2018.pdf, accessed on 1 April 2020
[8] The term 'District' is used in this report to cover all three types of administrative area.

Prior to coming into existence as a Municipal Assembly, Effia-Kwesimintsim was a Sub - Metro under Sekondi-Takoradi Metropolitan Assembly (STMA).

Figure 5.12 presents an overview of the Western Region, including the six coastal districts and some fishing communities in the AoI.

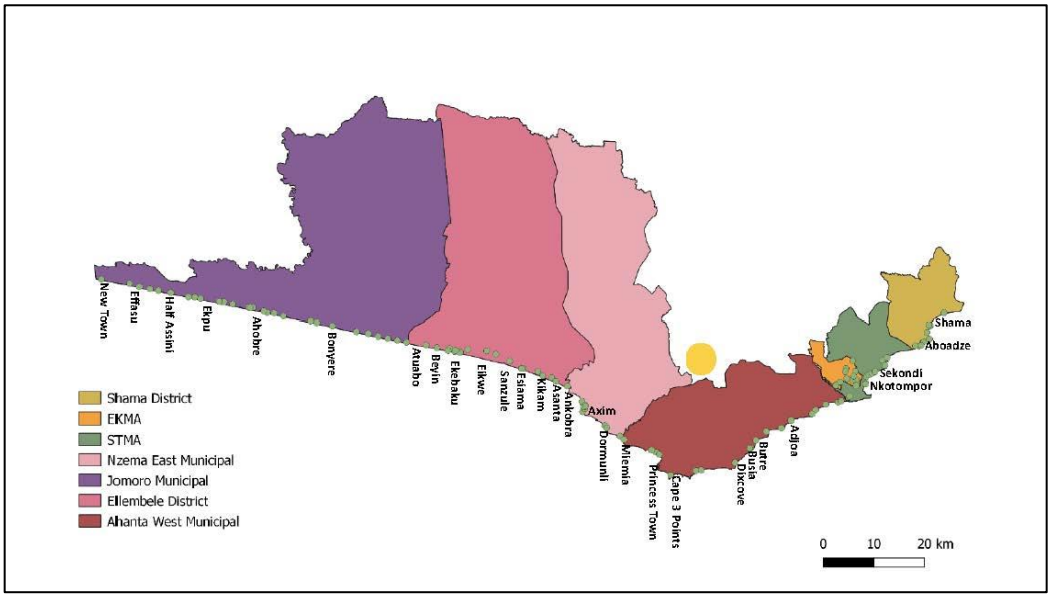


Figure 5.12: Map of the new Western Region of Ghana and its Districts and Towns

5.3.3 Administrative Structure

There is a dual system of governance in Ghana made up of formal government structures and traditional leadership structures. These systems of authority are recognised as complementary structures with different responsibilities. The decentralised government in Ghana referred to as the Local Government System, comprises three levels of administrative authorities, namely national, regional and district.

The Local Government System, as defined under the Local Government Act 462 of 1993, is made up of the Regional Coordinating Council (RCC), four-tier Metropolitan and three-tier Municipal/District Assemblies. Under these fall the Sub-Metropolitan District Council, Zonal Council and Urban/Town/Area/ Councils, as well as Unit Committees (Figure 5.13).

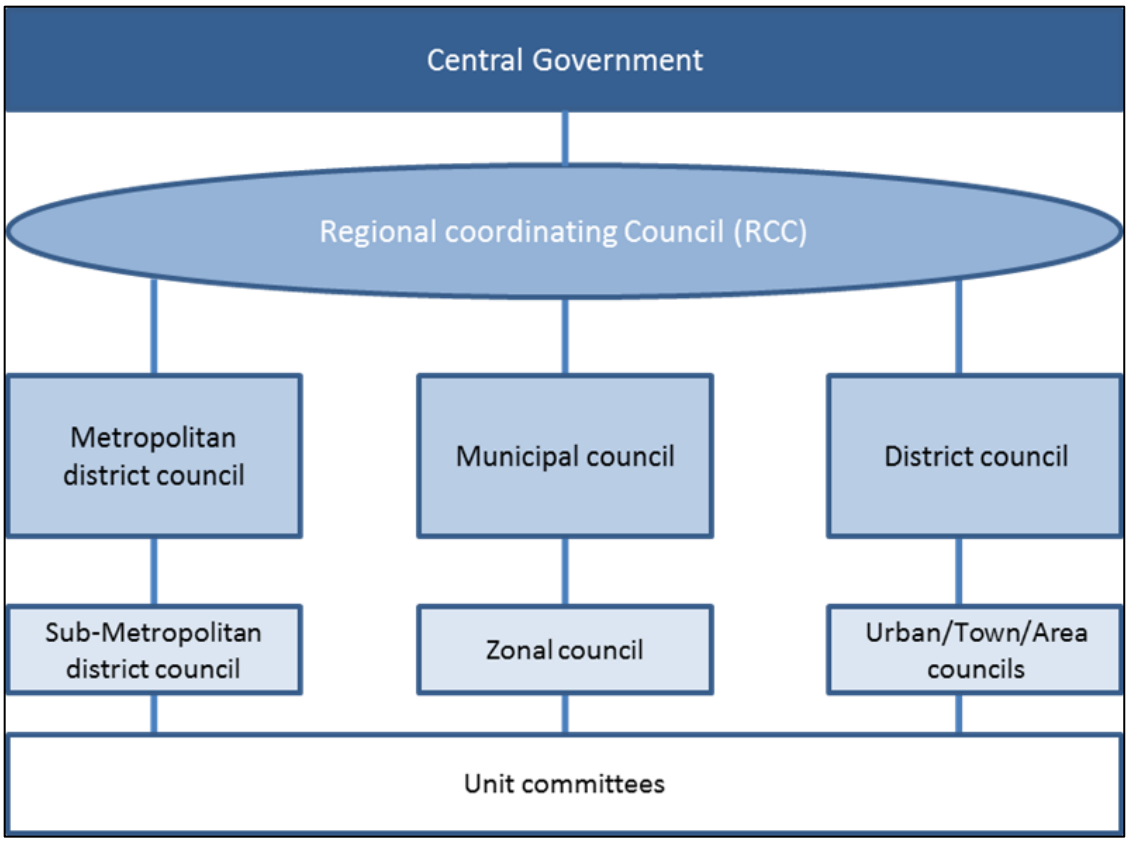


Figure 5.13: The Governance Structure in Ghana

5.3.3.1 Formal Structures

Following a Referendum on 27th December 2018 and the establishment of Constitutional Instrument (C.I) 117 dated 15th February 2019, the number of administrative regions in Ghana increased from 10 to 16[9]. Figure 5.14 illustrates the 16 regions created and their capitals following the 2018 referendum.

The new regions are Oti, Western North, Northeast, Ahafo, Savannah and Bono East Regions. The six new regions were carved from four already existing regions, namely Brong Ahafo, which has been split into three; Northern Region, also split into three; Western Region and Volta Region., Oti Region was carved from Volta, Bono East and Ahafo from Brong Ahafo, and Savannah and Northeast from Northern Region. The new Western North Region was carved from the former Western Region[10]. The Districts of Ghana are the second-level administrative subdivisions of Ghana, below the level of the region. There are currently 260 districts[11], out of which 6 are Metropolises, 109 are Municipalities and 145 are Districts.

[9] Ghana Districts, available here http://www.ghanadistricts.com/Home/AllDistricts and accessed on 16 June 2022
[10] Online article, Ghana now has 16 regions, published on 16 February 2019, at https://www.modernghana.com/news/916140/ghana-now-has-16-regions.html and accessed on 16 June 2022.
[11] Ghana Districts, available here http://www.ghanadistricts.com/Home/AllDistricts and accessed on 16 June 2022.

Source: Ghana Districts (2019), http://www.ghanadistricts.com/Home/LinkData/718

Figure 5.14: Map of Ghana's 16 Administrative Regions and Capitals

The key factors which determine an Assembly to be a Metropolitan, Municipal or District are the population size and settlement characteristics of the area. The Act stipulates the classification as follows.

- A metropolis is a local government unit or area with a minimum population of 250,000 people.
- A municipality is a single compact settlement with a minimum population of 95,000 people.

- A district is a local government unit or area with a minimum population of 75,000 people.

A District Assembly is established by the Minister of Local Government and serves as the highest political authority in each district. It is made up of:

- the District Chief Executive, appointed by the President of the Republic.
- one person from each electoral area within the district elected by universal adult suffrage[12];
- the member or members of Parliament from the constituencies that fall within the area of authority of the District Assembly; and
    - other members that shall not exceed thirty per cent of the total membership of the District Assembly appointed by the President in consultation with the traditional authorities and other interest groups in the district.

As the political and administrative authorities of the districts, the primary function of District Assemblies is to promote local economic development. According to the Local Government Act of 2016, District Assemblies also have the following tasks.

- Formulate and execute plans, programs, and strategies for the effective mobilization of the resources necessary for the overall development of the district.
- Promote and support productive activity and social development in the district and remove any obstacles to initiative and development.
- Sponsor the education of students from the district to fill particular workforce needs of the district, especially in the social sectors of education and health, making sure that the sponsorship is fairly and equitably balanced between male and female students.
- Initiate programs for the development of basic infrastructure and provide municipal works and services in the district.
- Be responsible for the development, improvement and management of human settlements and the environment in the district.
- In cooperation with the appropriate national and local security agencies, be responsible for the maintenance of security and public safety in the district.
- Ensure ready access to courts in the district for the promotion of justice.
- Act to preserve and promote the cultural heritage within the district.
- Initiate, sponsor or carry out studies that may be necessary for the discharge of any of their duties.

The new Western Region has Sekondi-Takoradi maintained as its capital and is made up of one Metropolis, eight Municipal Assemblies and five District Assemblies. Table 5.6 illustrates the status and district capitals in the newly created Western Region after reorganisation.

[12] Universal Adult Suffrage is the right of citizens in a given society who are entitled to vote in an election to select, at periodic intervals when these elections are called, a government to represent them.

Table 5. 6: Districts and Capitals of the New Western Region[13]

District	Status	Capital
Jomoro*	Municipal	Half Assini
Ellembelle*	District	Nkroful
Nzema East*	Municipal	Axim
Ahanta West*	Municipal	Agona Nkwanta
Sekondi-Takoradi*	Metropolis	Sekondi-Takoradi
Shama*	District	Shama
Amenfi Central	District	Manso Amenfi
Wassa Amenfi East	Municipal	Wassa-Akropong
Amenfi West	Municipal	Asankrangwa
Mpohor	District	Mpohor
Prestea Huni Valley	Municipal	Prestea
Tarkwa Nsuaem	Municipal	Tarkwa
Wassa East	District	Daboase
Effia Kwesimintsim** (formerly part of STMA until 2018)	Municipal	Kwesimintsim

*Coastal Districts that form part of this study are in bold.

** Effia-Kwesimintsim has no coastline but is included because it was formerly part of STMA

Source: Ghana Districts (2019), www.ghanadistricts.com

5.3.3.2 Traditional Structures

There is a dual system of governance in Ghana, with traditional government structures alongside formal government ones. These systems of authority are recognised as complementary structures that have different responsibilities. There is a decentralised formal and traditional government in Ghana with three levels of administrative authority, namely national, regional and district in both systems.

The Ministry of Chieftaincy and Religious Affairs in Ghana is the national official body responsible for ensuring linkages between the Government of Ghana and the traditional authorities in the country.

The vision of the Ministry is to preserve, sustain and integrate the regal, traditional and cultural values and practices to accelerate wealth creation and harmony for total national development.

Organisations under this Ministry include:

- Houses of Chiefs are organised into national, regional and traditional councils;
- National Commission on Culture;
- Bureau of Ghana Languages;
- Ghana Museums and Monuments Board and others.

[13] Ghana Districts (2019), http://www.ghanadistricts.com/Home/LinkData/718 accessed on 16 June 2022

The National House of Chiefs is the highest body in Ghana that unites all traditional rulers, chiefs, and kings. At the regional level, the Regional Houses of Chiefs represent the regional government, and their function is to express a cultural, historical and/or ethnic point of view on public policies. The Paramount Chiefs are the regional traditional heads of the people and custodians of the land and hold great influence. Their position is recognised by the formal administrative structures; however, it should be noted that the traditional stool boundaries do not align exactly with the formal administrative boundaries. Below the Paramount Chiefs are chiefs and sub-chiefs. Each chief has a traditional council composed of elders who carry out the instructions of the Chief and safeguard traditional customs and local knowledge for future generations. Traditional structures are intended to be politically impartial as they are responsible for supporting all members of the community, irrespective of political affiliation. The chiefs have their own territory and arbitrate and decide political and economic questions in their areas. This can extend to family and property matters, including divorce, child custody and land disputes, however, they do not handle criminal cases.

Each district belongs to a traditional council that assists the Paramount Chief to administer his area of jurisdiction. The Council is typically comprised of the Paramount Chief, the Queen Mother, divisional chiefs, various family heads and the linguist. The Council is the supreme organisation of the stool and must approve all decisions taken by the Chief.

An overview of chieftaincy structures in the six coastal districts is provided below.

- Jomoro. The district falls under the traditional jurisdiction and paramountcy of the Western Nzema Traditional Council, with its seat at Benyin. Benyin is the traditional as well as cultural capital from which the Omanhene, Awulae Annor Adjaye II exercises traditional authority over his people. The jurisdictional interest of the paramountcy stretches from Ekabaku, near Atuabo in the east, to Newtown, in the extreme west, along Ghana's frontier with La Cote d'Ivoire[14]. The 2018-2021 Medium-Term Development Plan indicates that although the district is said to be peaceful, there are chieftaincy disputes at Bonyere, Newtown and a few other areas.
- Ellembelle. The district has one Paramount Chief - the Eastern Nzema Traditional Council - that is situated at Atuabo. The jurisdictional interest of the paramountcy stretches from Ankobra to Atuabo.
- Nzema East. With the splitting of the old district into two (Nzema East Municipality and Ellembelle District), the Municipality still has five Paramountcies, out of which two in Axim (Lower and Upper Traditional Councils), the Nsein Traditional Council in Nsein, the Ajomoro Traditional Council in Apataim and the Gwira Traditional Council in Bamiankor.
- All the Traditional Councils present in the three districts of Nzema East, Ellembelle, and Jomoro constitute the Nzema Manle Council[15].
- Ahanta West. There are three Paramountcies namely, Ahanta, Upper Dixcove and Lower Dixcove with Otumfuo Nana Baidoo Bonsoe XIV as the Ahantahene. These Paramount Chiefs have their respective Divisional and Sub-Chiefs under their jurisdiction[16].
- Sekondi-Takoradi Metropolis (including Effia-Kwesimintsim Municipal). STMA traditionally can be classified into Paramountcies namely, Sekondi, Essikadu and Takoradi. The traditional councils are made up of various sub-chiefs and the councils meet regularly to discuss various issues related to the development of the traditional areas[17].

[14] Jomoro District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, October 2014.
[15] Ellembelle District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, October 2014.
[16] Ahanta West Municipal Draft Medium-Term Development Plan 2018-2021.
[17] STMA District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, October 2014.

- Shama. The Shama Traditional Area (STA) is governed by the Shama Traditional Council (STC) headed by a Paramount Chief with jurisdiction over three main Chieftaincy Divisions and several sub-chiefs.

In addition, each fishing community has a Chief Fisherman. This person oversees all matters pertaining to fishing, either on the community or on the landing site level (in the case of communities with more than one landing site). He also represents the local fishers at the Fishers' Association at the district level. The Chief fisherman works with a council of elders, which represents descent groups and/or representatives of gear groups and may or may not have to report back to other community leaders. Chief fishermen are elected, but they typically come from a certain clan or family. Fishmongers in each fishing community have a female leader known as the Konkohemaa.

5.3.4 Planning and Development

5.3.4.1 Development Policies

Eradication of poverty and reduction of inequalities in rural and deprived communities is the prime focus of the National Development Planning Commission[18]. Development is structured around four key pillars that include the following.

- Social Development. This is the core of 'national development' and refers to human development and welfare. The long-term objective of social development is to create safe, peaceful, and sustainable communities where, in accordance with the Constitution, Ghanaians can live productive, prosperous, and fulfilling lives, in freedom and peace[19].
- Economic Development. This deals as much with growth (the expansion in goods and services) as it does with opportunities for citizens to participate in the very process that generates that growth. With a dominant informal sector that accounts for 80-90% of employment but only about 40% of economic outputs, policies are essential to transform the sector into efficient hubs of production and productivity.
- Environmental Development. In Ghana, environmental development refers both to the 'built environment' (largely reflecting spatial planning and the various infrastructure that define it) and the 'natural environment' (made up principally of land, water bodies and the atmosphere) and how they influence the process of social and economic development. In early 2015, the first National Spatial Development Framework was developed to harmonise land use and spatial planning in the country. This legislation, along with others such as the Ghana Urban Development Policy and its Action Plan, complements policies on the natural environment to form a strong and coherent basis for incorporating 'environment' into Ghana's national development.
- Institutional Development. 'Institutions' generally comprise that network of laws, policies, regulations, organisations, cultural practices, belief systems and attitudes that, although abstract, play a critical role in attaining tangible results from national development efforts. Institutional development, therefore, forms a critical part of Ghana's evolving strategy for long-term national development and socio-economic transformation.

A number of development policies exist at a national, regional and district level. These policies have been formulated in response to key political and development milestones in Ghana's history and are summarised in Table 5.7. **Table 5.7**

[18] Ghana National Development Planning Commission, http://www.ndpc.gov.gh/
[19] http://www.ndpc.gov.gh/four-pillars/#social

Table 5.7: Development Policies Relevant to the Project

Policy	Key Aspects
National Level Policies	
Long-Term National Development Policy Framework (LTNDPF) 2018-2057	• The LTNDPF which has a vision of a just, free and prosperous nation with high levels of national income and broad-based social development has been mainstreamed with the Sustainable Development Goals (SDGs), African Union Agenda 2063 and the Paris Climate Change Agreement (COP21). • It has the following five main Goals which span 40 years and are phased out in a series of ten 4-Year medium-term development plans (MTDPs): – Build a Prosperous Society; – Create Opportunities for All; – Safeguard the natural environment and ensure a resilient built environment; – Maintain a stable, united and safe society; – Strengthening Ghana's role in international affairs.
Co-ordinated Programme of Economic and Social Development Policies (CPESDP), 2017-2024	• The CPESDP reflects the President's development program as required by the constitution from a newly elected government. • It sets out a vision for agricultural modernisation, industrial diversification, and youth employment; embeds national strategies to localise and achieve the Sustainable Development Goals; and articulates a pathway to economic transformation and inclusive growth. • Priority interventions include: – Revitalising the Economy; – Revamping Economic and Social Infrastructure; – Transforming Agriculture and Industry; – Social Development; – Reform the Delivery of Institutions of Governance; – Leveraging Science, Technology and Innovation for Development.
Medium-Term National Development Policy Framework (MTNDPF) 2018 – 2021	• The MTDF has been developed by the National Development Planning Commission (dated May 2017) and it outlines the government's medium-term priorities for Ghana. • The MTDF focuses on five broad thematic areas namely: (i) economic development, (ii) social, (iii) environment and infrastructure, (iv) governance and, • (v) international relations, to optimise key sources of growth and enhance the economy's resilience to shocks by focusing on transformation and value addition in agriculture and industry. • The development dimensions under the MTNDPF are: – Economic, – Social Development, – Environment, Infrastructure and Human Settlements, – Governance, Corruption and Public Accountability and – Ghana's Role in International Affairs.

Ghana Education Strategic Plan (ESP) 2018–2030	• The ESP 2018–2030 puts Ghana on the road towards meeting the Sustainable Development Goals (SDGs) and represents a deliberate reorientation towards this aim, as it replaces the previous ESP 2010–2020. • Under the plan, every sub-sector of the education system has a strategic goal and is based on three policy objectives: • Improved equitable access to, and participation in, inclusive education at all levels; • Improved quality of teaching and learning in science, technology, engineering, and mathematics (STEM) at all levels; and • Sustainable and efficient management, financing, and accountability of education service delivery.
Ghana's Education Sector Medium-Term Development Plan 2018-2021	• This plan sets out the vision and the policies for transforming Ghana into a 'learning nation'. • It recognises the strengths and weaknesses of the current system and describes strategies to address the challenges to give every Ghanaian child the opportunity to contribute to national development.
Ghana National Spatial Development Framework (NSDF), 2015-2035, Volume II: Overall Spatial Development Strategy	• The NSDF aims to: – strengthen national development planning, including medium and long term, by articulating the spatial dimensions of social, economic, environmental and other policies at the national level; – establish a national spatial framework that gives policy direction to land use planning and management at the national level, to guide the preparation of other lower hierarchy plans, such as regional, sub-regional and district spatial development frameworks, structure plans and local plans – make explicit the spatial information from sectoral agencies -- including their plans, projects, resources and assets -- to enable coordinated decisions and aligned policies as well as reduced duplications, conflicts and overlaps; – provide spatial policies to help ensure sustainable development as well as mitigate and adapt the natural environment and human settlements to climate change. • The spatial strategy is based on the following pillars: – emphasise balanced polycentric development; – improve regional, national and international connectivity; – Strengthen the metropolitan city regions of Accra and Kumasi; – Promote development in secondary cities; – Ensure sustainable development and protect ecological assets.
Regional Level Policies	

Western Region Spatial Development Framework (WRSDF), October 2012, under the Ghana-Norway Agreement of Strengthening the Environmental Management of the Oil & Gas Sector in Ghana	• The oil and gas industry has and will generate many economic activities that have and will continue to influence land use, human settlements, the environment and transportation. The industry has and will present challenges to land users and holders, owing to changing land use. In recognition of this, development partners and the government developed a Western Region Spatial Development Framework with the objective to 'ensure a spatially balanced, diversified and environmentally friendly economy that brings sufficient employment and social services for its people and the nation, based on sustainable use of the natural resource endowment'. It presents a spatial plan for the integration of social, economic and environmental development for the Region. • Zones the Region into three spatial zones. • Identifies the Project Area within Zone 3: Coastal - Industrial Districts. • Recognises the discovery of oil and gas as a key driver of development in the Region and the AoI. • Considers the following Millenium Development Goals as pivotal for the development of the Region and defines targets under the following goals: – Goal 1: Eradicate extreme poverty and hunger; – Goal 7: Ensure environmental sustainability; – Goal 8: Develop a global partnership for development.
District Level Policies	
Jomoro Municipal Assembly Final Medium-Term Development Plan (MTDP) 2018-2021	• The broad development goal of the Jomoro District is to achieve accelerated and sustainable growth and reduced poverty through effective collaboration with the • the private sector for agriculture transformation, human and institutional capacities development and job creation. • The MTDP builds on the development dimensions defined in the MTNDPF (see above).
Ellembelle District Medium-Term Development Plan (MTDP) 2018-2021 (Prepared November 2017)	• The District Medium-Term Development Plan (DMTDP) under the National Medium-Term Development Policy Framework (NMTDPF) 2018 – 2021 is driven by the Long-Term National Development Policy Framework (LTNDPF) 2018-2057 and builds on the five thematic goals defined by the Framework. • The district development goal is to achieve accelerated and sustainable growth and development, poverty reduction, promotion of gender equity, and protection and empowerment of the vulnerable and excluded within a decentralised democratic environment. • The main objective of the plan is to put in place a road map, which in the medium term would guide the district to pursue a course of sustainable development by reducing the generally high level of poverty and improving the living conditions of the people in the district with considerable emphasis on growing the informal sector for accelerated local economic development.

Nzema East Municipal Draft Medium-Term Development Plan (MTDP) 2018-2021	• This MTDP, in the context of the current development focus, will reflect development priorities and goals within the framework of the five thematic goals defined at the national level. • Specific areas of priority include but are not limited to: – Revenue mobilization and management: (development of market and industrial enclaves as satellite points for high commercial activity and hence revenue accessible points. This is directly linked to the enhancement of human and technological capacity to manage revenue systems); – Private sector participation in development; – Local economic development (aquaculture development, enhancement of artisanal skills, etc.); – Unveiling the tourism potential in the Municipality; and – Social infrastructure and amenities: education, health, water and sanitation, transportation.
Ahanta West Municipal Assembly Medium-Term Development Plan (MTDP) 2018-2021	• The District Development Focus for the planned period 2018-2021 aims at ensuring that all hindrances to development are removed to pave the way for a rapid socio-economic development of the District thus preparing the grounds for the take-off. • The Economic Development Focus aims to: – embark on aggressive Local Economic Development; – take stock of existing opportunities and carry out activities to boost the local economy; – provide needed infrastructure and support to artisans in the district; – local revenue mobilization, street naming and property addressing, efficient and prudent revenue management system to support local economic development; – promote an efficient agricultural sector capable of feeding the District and exporting to neighbouring markets; – take advantage of existing tourist potentials in collaboration with the private sector; and – foster strong collaboration with the private sector for job creation. • The Social Development Focus aims to ensure that people have access to quality basic social services such as health care, quality education, and potable water, and provide support to the aged children women and other vulnerable groups in society, all efforts aimed at rapid growth and development. • The Environment, Infrastructure and Human Settlements focus aims to ensure: – Decent housing with a clean environment; – Construction of drains; – Liquid and solid waste management; – Application of sanctions and intensive education to bring about needed behavioural change. • Under Governance, Corruption and Public Accountability, the focus is to: – Provide needed office and residential accommodation; Encourage the participation of the citizenry in decision-making processes and strengthen and transform established institutions.

Sekondi-Takoradi Metropolitan Assembly, Final Draft Medium-Term Development Plan (MTDP) 2018-2021	• According to Section 1.2.4.5 of the Plan, there is a twenty-year plan to make Sekondi Sub-Metro (one of the three Sub-metropolitan areas of the Metropolis) the Administration hub of the Metropolis with Takoradi being the main Commercial centre and Essikado-Ketan Sub Metro earmarked for industrial purposes and also serving as a bulk breaking centre to support the commercial function of Takoradi Sub Metro. Effia-Kwesimintsm will serve as the food basket of the Metropolis.
Sekondi-Takoradi Metropolitan Assembly Spatial Development Plan (referred to in the Ghana National Spatial Development Framework (NSDF), 2015-2035, Volume II: Overall Spatial Development Strategy)	• The STMA plan adopts a 'structured continuity' concept that: – promotes re-development of existing areas and extension of already-developed areas, and – restricts peripheral development not served by existing infrastructure. • The plan also advocates a 'two-centre city'—the Takoradi CBD and the Secondi port. It defines four, nested, growth zones: zone 1 comprises the two city centres; Zone 2 is the old residential areas including fishing villages as well as public and commercial facilities; Zone 3 includes new residential areas, farms and vacant land; and Zone 4 is mainly farm and parks. • Key spatial recommendations, which are endorsed by NSDF, include the following: – a green belt to preserve existing open space, including wetlands; – central business districts strengthened with upscale offices and retail; – upgraded historic core areas to include improved housing; – sub-centres developed as activity nodes; – mixed-use development along main radial corridors; – public transport to reduce urban sprawl and reliance on private vehicles; – land allocated for small and medium-scale enterprises; and – redeveloped derelict and vacant land and properties.
Effia-Kwesimintsim Municipal Assembly Draft Medium-Term Development Plan (MTDP) 2018-2021	• Similar to the other MTDP, it is developed under the Medium–Term National Development Policy Framework Agenda for Jobs: Creating Prosperity and Equal Opportunity for All. • Development Priorities and Intervention Areas relevant to the Plan include: – Private sector development; – Agriculture development; – Local Economic Development; – Roads and Transport; – Health; – Education; – Revenue Mobilisation; – Social protection; – Slum upgrading; – Water and Sanitation; – Waste Management.
Shama District Assembly Medium-Term Development Plan (MTDP) 2018-2021 (Prepared September 2017)	• For the period 2018-2021, the goal of the district is to ensure that all the people have access to basic social services while creating an enabling environment for economic growth, job creation, improved security and poverty alleviation in an inclusive society. • The Plan contains 30 programs with 55 projects translating into 700 activities at an estimated cost of approximately 110 million Ghana Cedis.

District Spatial Development Plans	• District assemblies have spatial development plans to guide land use decision-making and land allocation for different uses. However, traditional leaders and landowners give out large areas of agricultural land without regard to these spatial plans, especially when economically attractive land use options are available, offering important sums of money. The result is that spatial development plans have not been effectively implemented.

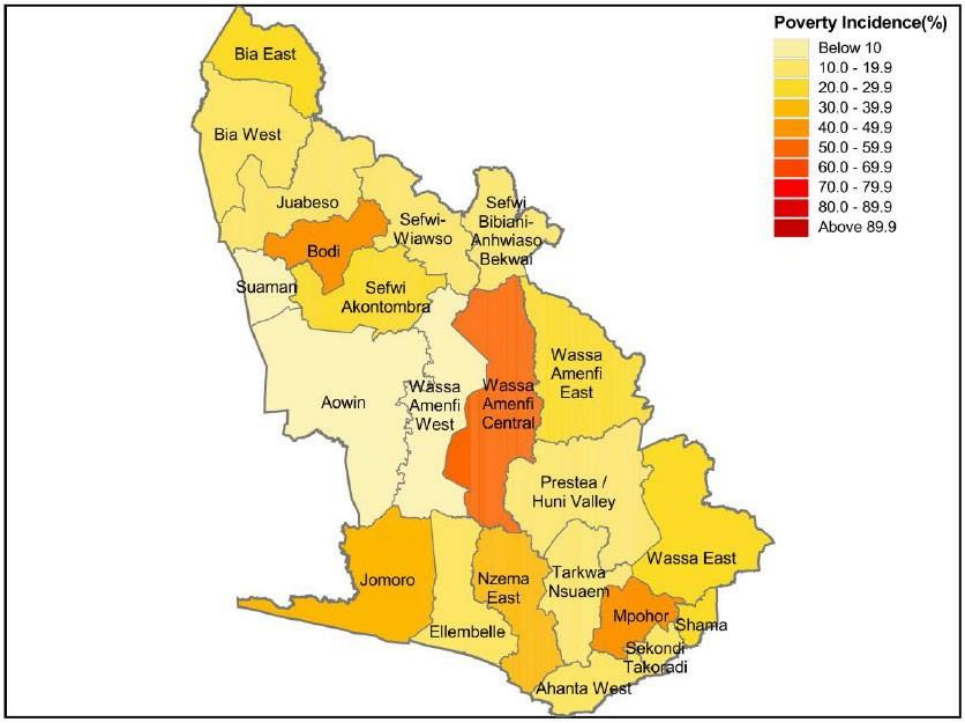
5.3.4.2 Poverty and Vulnerability

Poverty levels in the six coastal districts are varied. Shama, Sekondi-Takoradi Metropolis and Ahanta West (Ahantas) Districts are urban with a lower poverty ratio compared to the Nzema East, Ellembelle and Jomoro Districts (Nzemas) that are peri-urban and rural. A Community Perception and Social Economic Survey (CPSES), conducted by WRCF in 2016, found the average poverty incidence for the districts to be Jomoro at 28.2%, Ellembelle 26.2%, Nzema East at 26.8%, Ahanta West at 25%, STMA at 11.4% and Shama 22.7%. Some of the very large oil and gas infrastructure is located in the last three districts. Furthermore, the offshore oil rigs are within the seas bordering these districts (e.g., FPSO Kwame Nkrumah). The Ghana Gas plant and Eni's gas infrastructure are in the Ellembelle District.

These infrastructures have brought opportunities in the districts including the service sector (hotels), markets, rental accommodation, factories, which are dotted along the towns in the districts and improved road networks in some towns, among others (Sam and Buckle 2017).

According to the 2015 Ghana Poverty Map, Sekondi Takoradi Metropolis (68,482), Jomoro (44,662) and Wassa Amenfi Central (35,095) are the districts with the highest number of poor persons in the region. Suaman (1,206) and Wassa Amenfi West (6,207) districts have lower numbers of poor persons[20]. Figure 5.15 illustrates the incidence of poverty in the Western Region of Ghana. The map shows the Western Region prior to the 2018 administrative reorganisation and therefore includes data for the current Western North and Western Regions.

[20] Ghana Poverty Mapping Report, Ghana Statistical Services, May 2015, available at https://www.statsghana.gov.gh/gssmain/fileUpload/pressrelease/POVERTY%20MAP%20FOR%20GHANA-05102015.pdf and accessed in June 2022



Source: Ghana Poverty Mapping Report, Ghana Statistical Services (2015), reporting data by the former 10 regions of Ghana

Figure 5.15: Poverty Incidence in the Western Region[21].

According to the 2017 District Profiles published by the WRCF, the following percentage of the population in the coastal districts live in severe poverty[22]:

- Jomoro: 22%;
- Ellembelle: not specified;
- Nzema East: not specified;
- Ahanta West: 27%;
- Sekondi Takoradi Metropolitan Assembly: 31%;
- Shama: 24%.

Vulnerable individuals or groups are understood as those that are less able to cope with change due to a pre-existing condition that limits their ability to access social, economic, technological, institutional, and cultural resources. Vulnerable groups that may be present in the coastal districts include:

- low-income households;
- female-headed households;
- households with a high number of dependents;
- households with limited or no access to land;
- households with limited or no alternative livelihood activities other than fishing;

[21] The map shows the Western Region area according to the administrative structure of Ghana comprising 10 regions (prior 2019).
[22] The poverty line was revised in 2015—since then, a person is considered to be in extreme poverty if they live on less than 1.90 international dollars (int.-$) per day.

- households with elderly and/or disabled individuals; and
- people with HIV/AIDS.

5.3.5 Human Rights Context

This section presents an overview of the human rights context in Ghana, based on a desktop analysis of publicly available information on the situation in the country.

The Human Rights Context section is divided into two parts. In the first part, it sets out the institutional framework at the national and international levels. In the second part, it presents the human rights situation in the country in practice, with an emphasis on labour rights and welfare.

5.3.5.1 National Human Rights Institutional Framework

Since the introduction of the Constitution of Ghana in 1992, basic rights, namely the human rights of every human being have been recognised. It is the responsibility of the government of Ghana to enforce and uphold these human rights. The Commission on Human Rights and Administrative Justice (CHRAJ)1 of Ghana has the mandate to protect universal human rights and freedoms, especially those vested in the 1992 Constitution, including civil, political, economic, social, and cultural rights. Specific mandates concerned with the protection of human rights are stated in Article 218 (a), (c) and (f) of the 1992 Constitution and Section 7 (1) (a) (c) and (g) of the CHRAJ Act.

The CHRAJ investigates complaints about how public institutions and their staff carry out their everyday executive and administrative functions.

The CHRAJ is also one of the State agencies with the power to promote integrity in public service and combat corruption in Ghana. The Commission contributes to the promotion of high ethics and integrity in Public Service and enforces compliance with the ethical standards contained in the Code of Conduct for Public Officers.

5.3.5.2 International Human Rights Framework

Ghana has acceded to only part of the United Nations human rights treaties, specifically treaties on the elimination of discrimination against women, racial discrimination, and the protection of the rights of the child. A full list of the UN human rights treaties signed and/or ratified by Ghana is included in Table 5.8. **Table 5.*8***

Table 5.8: Ghana Human Rights Conventions

Human Rights Instruments (Date into force)	Signature/ Ratification Dates
Convention against Torture and Other Cruel Inhuman or Degrading Treatment or Punishment: 1987	Signature: 7 September 2000. Ratification/Accession: 7 September 2000.
Optional Protocol of the Convention against Torture	Signature: 6 November 2006. Ratification/Accession: 23 September 2016
International Covenant on Civil and Political Rights	Signature: 7 September 2000. Ratification/Accession: 7 September 2000.
Second Optional Protocol to the International Covenant on Civil and Political Rights aiming to the abolition of	Signature: NA. Ratification/Accession: NA

the death penalty	
Convention for the Protection of All Persons from Enforced Disappearance	Signature: 6 February 2007 Ratification/Accession: NA
Convention on the Elimination of All Forms of Discrimination against Women: 1979	Signature: 17 July 1980. Ratification/Accession: 2 January 1986.
International Convention on the Elimination of All Forms of Racial Discrimination: 1969	Signature: 8 September 1966. Ratification/Accession: 8 September 1966.
International Covenant on Economic, Social and Cultural Rights: 1966	Signature: 7 September 2000. Ratification/Accession: 7 September 2000.
International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families: 1990	Signature: 7 September 2000. Ratification/Accession: 7 September 2000.
Convention on the Rights of the Child: 1990	Signature: 29 January 1990. Ratification/Accession: 5 February 1990.
Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict: 2002	Signature: 24 September 2003. Ratification/Accession: 9 December 2014.
Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography: 2002	Signature: 24 September 2003. Ratification/Accession: NA
Convention on the Rights of Persons with Disabilities: 2008	Signature: 30 March 2007. Ratification/Accession: 31 July 2012

Source: Office of the High Commissioner of Human Rights (OHCHR), Ghana Country Profile, Status of Ratification, accessed in April 2020 at https://tbinternet.ohchr.org/_layouts/15/TreatyBodyExternal/Treaty.aspx?CountryID=67&Lang=EN

5.3.5.3 Labour

The Ministry of Employment and Labour Relations is mandated to formulate policies on Labour and Employment issues, develop sector plans, coordinate Employment and Labour related interventions across sectors, promote harmonious labour relations and workplace safety, and monitor & evaluate policies, programmes/projects for accelerated employment creation for national development.

The National Labour Commission (NLC) is established under Section 135 of the Labour Act, 2003 (Act 651). The function of the Commission includes the settlement of industrial disputes through negotiations and other effective alternative methods of dispute resolution, such as mediation and arbitration. Others are the NLC's Regulations (2006), Legislative Instrument (LI) 1822 and the Labour Regulations (2007), LI 1833. The Commission, a tripartite body, is composed of seven members under Section 136 of Act 651 as follows: A chairperson and six others, two representatives each from Government, employers' organizations, and Organised Labour. The Members of the Commission are all part-timers[23].

The Labour Department is one of the major arms of the Ministry of Employment and Labour Relations. It exists to carry out functions subject to ILO Convention No. 150 concerning the Labour Administration system, ratified by Ghana in 1986. The Convention defines Labour Administration as ''public administration activities in the field of national labour policy''.

[23] National Labour Commission, http://www.melr.gov.gh/national-labour-commission/

Accordingly, Section 1 of the Labour Act 2003 (Act 651) provides for the establishment and functions of the National Employment Service. Section 12 of the Act also mandates the Department to conduct labour inspections of workplaces[24].

The primary law and regulations that govern employment relationships in Ghana are the Labour Act 2003 (Act 651) and the Labour Regulations. The Labour Act stipulates that an employer cannot discriminate against a person on the basis of several categories, including gender, race, ethnic origin, religion, social or economic status, or disability, whether that person is already employed or seeking employment. However, discrimination in employment and occupation does occur with respect to women, persons with disabilities, HIV-positive persons, and LGBTI persons[25].

5.3.5.4 Child Labour

According to the Constitution of Ghana (1992) and the Children's Act (1998), the minimum age for employment is 15 years and the minimum age for engagement of a child in light work is 13 years. Light work is work that is not likely to be harmful to the health or development of the child and does not affect the child's attendance at school or the capacity of the child to benefit from education. The minimum age for apprenticeship is 15 years or after completion of basic education. The minimum age for hazardous work is 18 years. Hazardous work (which poses a danger to the health, safety and morals of a person) includes the following activities: going to sea; mining and quarrying; carrying and transporting heavy loads; manufacturing industries where chemicals are produced or used; working in places where machines are used; and work in places such as bars, hotels and places of entertainment where a person may be exposed to immoral behaviour. No person may engage a child in exploitative labour, the labour that deprives a child of his health, education, and development. A child may not be engaged in night work (between 08:00 p.m. and 06:00 a.m.)[26].

According to ILO Committee notes from a report of 2017, a significant number of children below 18 years of age are engaged in hazardous conditions of work in the agricultural sector, with an estimated 10 per cent of them working in cocoa-specific hazardous activities. The ILO Committee also reports information from a study carried out by ILO–IPEC that children are engaged in hazardous fishing activities and are confronted with poor working conditions. Among the children engaged in fishing activities, 11 per cent were aged 5–9 years and 20 per cent were aged 10–14 years. Furthermore, 47 per cent of children engaged in fishing in Lake Volta were victims of trafficking, 3 per cent were involved in bondage, 45 per cent were engaged in forced labour and 3 per cent were engaged in sexual slavery[27].

In Ghana, fishing is an important economic activity operated by artisanal, small- and large-scale fishers who operate in marine waters (sea and lagoons) and inland waters (lakes, rivers, and reservoirs but most significantly in Lake Volta).

Empirical evidence points to the fact that, especially in the artisanal and small-scale fisheries sector, children are engaged to work, and many are trafficked from one location to the other to engage in fishing.

The USAID Ghana Sustainable Fisheries Management Project (SFMP) conducted studies into the prevalence of child labour and trafficking in fisheries in 2015 and confirmed the existence of the problem and the need to address it, not only as part of the overall project strategy but most importantly the problem requires government action. In view of this, the Netherlands Development Organisation, SNV, an implementing partner of the project was given the task of supporting the Fisheries Commission of Ghana to develop a national policy on child labour and trafficking in fisheries.

[24] Labour Department, http://www.melr.gov.gh/labour-department/
[25] Ghana 2018 Human Rights Report, Country Reports on Human Rights Practices for 2018, United States Department of State, Bureau of Democracy, Human Rights and Labor available at https://www.state.gov/wp-content/uploads/2019/03/Ghana- 2018.pdf and accessed on 16 June 2020
[26] As above
[27] https://mywage.org/ghana/labour-law/fair-treatment-at-work/child-labour

Hence, a technical working group was established which was made up of relevant anti-child labour and trafficking agencies with a Terms of Reference (TOR) to develop an appropriate policy document. In December 2015, the team held an initial meeting to discuss the dimensions of CLaT (Child Labour and Trafficking) in fisheries. Stakeholders were consulted which included representatives from the Ministry of Gender, Children and Social Protection, the anti-Human Trafficking Unit of the Ghana Police, and the representatives of the Ghana National Canoe Fishermen Council, amongst others.

In Ghana's marine and inland fishing sector, children work on board vessels and boats, unloading catches, preparing nets and baits, feeding, and harvesting fish in aquaculture ponds, and sorting, processing, and selling fish. At the upstream level of the fishing supply chain, or other business sectors linked to fishing, child labour occurs in areas such as net-making and boat building.

The first nationwide survey indicating the occurrence of Child Labour undertaken in 2001 (GSS, 2003) found that more than 49,000 children were engaged in fishing (boys being the majority) and over 126,000 were active in mining and quarrying. The survey found that 1.3 million children were involved in Child Labour. The 2005 Multiple Indicator Cluster Survey (MICS), which investigated the prevalence of child labour, found that 34 percent of children aged 5-14 years were involved in child labour at any particular point in time.

In 2015, the USAID/Ghana SFMP survey of 36 coastal communities of the Central Region assessed the severity of CLaT to identify the root causes of CLaT. The survey indicated that among children from households engaged in the fisheries value chain, only 30 percent attended school regularly. These children engaged in fishing-related activities after school as well as during holidays. The remaining 70 percent that did not attend school regularly engaged in fisheries activities full-time.

The Child Labour situation is worse in the fishing sector because seasonal fluctuations, hazardous conditions, and high fuel prices contribute to high poverty levels. Many parents see child labour as something positive because they think that their children are learning a useful trade.

There is an increased awareness of the perils of child labour and trafficking in the fisheries sector, and recently, Ghana has prioritized the issue of child labour and trafficking as a major socioeconomic and socio-political concern. The Government of Ghana has addressed children’s welfare and taken measures towards eliminating CLaT. The Children's Act, of 1998 (Act 560) was a move by the government to reform and consolidate laws relating to children (defined as people below 18 years of age). It provides for the rights of the child and regulates child labour and apprenticeships.

The existing Fisheries Act, 2002 (Act 625) and the Fisheries and Aquaculture Policy Framework, (2008) make provisions for the regulation and management of fisheries, development of the fishing industry and sustainable exploitation of the fisheries resources and for the regulation of the marine and inland fisheries activities respectively, yet neither address CLaT. Figure 5.16 below illustrates children involved in fishing-related activities.

Figure 5. 16: Children engaged in fishing-related activities on the beach (CLaT Pra Report, 2015)

Other governmental initiatives to improve the welfare of children include such specific social protection programs as the Free Compulsory Basic Education (fCUBE), Capitation Grant, School Feeding Program, the Livelihood Empowerment against Poverty (LEAP) and the National Health Insurance Scheme (NHIS).

The integrated National Anti-Child Labour and Trafficking in Fisheries Policy takes into account national and international plans and programs across sectors—aiming to combat child labour and trafficking of children with particular reference to the fisheries sector. This Ant-CLaT in Fisheries Policy is structured around the 5 P's framework namely Policy, Prosecution, Protection, Prevention, and Partnership. The Policy is intended to include all Metropolitan, Municipal and District Assemblies (MMDAs) to incorporate CLaT issues in their plans with budget lines to reduce challenges associated with the implementation of CLaT reduction activities.

5.3.5.5 Forced Labour

The Constitution (1992) prohibits all forms of forced labour. The Labour Act (2003) also prohibits all forms of forced or bonded labour. In addition, employers are prohibited from employing a trafficked person or a victim of trafficking as defined by the Human Trafficking Act, of 2005.

The Government of Ghana has made significant efforts to eliminate trafficking by validating and implementing a national anti-trafficking action plan and expending funds allocated for the plan; prosecuting and convicting labour and sex traffickers under the Human Trafficking Act; increasing inter-agency cooperation in efforts to remove child victims from trafficking situations; adopting systematic procedures for identifying and referring trafficking victims for services; and conducting and providing support for anti-trafficking public awareness activities. The 2005 Human Trafficking Act, amended in 2009, criminalised sex and labour trafficking. However, the government reported initiating 113 total investigations into suspected human trafficking during the calendar year 2017, compared to 138 investigations in 2016. Of the 113, the Ghana Police Service (GPS) Anti-Human Trafficking Unit (AHTU) reported conducting 91 investigations of potential trafficking crimes, compared with 118 investigations in 2016. Of these 74 were labour trafficking investigations, most of which were trafficking within Ghana, and 17 were sex trafficking investigations, all of which involved cross-border trafficking[28].

[28] United States Department of State, 2018 Trafficking in Persons Report - Ghana, 28 June 2018, available at: https://www.refworld.org/docid/5b3e0b364.html [accessed in June 2022]

5.3.5.6 Fair Treatment and Equal Pay

The annual report compiled by Hays Oil and Gas and Oil and Gas Job Search, on average annual salaries in the global oil and gas industry for the year 2013, indicated that Ghanaian workers in that industry were among the least paid in the world at that time. The 2013 report looked at 24 industry disciplines and sampled more than 7,200 employers and 24,000 other respondents in the industry across 53 countries. It showed that oil and gas companies in Ghana paid the locals US$26,800 on average every year, which compared unfavourably with the US$128,500 that their expatriate counterparts got every year. This indicated a disparity of 379.48%.

At that time, tensions had been reported among local workers on various offshore facilities who were complaining about generally low salaries and pointing accusing fingers at offshore vessel owners and recruitment agencies as short-changing the locals. This resulted in an initiative by the Ghana Petroleum Commission to develop guidelines on salaries and remuneration in the upstream oil industry[29].

5.3.5.7 Summary of Human Rights Issues

An overview of the situation in the country, based on the information in the Ghana 2018 Human Rights Report[30] is provided below.

- Discrimination. The Constitution and law provide for the same legal status and rights for women as for men under family, labour, property, nationality, and inheritance laws. While the government generally has made efforts to enforce the law, predominantly male tribal leaders and chiefs are empowered to regulate land access and usage within their tribal areas. Within these areas, women were less likely than men to receive access rights to large plots of fertile land. Widows often faced expulsion from their homes by their deceased husband's relatives, and they often lacked the awareness or means to defend property rights in court.
- Education: The Constitution provides for tuition-free, compulsory, and universal basic education for all children from kindergarten through junior high school. In September 2017, the government began phasing in a program to provide tuition-free enrolment in senior high school, beginning with first-year students. Girls in the northern regions and rural areas throughout the country were less likely to continue and complete their education due to the weak quality of educational services, inability to pay expenses related to schooling, prioritization of boys' education over girls', security problems related to the distance between home and school, lack of dormitory facilities, and inadequate sanitation and hygiene facilities.
- Freedom of Expression. The constitution and law provide for freedom of expression, including for the press and the government generally respected this right. The government did not restrict or disrupt access to the internet or censor online content, and there were no credible reports the government monitored private online communications without appropriate legal authority.
- Freedoms of Peaceful Assembly and Association. The constitution and law provide for the freedoms of peaceful assembly and association, and the government generally respected these rights.
- Freedom of Movement. The constitution provides for freedom of internal movement, foreign travel, emigration, and repatriation and the government generally respected these rights. In an effort to

[29] http://www.reportingoilandgas.org/ghanaian-oil-industry-staff-among-lowest-paid-in-the-world-report/

[30] Ghana 2018 Human Rights Report, Country Reports on Human Rights Practices for 2018, United States Department of State, Bureau of Democracy, Human Rights and Labor available at https://www.state.gov/wp-content/uploads/2019/03/Ghana 2018.pdf and accessed in June 2022

curb human trafficking, however, the government in 2017 imposed a ban on labour recruitment to Gulf countries after increased reports of abuse endured by migrant workers. Media investigations during the year revealed some recruitment agencies continued their operations despite the ban.

- Torture and Other Cruel, Inhuman, or Degrading Treatment or Punishment. While the constitution and law prohibit such practices, there were credible reports police beat and otherwise abused detained suspects and other citizens. Victims were often reluctant to file formal complaints. Police generally denied allegations or claimed the level of force used was justified.

According to the Ghana 2018 Human Rights Report[31], human rights issues included arbitrary or unlawful killings by the government or its agents; harsh and life-threatening prison conditions; corruption in all branches of government; lack of accountability in cases of violence against women and children, including female genital mutilation/cutting; infanticide of children with disabilities; criminalization of same-sex sexual conduct, although rarely enforced; and exploitative child labour, including forced child labour. The government took some steps to address corruption and abuse by officials, whether in the security forces or elsewhere in the government. This included the establishment of the Office of the Special Prosecutor (OSP).

[31] CHRAJ website, https://chraj.gov.gh/human-rights/

5.3.6 Demographic Profile

5.3.6.1 National Level

The current population of Ghana is 30,832,019 (2021). Ghana's land mass is almost the same as the United Kingdom's (92,099 square miles/238,535 km^2), giving the country an overall population density of 335 people per square mile, or 129 people per square kilometre. The 2021 Ghana Population and Housing Census indicated there was a big difference between the rate of growth of the urban and rural population in Ghana, reflecting a shift of the population from rural to urban localities while at the same time portraying that some rural localities have become urban over time[32]. As of 2020, the urban population in Ghana was 57.35%, the highest percentage over the past 60 years[33].

At the time of the 2010 Census, the percentage of the male population was relatively equal (50%) to that of the female population. By 2019, the female population had slightly increased up to approximately 51%.

According to Ghana Statistical Service, in 2021 the average household size was 3.6, the lowest recorded in the last six decades, and decreased by one person (0.9) since 2010 (4.5)

The annual intercensal growth rate between 2010 and 2021 was 2.1%, the lowest since independence. The modal growth rate was 2.0%, which was recorded in the Western Region and was the ninth (9th) on the annual intercensal growth rate chart as shown below (Figure 5.17)

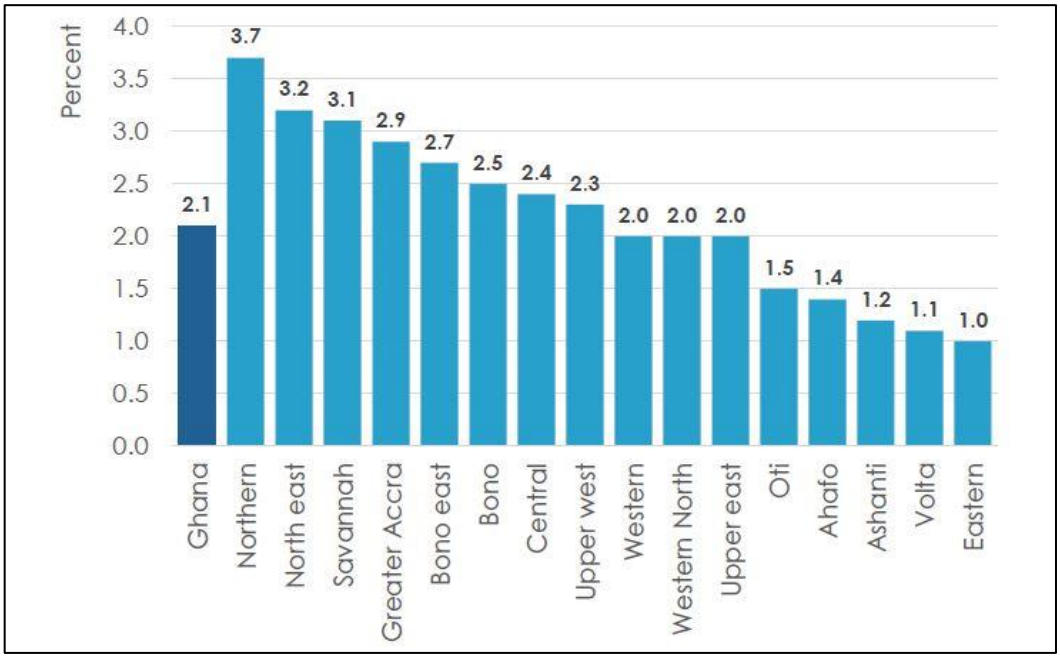


Figure 5.17: Annual Inter-Censal Growth Rate by Region

The birth rate per woman in 2020 was 3.8.[34] The life expectancy at birth for Ghana was 64 years[35] (both sexes combined), increasing from 46 years in 1960. The key human development indicators for Ghana, concerning demographics and life expectancy, are presented in Table 5.5.

[32] 2021 Ghana Population and Housing Census -Populations of Regions and Districts, General Report (Volume 3A), November 2021
[33] https://www.indexmundi.com/facts/ghana/urban-population, accessed June 2022
[34] https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?locations=GH
[35] As above

Table 5.1: Key Human Development Indicators for Ghana

Human Development Indicator	Data
Sex ratio at birth (male to female births)	1.05
Urban population (%)	57
Young age (0-14) dependency ratio (per 100 people ages 15-64)	63.4
Old-age (65 and older) dependency ratio (per 100 people ages 15-64)	5.2
Net migration rate (per 1,000 people)	45.2
Median age (years)	21.5

Source: UNDP, Human Development Report, 2019[36]

5.3.6.2 Regional and Local Level

The new Western Region (formed after the 2018 administrative reorganisation) had a total population of 2,060,585 or 6.7% of the national population (Ghana Statistical Services, 2021)[37] as compared to approximately 1.6 million at the time of the 2010 Census.

Among the 14 Districts in the Region, the Prestea Huni Valley Municipal has the highest share of the population (11.1%), whilst Mpohor District has the lowest share at 2.5%[38]. Table 5.9 shows the six districts in the Project's AoI and the associated population by gender, according to the Ghana 2021 Population and Housing Census published by the Ghana Statistical Service.

Despite the relatively similar number of males to females in the Region in 2010, there are variations in the sex ratio by District. All coastal Districts have sex ratios lower than 100.0 with Shama having the lowest (89.5).

Table 5.9: Population by Sex for the Coastal Districts, 2021

District	2021		
	Male	Female	Total
Jomoro	62,649	63,927	126,576
Ellembelle	60,586	60,307	120,893
Nzema East	48,590	46,031	94,621
Ahanta West	75,219	77,921	153,140
Sekondi Takoradi Metropolitan (including Effia-Kwesimintsim	137,598	141,214	278,812
Shama	57,210	60,014	117, 224
Total population of the Western Region*	**441,852**	**449,414**	**891,266**

Source: Ghana Statistical Service (2021). Population refers to the Western Region after the 2018 administrative reorganisation.

[36] http://hdr.undp.org/en/countries/profiles/OMN
[37] 2021 Ghana Population and Housing Census -Populations of Regions and Districts, General Report (Volume 3A), November 2021
[38] As above

In terms of population density, the highest density is in Sekondi-Takoradi Metropolis (1,847 people/km^2), which shows the metropolitan nature of this district. The following are Shama (379 people/km^2), Ahanta West (180 people/km^2), Jomoro (112 people/km^2), Ellembelle (36 people/km^2) and Jomoro (26 people/km^2) at significantly lower densities[39].

5.3.6.3 Age

The population in the six districts in the Project's AoI is relatively young, with a 40% share of the population under 15 in five districts[40]. In Sekondi Takoradi Metropolitan, 44.8% of the population is below the age of 14 with 51.9% between 15 and 64 while those above 65 are only 3.3%. The high proportion of youth leads to a relatively high dependency level in the Region. This dependency places a demand on the economically active sector of the population and thus households have difficulties in maintaining and/or improving their standards of living. Figures available in previous years' district profiles (2012) indicate that Ahanta West, Jomoro and Shama had >50% of their population aged between 15 and 64. More recent figures on the age distribution of the population in the Project's AoI have not been available.

5.3.6.4 Urbanisation

Approximately, 51.6 % of the Western Region is urbanised and the remaining 48.4% is rural (the rural/urban classification of localities is population-based, with a population size of 5,000 or more being urban and less than 5,000 being rural). The six coastal districts in the AoI show differences in terms of the number of such urban centres and, naturally, associated populations.

An overview of the urbanisation levels of the six coastal districts in the AoI is provided below.

- Jomoro Municipal. The district is the largest and has the second-highest population out of the six coastal districts. The district is typically rural with a population of 88,504 people living in rural areas. This represents approximately 69.9 % of the total district population.
- Ellembelle District. The district was carved out of the then Nzema East District, now Nzema East Municipal in December 2007 by Legislative Instrument (LI) 1918 and officially inaugurated in February 2008. Ellembelle District is among the developing areas in the country. It is predominantly rural in terms of economy and demography and currently has two Onshore Gas Processing Facilities at Sanzule and Atuabo. The District's Medium Term Development Plan 2018 – 2021 indicates that the urban population has a ratio of only 28%. Most of the communities in the district lack basic services like potable water, health facilities, decent housing, a clean environment, and quality education facilities. The district has very poor road conditions, especially in the northern part. However, the coastal areas have tarred roads.
- Nzema East Municipal. Having the least population among the six coastal districts, Nzema East has approximately 75.4% of the population living in the rural areas whilst 24.6 % are in the urban areas. There are more women in urban areas than in rural areas.
- Ahanta West Municipal. This district ranks fourth in size but has the largest population (153,140) among the six coastal districts. A large proportion of the population approximately 53.7% lives in rural

[39] 2010 Population and Housing Census, Western Region Analytical Report, Ghana Statistical Service, accessed in June 2022
[40] District Profiles published by the WRCF, available at http://wrcfghana.org/archives/publication category/information-about-the- western-region, accessed in June 2022

settlements and thus Ahanta West is a rural district despite it being located adjacent to the Western Region capital of Sekondi – Takoradi. Communities along the main road from Takoradi –Agona Ahanta – Eluobo have a relatively higher population than those farther from the main road.

- Sekondi-Takoradi Metropolis (STM). It is the third-largest city in Ghana and the Region's largest city. In December 2017, the STM was made up of four Sub- Metropolitan District Councils: Takoradi sub-metro at Takoradi, Sekondi sub-metro at Sekondi, Essikado-Ketan sub-metro at Essikado and Effia-Kwesimintsim. In 2018, Effia-Kwesimintsim Sub Metro was elevated to Municipal Assembly; hence, the assembly comprises three Sub- Metropolitan District Councils Takoradi, Sekondi and Essikado- Ketan sub metros. Over the past 20 years, STM has been constantly expanding. The greatest urban expansion occurred in the Essikado-Ketan sub-metro, followed by the Sekondi Zone, while the least urban expansion occurred in the Takoradi Zone followed by the Effia-Kwesimintsim Zone (831.46 ha). The Takoradi Zone recorded the least urban expansion because this zone has no land for further expansion as they have expanded fully in the past[2]. About 90% of the total land area in the Sekondi-Takoradi Metropolitan Assessment is the built environment. This comprises residential buildings, offices, industries, markets, educational facilities, health facilities and many others. Most of the buildings are sky-rise buildings, which indicates the high demand for land in the metropolis and the urgent need to make intensive use of the existing land. 10% of the land area in the metropolis is used for urban agriculture. This portion is located in the northern part of the metropolis. There is a continual high demand for residential housing hence the agricultural land is decreasing as people extend to these areas to build housing facilities.
- Shama District. Just slightly larger in terms of area, than STMA, Shama District is the second most urban of the six coastal districts and one of the few urban districts in the country. The 2021 Population and Housing Census indicates that approximately 64.5% of the district population was living in urban settlements. Shama District is made up of 54 settlements, which are evenly distributed within the district's boundaries. However, the major settlements are located in the coastal areas, while the minor ones are in the inland part of the district. Based on the size of the population and the services rendered, there are five major settlements in the district: Shama, Abuesi, Aboadze, Inchaban and Komfueku. The cumulative population size of these communities makes up 54.5% of the total district population. Settlements such as Shama, Aboadze, Beposo, Inchaban and Supomu Dunkwa are classified as urban while semi-urban ones are Komfoeku, Beposo and Shama junction.

5.3.6.5 Population Change

Many factors account for the movement of Ghanaians within and out of the country. Migration literature in Ghana has identified these at both the internal and international levels. Internally, the old north-south pattern continues which is fuelled by infertile soils and lack of local services in Ghana's northern sector. Accordingly, rural outmigration in northeast Ghana is for employment purposes and it is dominated by young people[41].

According to the Ghana Statistical Service (2019), the population migrating internally within Ghana was 40% and most of them (53.2%) were employed in agriculture, forestry, and fishing (33.8%) and wholesale and retail, repair of motor vehicles and motorcycles (19.4%) sub-sectors. At the national level, the percentage of the male

[41] Kennedy Atong Achakoma et al: Labour Migration Study in Ghana, 2016. ISBN: 9988-572-71-9, available at http://www.fesghana.org/index.php?page=new-publications,

migrant population (36.9%) is lower than their female counterparts (42.9%). People born at their current place of residence and that has never stayed away for a year, or more are classified as non-migrants. Close to two-thirds (63.1%) of the male population are non-migrants compared to their female counterparts (57.1%). Regionally, Upper West has the highest proportion (78.4%) of the non-migrant population, followed by Northern (75.6%) and Upper East (74.6%) with the least being Greater Accra region (45.5%).

Oil-driven growth in the Western Region has led to high expectations among communities in the six coastal districts in the AoI that they will benefit from the industry. There is population growth in anticipation of jobs and other economic opportunities associated with the oil and gas industry and a rapid increase in the cost of living (Sam and Buckle 2017). Comparisons between the 2010 and 2021 Population Census indicated that Jomoro and Sekondi-Takoradi (STMA) saw a decline in population by 15.68% and 81.26% respectively. The creation of a new district out of STMA led to a drastic reduction in the district's population. The decline in Jomoro's population could be attributed to socio-economic-driven migration. The remaining coastal districts recorded population increments ranging from 38.16% to 55.56%

The expansion in communication, energy, transportation, water and sanitation, the social interactions of people and the development of the oil and gas industry over the past years, mainly based in Sekondi–Takoradi city (one of the districts in the AoI), function as a pull factor to attract migrants into the city from different parts of the country. This contributes to the attraction of a skilled workforce, which allows the transfer of knowledge and skills in specialised sectors of the economy such as the oil and gas industry. Not many migrants return to their communities once they have left. However, as the development of the oil and gas sector off the coast continues, an additional influx of employment seekers can be expected in the region. While urban migration may not be a problem in itself, issues may arise if individuals do not have sufficient skills or funds to seek alternative livelihoods. Further, this increased demand for jobs needs to be met with sufficient employment opportunities (Sam and Buckle, 2017).

The Western Region also attracts migrant labourers due to its active mining and manufacturing (cocoa and forest products processing) (cocoa plantation) sectors, which are also present in the coastal districts.

Nzema East Municipal and Ellembelle District have seasonal migration patterns, mainly attributed to seasonal fishing activities, as people migrate to key fishing areas during the fishing season and return to their crops for the farming season. Similarly, large proportions of fishermen migrate from other coastal Districts Ahanta West District during the major fishing season which is normally between July and September.

An overview of migration patterns in the coastal districts in the AoI, based on the district reports analysing the 2010 Census data, is provided below.

- Jomoro. Out of the total approximately 51,000 migrants (26% of the district population) recorded in the district, approximately 59% of the migrants living in the district were born in another region while 41.1% were born elsewhere in the Western Region. Most of the migrants from other regions come from the central region (23.9) and outside the country (8.5%). Out of the total migrants in the district, 29.3% were residents between 1-4 years. About 22% had stayed in the district between 10 to 19 years and 18.3% had lived there for 20 or more years. With those born elsewhere in another region, the highest number of migrants came from Central Region and the second largest group was from the Volta Region. Comparisons between the 2010 and 2021 population censuses, however, indicated a general population decline of 15.68% in the district.
- Ellembelle. Out of the total approximately 19,000 migrants (16.6% of the total population) in the district,

33% had lived there for 1-4, while 16% had stayed for less than a year and 16% for more than 20 years. For the proportion of the migrants born elsewhere, in another region in the country, the highest proportion (22%) were born in the Central Region while the lowest proportion (5.4%) were born in the Greater Accra region. A significant number of the migrant population (16.2%) was born outside the country. This significant number may be attributed to the presence of refugees (from both Liberia and Cote d'Ivoire) in the district. The data also indicates that migrants who have lived in the district for between one year or less and 4 years constitute about 50 % and that may be attributable to the recent oil find located not too far from the district could have influenced this movement into the district. The current population based on the 2021 Census indicates a total district population of 120,893 – a 38.16% increase from the 2010 Census.

- Nzema East. Out of the total population, approximately 17,000 (28%) are migrants. Of the migrant population, 14.4% have spent less than one year in the Municipality, 25.2% have spent between 1 and 4 years, 17.7% have spent between 5 and 9 years and 44.7% have spent over 10 years in the Municipality. Approximately 41% of the migrants were born elsewhere in the region, while 52.9% were born elsewhere in another region. Most of the migrants (33.1%) born elsewhere in another region were born in the Central Region. In 2021, the total population stood at 94,621 thus representing an increment of 55.56% when compared to the 2010 Census.
- Ahanta West. Out of the total of approximately 30,000 migrants (21.7% of the total population) in the district, 64.3% were born elsewhere in the Western region, while 30.7% were born in another region. Out of the total number of migrants, 15.3% had lived there for less than one year. Thirty-two percent have been residents for 1-4 years and 36% for more than 10 years. The Central Region has the highest proportion (38.1%), whereas migrants from the Upper West region (0.9%) are the lowest. The oil found in the district has attracted migrants in recent years, as total migrants in the district with less than 5 years stay constitute 47.1%. Based on the 2021 Census, the Ahanta West population has experienced a general increase of 44.18% when compared with the previous Census in 2010.
- Sekondi-Takoradi Metropolis (including Effia-Kwesimintsim Municipal). Approximately 59% of the migrants living in the Metropolis were born in another region while 41% were born elsewhere in the Western Region. The highest proportion (29.5%) of the migrants in the Sekondi-Takoradi Metropolis has lived there for 1 to 4 years. The lowest proportion (15.9%) has lived there for less than 1 year. The concentration of migrants who have lived in the Metropolis between less than one year and 1-4 years could be attributed to the oil found in the region. For those who migrated from other regions in Ghana to live in the Sekondi-Takoradi Metropolis for 20 years and above, Central Region dominate with 27.7 percent followed by Northern (26.8%), and Upper West and Upper East with 26.4 percent and 25.4 percent respectively, with the least (13.9%) coming from outside Ghana1. The current population for Sekondi-Takoradi based on the 2021 Census stands at 104,837 – an estimated 81.26% reduction from the 2010 Census. This is attributable to the exclusion of Effia-Kwesimintsim Municipal from the Sekondi-Takoradi Metropolis in the 2021 Census.
- Shama. Out of the total district population, about 26% are persons who have migrated to the district. There are more migrants from the Central region than any other region, probably due to the proximity of the location of the district. Of these migrants, 20.4% percent have lived in the district for 20 years and more. The region with the smallest number of migrants in the district is the Upper West (46). The

highest proportion (24.3%) of migrants who have lived in the Shama district for less than one year is from the Greater Accra Region. Most migrants (29%) have lived in the district for 1-4 years as compared to the other categories of years. Higher proportions of the migrants are from Volta (33.7%) and Central (25.9%) Regions and have lived in the district for twenty years and more. The proportions of migrants from outside Ghana who have lived in the district for less than one year and for twenty years and above are 11.1% and 18.1% respectively. Shama district indicated a general population increase of 43.02% as of the 2021 Census.

5.3.6.6 Ethnicity and Language

In Ghana, ethnicity is characterised by one's mother tongue language. The official language of Ghana is English, and it is the main medium for teaching in schools from the fourth year of basic schooling.

Other languages spoken in Ghana include Akan, Dagaare, Dagbani, Dangme, Ewe, Ga, Gonja, and Kasem. The dominant ethnic group in Ghana is Akan, which is made up of several smaller ethnic groups, each of which has its own language.

According to the Ghana Statistical Service (2019), the majority of heads of households within the country are Akan (52.5%) followed by Mole-Dagbani (13.5%) and Ewe (12.8%) while the Mande (0.9%) constitute the smallest proportion.

- The population in the Western Region consists predominantly of people of Akan descent (the largest ethnic group in Ghana) and is dominated by two ethnolinguistic groups: the Nzema primarily occupy the western coastline whilst the Ahantas occupy the eastern coastline of the region. In addition, the area hosts people of other ethnolinguistic groups who are more recent arrivals. These groups are fully integrated members of the communities and are primarily of Ewe, Fante or Ga origin, all recognised as large ethnolinguistic groups in Ghana. Akans in the region have a high degree of cultural homogeneity, have similar cultural practices, and celebrate the same festivals.

An overview of ethnicity in six coastal districts in the AoI is provided below.

- Jomoro. The Jomoro District is predominately Akan, which constitutes 88.7%, out of which 60.5% are Nzemas and 15.4% are Fantis. About 6.0% of the population in the district are Ewe with other foreign languages forming 3.1%[42].
- Ellembelle. The 2010 Census indicated that the predominant ethnic group in the district is Akan representing 89% of the population, followed by Ewe (4%), Mole-Dagbani (4%) and Ga-Adangbe (3%). The major language spoken all over the district is Nzema with other dialects like Evalue and Gwira, Fanti and Twi being widely spoken[43].
- Nzema East. The ethnic groups in the Municipality are mainly Nzemas and Gwiras. There are other minority groups such as Ahantas, Fantes and other smaller ethnic groups. The predominant Ethnic grouping is Akan (89.0 %), Ga-Adangbe (3.0%), Ewe (4.0%) and Mole – Dagbani (4.0%). The major language spoken all over the municipality is Nzema with other dialects like Evalue and Gwira, Fanti

[42] Jomoro District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, accessed in June 2022
[43] Ellembelle District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, accessed in June 2022

and Twi[44].

- Ahanta West. The main ethnic group of the district is Ahanta consequently the main language spoken is Ahanta. However, Evalue is also spoken by the people of Egyambra, Princess Town and Princess Aketakyi and Fante by the people of Adjua, Funkoe, New Amanful and Dixcove). Other ethnic groups in the district include Nzema (5.5%), Ga-Dangme (1.03%), Ewes (3.2%), Guans (0.15%), other Akans (22.84%), Mole Dagbani (0.9%), Grusi (0.26%), Gruma (0.05%), Mande (0.06%) and other ethnic groups (0.41%). Although the District is ethnically diverse, the Ahantas and Evalues constitute the largest groups[45].
- Sekondi-Takoradi Metropolis. The distribution of the proportion of ethnic groups in the Sekondi-Takoradi Metropolis is as follows Fante 46.5%, Ahanta 12.2%, Asante 12.2%, Nzema 3.8% and Wassa 3.0%. The proportion of the rest of the ethnic groups is below 3%. The inhabitants of Sekondi-Takoradi are very friendly and exhibit hospitality. The majority of the population speak Fante but the main local dialects are Ahanta, Nzema and Wassa. English is however the official language[46].
- Effia-Kwesimintsim. The people of Effia-Kwesimintsim municipality are indigenously Ahantas. The majority of the people speak Fante but Ahanta is the main local dialect. English is, however, the official language.
- Shama. Fantes, especially the 'Asimas', are the predominant tribe in the district constituting about 80% of the population. This is followed by the Ewes (10%); Ahantas (3%) and several other smaller tribes constituting the remaining 7% of the population2. Fante is the language predominantly used in the districts[47].

5.3.6.7 Religion

The 1992 Constitution of the Republic of Ghana allows for freedom of worship; therefore, all persons have the right to join or not to join any religious organisation of their choice. The people's religious affiliation is expressed in the constitutional guarantee for freedom of worship. The predominant religion of the Western Region in 2010 is Christianity (82%) followed by Islam (9.3%). Traditional religion declined from 1.5 % in 2000 to 0.8 % in 2010 despite the traditional nature of the region's social structure.[48]

An overview of religion in the coastal districts in the AoI is provided below.

- Jomoro. Approximately 84.1% of the population are Christians (Catholic, Protestant (Anglican Lutheran), Pentecostal/Charismatic, and other Christians). The highest is Catholic (27.5%), followed by Pentecostal/Charismatic (25.4%), with Protestants/Anglicans forming 15.2% and Other Christians representing 14.0%. Islam constitutes 7.3% and persons with no religious affiliation account for 8.0% of the district population. The smallest religious group was the traditional religion, which accounts for only 1.2 percent[49].
- Ellembelle. Christians are in the majority constituting 79%, followed by Muslims (8%) and Traditionalists (0.3%).

[44] Nzema East Municipality District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, accessed in June 2022
[45] Ahanta West District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, accessed in June 2022
[46] STMA District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, accessed in June 2022
[47] Shama District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, accessed in June 2022
[48] 2010 Population and Housing Census, Western Region Analytical Report, Ghana Statistical Service, accessed in June 2022
[49] Jomoro District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, accessed in June 2022

Ten percent of the population in the district belongs to other religious affiliations[50].

- Nzema East. Pentecostal/Charismatic group constitute the highest proportion (27.4%), followed by other Christians (21.6%), Protestants (19.5%) and Catholics (13.7%). Those with no religion form 9% of the population while adherents of Islam represent 6.1%[51].
- Ahanta West. The dominant religion in the district is Christianity with 78.6% of the population professing adherence to the Christian faith. Islam forms 3.2%, those who do not profess to any religion form 15.4% while the traditionalists make up 1.6 percent of the population[52].
- Sekondi-Takoradi Metropolis (including Effia-Kwesimintsim Municipal). Pentecostal (34.7%) dominates in the religious affiliation category followed by the Protestants (25.6%) and Catholics (14.3%). Other religious affiliations in the STM include other Christians (11.8%), Islam (9.4%), traditionalists (0.2%) and other religions (0.6%). Those without religion make up 3.5% of the population[53].
- Shama. Christianity is the dominant religion in the district, and it constitutes 61 percent of the population followed by Islam at 25 percent while the other religions, including traditional religion, make up the remaining 14 percent[54].

5.3.7 Land Tenure

Ghana maintains a dual land tenure system, comprised of customary and statutory land tenure. Customary tenure is based on local practices and norms, which are flexible and vary according to location. This type of tenure is typically unwritten and managed by a traditional ruler (the paramount chief or local chiefs); a council of elders; or family or lineage heads. The principles stem from rights established through the first clearance of land, conquest, or settlement.

The National statutory land tenure system is based on officially documented statutes and regulations, formalised in a legal system that is rooted in colonial law. These laws define processes, acceptable behaviours and consequences for non-compliance. Government structures and individuals delegated with relevant authority deal with the administration of this legal system. The state-recognised land rights are allocated and confirmed through the issue of titles or other forms of registration of ownership.

Under the 1992 Constitution, the following three distinct-level land tenure systems are recognised.

- Public land is owned by the government or has been acquired by the government for public use (specifically for infrastructure development).
- Stool (or skin) land is communal land held by traditional communities or confederation of communities, including stools, skins, and families. This type of land is characterised by varying tenure and management systems.
- Private freehold land is not owned by government or traditional authorities but is held by families or groups who are members of the community.

[50] Ellembelle District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, accessed in June 2022
[51] Nzema East Municipality District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, accessed in June 2022
[52] Ahanta West District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, accessed in June 2022
[53] STMA District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, accessed in June 2022
[54] Shama District Analytical Report (based on the 2010 Population and Housing Census), Ghana Statistical Service, accessed in June 2022

The customary owners, stools, skins, clans, families and tendamba, own about 78% of the total land area in Ghana. Of the remaining 22%, the state owns about 20% percent while the remaining 2% percent is held in dual ownership: the legal estate in the government and the beneficiary/equitable interest in the community (FAO, 2003). There are no comprehensive data on land ownership and defined boundaries for 78 percent of the land held by the customary sector (FAO, 2003).

Under customary lands, there are three forms of right to land, and due to the nature of the land tenure system, an individual can hold multiple rights to one piece of land. The land use rights are described below.

- Use Rights: the right to use the land (conferred either to 'natives' or to 'settlers').
- Control rights: the right to make decisions on how the land should be used and to benefit financially from the sale of the crops etc.
- Transfer rights: the right to sell or mortgage the land; to convey the land to others through intra-community re-allocations or to heirs; and to reallocate use and control rights.

Under the traditional system, any person who wants to buy or lease land has to request permission from the chief and follow the correct traditional protocols. Family land can be bought or leased, and if leased, the family and the lessee must agree on the rent before the transaction is regarded as complete. The same applies if the person wants to buy the land and a selling price must be agreed upon. Once this transaction is completed, the buyer becomes the legal owner of the land.

Nzema land is owned by stools (Nzema East, Western and Eastern Nzema) while in the Ahanta areas (Shama, Sekondi Takoradi Metropolitan Assembly and Ahanta West) lands may be owned by stools or families. The system of inheritance in all the districts is matrilineal (mostly among Akan-speaking ethnic groups), where family members belonging to the maternal line of inheritance have ownership and control rights. The practice is that community and family members are allocated portions of this communal land for farming. Though every family or community member has access to the land, control remains in the hands of the chief, or in the case of the family – with male leaders. In apportioning land for farming, males get larger acreage than females, therefore, men grow cash crops (coconut, oil palm) while women, owing to their smaller portions, grow subsistence crops[55]. There are tenant farmers (migrants) who farm on 'abunu' or 'abusa'[56] basis in which farm produce when sold is divided into two or three parts with the landowner receiving one part (Sam and Buckle 2017).

Ownership, access, and control over land correlates with compensation received for lands acquired for oil and gas activities. Landowners who sell land get more money than those who sell crops. Usually, when the chief or family leaders get the compensation, they share among families that constitute the stool, or among the family members. A stool that receives compensation for land divides the money[57].

There is a legal obligation to distribute revenues from Stool Land (Article 267 of the Constitution and Section eight of the Stool Lands Act 1994) as follows.

- The first ten percent of the revenue accruing from Stool Lands shall be paid to the Administrator of Stool Lands to cover administrative expenses.
- The remaining revenue shall be disbursed in the following proportions by the Administrator.

[55] Females are not given control over land because when they marry, control of the land would go to their husbands who are considered 'outsiders'. However, some women own cash crops

[56] Abunu' (division by two) and abusa (division by three) are farming practices in which non-land owners are allocated land to farm sharing the farm produce or money derived from sale of produce with the land owner.

[57] As above

- 25% to the Stool through the traditional authority for the maintenance of the Stool in keeping with its status.
- 20% percent to the traditional authority; and
- 55% percent to the District Assembly within the area of authority in which the Stool Land is situated.

5.3.8 Land Use

Most of the land in the Western Region is used for the commercial exploitation of natural resources. The Region is the country's largest producer of cocoa, coconuts, palm oil, timber and gold. There are also rubber plantations (near Cape Three Point and Atuabo), a rubber-processing factory in the Agona Junction and other factories in Takoradi and Shama.

In the coastal districts, the land is mostly used for community infrastructure and subsistence farming. Most of the farming undertaken at the community level is small-scale, due to the use of traditional farming methods. This, in conjunction with the distance between the towns and farming plots, and the poor soil quality, means that many people in the communities cannot afford to farm on a larger scale.

The current majority of land use in Jomoro District is by the wetlands, subsistence farms, trees and forest. The Amanzule wetland spreads through Jomoro, Ellembelle and Nzema East and extends to the border with neighbouring Côte d'Ivoire. Industrial and residential areas are concentrated mostly along the coastal areas. Ellembelle district shares an extensive part of the Greater Amanzule wetland with Jomoro District to the west side. Large portions of the total land area of the district have forest vegetation cover (in the northern part) while the southern portion is mainly the coastline. Various settlements have spread through the entire district. Some of the very large oil and gas infrastructures are located in the Jomoro, Ellembelle and Nzema East districts.

In Ahanta West, most land in the Western Region outside forest reserves and other protected areas has been deforested and converted to agriculture. There has been an increase in demand for other land uses such as industries and housing in the district with the discovery and production of oil and gas in the Western Region. Large tracks of land are used for rubber and oil palm plantations.

In STMA, the largest land areas are dedicated to agricultural and residential use. Industrial land areas are mostly located in the northern part and the coastal area. Figure 5.18 illustrates the land use plan for the STMA until 2021 and Figure 5.19 illustrates the planned land use in 20 years. This projection shows an increase in industrial land use, which will be mostly concentrated in the coastal area. Residential areas will continue to expand, particularly towards the north of the Metropolis, significantly reducing farmland areas.

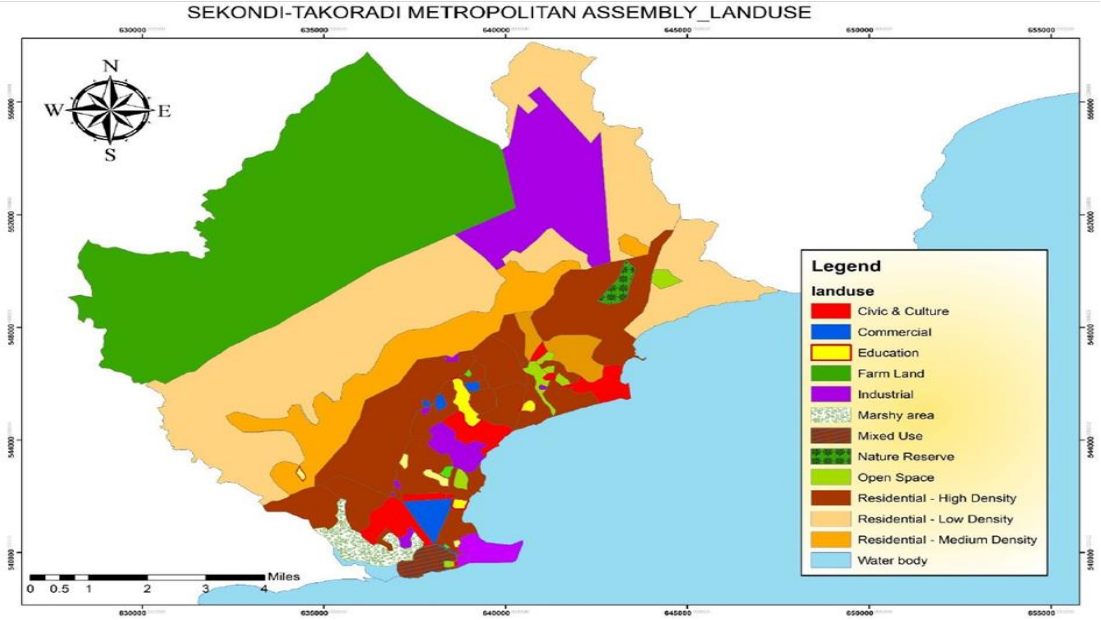
5.3.8.1 Issues Related to Land Use

The discovery of commercial quantities of oil and gas off the coast of Ghana and their development for production has led to a high increase in infrastructure projects and investments in the Western Region, particularly the six coastal districts. Large tracts of land have been taken over for oil and gas infrastructure, businesses, pipelines, roads, and areas

for machinery repair. These huge investments have had big implications for the communities who live in these areas and for their livelihoods, particularly for those who rely on natural resources (Sam and Buckle, 2017).

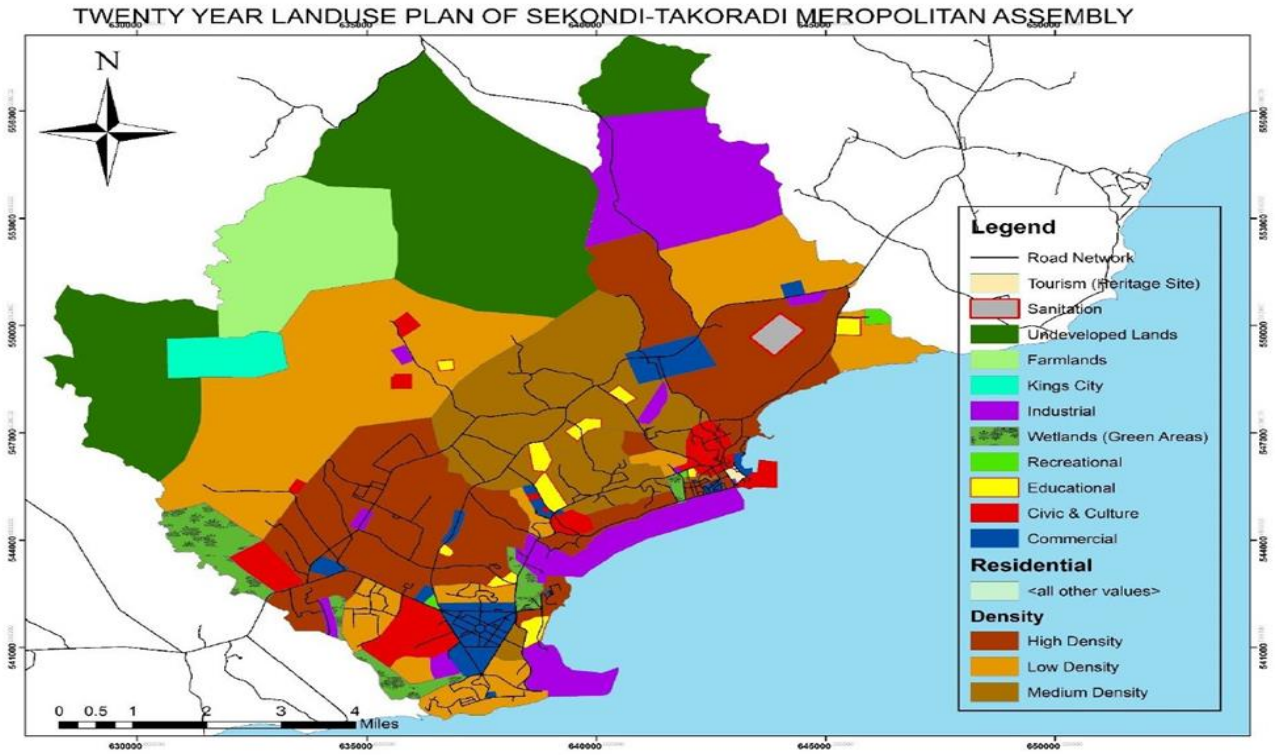
Speculative land purchases, the construction of large infrastructure for oil and gas activities and allied services are rapidly changing the landscape of the six coastal districts. Rapid conversion of agricultural land for residential, commercial, and industrial uses is displacing traditional agro-based livelihoods with negative implications for food security and the overall resilience of ecosystems in the six coastal districts (Sam and Buckle, 2017).

According to a 2015 survey, between 1,500 and 4,500 acres of fertile agricultural land had been cleared for oil and gas companies, real estate, or warehouses in the Ahanta West district alone.



Source: Sekondi-Takoradi Metropolitan Assembly, Final Draft Medium-Term Development Plan 2018-2021.

Figure 5.18: Land Use Plan for Sekondi-Takoradi Metropolitan Assembly



Source: Sekondi-Takoradi Metropolitan Assembly, Final Draft Medium-Term Development Plan 2018-2021.

Figure 5.19: Twenty-Year Land Use Plan for Sekondi-Takoradi Metropolitan Assembly

Construction of the Ghana National Gas Plant affected hundreds of coconut farmers in Atuabo (in the Ellembelle District) whose farms had been decimated by the Cape St. Paul Wilt disease. Gas pipelines stretching over 111 km through 85 communities across four districts have been laid. The Atuabo Freeport, covering 2000 acres of land, affected Anokye, Atuabo and Asemda, and Eni's gas activities affected the town of Sanzule. Of the 1,263 issues logged by WRCF in the 2016 round of community conversations, 49 land-related issues were highlighted by community members across the six coastal districts of the Western Region. The issues related to compensation, livelihood, reinstatement, and resettlement resulting from the activities of the oil and gas industry, mining, construction and plantation industries.

On compensation concerns, the Ellembele District discussed the most issues (#17, 46%) relating to their land because it hosted the Ghana Gas plant and its network of pipelines, construction of new highways and access routes to the plant, and the existence of mining or quarry operations. Communities such as Nkroful (Ellunibo, Tema and Ebanso) intensely elaborated on the oil, gas, and quarry operation's disproportionate compensation package compared to the loss of their farmland. In some cases, the compensation for land or houses affected has not been paid at all. In the Sekondi Takoradi Metropolitan area, most of the issues from Adientiem, Kansaworodo, Whindo and Ntankorful complained about the lack of compensation for landowners who have been affected by the laying of the gas pipelines (Sam and Buckle, 2017).

The issue of land acquisition, sharecropping, land tenure, exploitation of non-timber forest products (NTFPs) and land development still pose constraints to agricultural development in the Municipality. Illegal mining (galamsey) and the absence of proper land tenure arrangements have led to the devastation of large acres of

forestlands.

Loss of farmland and low compensation for crops has implications for women's economic opportunities and women's empowerment. Because their literacy rate is lower than men, women are less likely to take advantage of economic opportunities within the oil and gas industry. There is a loss of belongingness to family land where community members have to find new lands to farm on.

Furthermore, their bargaining power is weakened because having lost their land, many end up as tenant farmers with fewer rights on other people's land. Women are spending more to farm than previously. They sometimes must pay a token for these new farmlands. When previously women would walk to their farms, now they have to travel by car to new farms. In the Ahanta West District, women are travelling by car from their communities (Hotopo, Ewusiejo, Bokro) to Ayiem, a green zone area, to farm. Furthermore, women trek long hours to farms, which affects how much time they spend on household chores and family care, or where they put family care first, amount of time spent on the farm is affected, which in turn affects what they grow and how much they can sell (Sam and Buckle, 2017).

The degradation of the coastal environment affects livelihood and human settlements. Sand winning for construction has led to incursions of seawater into communities, leading to eroding coastlines and flooding that require the construction of sea defence walls. Specifically, the Ellembelle District is affected by serious sea erosion along the beach, stretching from Ankobra community to Atuabo community, flooding in Ankobra community, depletion of the mangroves on the wetlands, endangering species in the sea, especially where the Ankobra River enters the sea.

Jomoro district is a relatively low-lying coastal district and is prone to flooding. A flooding event in 2014 affected 973 houses and 10 schools in 15 communities and destroyed crops such as cassava, tomatoes, plantain, and groundnuts. Similarly, the STMA is also prone to flooding events.

Construction in flood-prone areas leads to flooding of adjoining communities, calling for the resettlement of communities in some districts, for example in Shama District. Due to the high demand for accommodation, urban areas like Shama and the Sekondi-Takoradi Metropolis have seen the development of unregulated housing projects (Sam and Buckle, 2017).

5.3.9 Economy and Livelihoods

5.3.9.1 National and Regional Economy

The Gross Domestic Product (GDP) in Ghana was 68.53 billion US dollars in 2020, according to official data from the World Bank and projections from Trading Economics. The per capita GDP in 2020 was 2,205.5 USD. The agricultural sector remains a major driving force in the development of the Ghanaian economy, despite being overtaken by the services sector in recent times. The sector continues to provide employment for almost 50% of employed persons in Ghana. However, the industrial sector, with average annual growth exceeding 10%, was a major driver of growth in the three years up to 2019[58].

The economy is expected to remain on a steady course of expansion in 2020. Focus Economics panellists project the economy will expand 6.1% in 2020 and 5.6% in 2021[59]. The impact of COVID-19 on the economy could

[58] https://tradingeconomics.com/ghana/gdp
[59] https://www.afdb.org/en/countries/west-africa/ghana/ghana-economic-outlook

possibly have affected these projections.

The main economic activities in Ghana and the largest contributors to the GDP include:

- agriculture, which includes farming, fishing, and forestry;
- industry, including mining, manufacturing, energy production and construction; and
- services, covering government activities, communications, transportation, finance, and all other private economic activities that do not produce material goods[60].

Agriculture, (including forestry and fishing) is the major industry in the Western Region (47.5%), accounting for the largest proportion of employed persons in all districts except Sekondi-Takoradi Metropolis. It is the largest producer of cocoa, rubber (including rubber processing) and coconut and one of the major producers of palm oil. Wholesale and retail, and repair of motor vehicles and motorcycles is the second-largest industry in the Region and in 13 districts. It is the most important industry in the Sekondi-Takoradi metropolis employing about 1 in 3 persons. Mining and quarrying is the second largest employer in Tarkwa Nsuaem (22.6%) and Prestea/Huni Valley (18.2%). The Western Region has considerable natural resources (minerals: gold, manganese, bauxite, forest reserves, timber, cocoa, oil palm, coconut, and recently offshore oil), which gives it a high level of economic importance within the context of the national economy, and it is the highest contributor to the country's GDP, at 55%. Other economic activities undertaken in the Region includes offshore oil & gas production, imports, and exports, and, to a limited extent, tourism.

5.3.9.2 Employment Status: National and regional level

About 1,027,594 persons aged 15 years and older are estimated to be unemployed in Ghana, out of which 57.4% are females. About seven in every 10 (70.4%) of the unemployed are located in urban areas and 29.6% in rural areas. It is observed that 114,871 (or 11%) of the estimated unemployed persons are located in the Western Region, ranking third out of the ten regions, after Greater Accra and Ashanti regions. Out of the 114,871 people in the Western Region, 59% were women and 41% were men. In addition, more unemployed (69%) were present in urban areas compared to 31% in rural areas (Ghana Statistical Service, 2019).

In terms of age, at the national level, nearly three-quarters (74.1%) of the unemployed persons are within the age group 15-34 years. The unemployment rate is highest among the 20-24 years age group (19.9%) and lowest among the 55-59 years age group (3.0%). In urban areas, 72.2 % of the unemployed population are youthful compared to 78.4 % of their rural counterparts. However, for those residing in urban areas, the unemployment rate is highest among the 15-19 years age group (28.8%). Irrespective of sex and locality type, the 20-24 age group recorded large numbers of unemployed population (Ghana Statistical Service, 2019).

The concept of time-related underemployment has been introduced to complement the statistics on unemployment. Time-related underemployed persons are those whose total actual hours worked were less than 40 hours and were willing and available to work additional hours on the job(s) in which they worked or wanted to change their work situation for different reasons. About 2.4 million persons 15 years and older, representing 21.4% of the employed population are estimated to be underemployed. Of this number, 59.3% are females and 40.7% are males. In addition, 59.3% of the underemployed are located in rural areas and 40.7% are in urban areas (Ghana Statistical Service, 2019). In terms of regional distribution, Northern Region ranks first out of the

[60] https://www.indexmundi.com/ghana/gdp_composition_by_sector.html

ten regions, with 16.1% underemployed persons, while Western Region ranks fifth with 10.7%. Slightly more women than men in the Western Region are underemployed; however, figures are comparable between urban and rural areas.

According to the 2010 Census Data for the Western Region (before the 2018 reorganisation), seven out of ten persons were economically active, while one out of three are not. Juabeso had the highest economically active rate of 83.8%, while Ellembelle recorded the lowest rate of 59.0%. Ten districts recorded economically active rates of over 70% while five (Jomoro, Nzema East, Sekondi-Takoradi Metro, Shama, and Tarkwa Nsuaem) all had values of over 60%. The Western Region had 4.1% of persons aged 15 years and over unemployed. Four districts, namely, Ahanta West, Sekondi Takoradi Metro, Shama (included in the AoI) and Tarkwa Nsuaem Municipal, recorded unemployment values higher than the regional figure, with Sekondi-Takoradi Metro having reported the highest value of 7%.

5.3.9.3 Employment Status: Districts the AoI

An overview of employment in the coastal districts in the AoI, based on the District Analytical Reports of the 2010 Census results, is provided below.

- Jomoro. About 67% of the population in the district are economically active while 32.8% are inactive. Of the economically active population, 94.3% are employed. Agriculture employs the majority of people in the district. Crop farmers and fishermen constitute 39.5% of the workforce, with males (47.8%) far exceeding females (31.7%). The second largest sector employing people is manufacturing (17.9% of the employed people). Female-dominated sectors include manufacturing with 23.9 percent, wholesale, and retail; repair of motor vehicles and motorcycles (20.4%), accommodation and food service activities (14.4%), and other service activities (4.6%). Male-dominated industries include mining and quarrying (0.4%), construction (3.1%), transportation and storage (8.8%) and education (4.2%). Private informal employment represents 91.3% of the employed population, followed by the public (government) sector (4.5%) and private formal (3.7%) employment. There are more females (95.3%) in the private informal sector than males (87.0%). The employment characteristics indicate that the employed population have low skills and they are mostly self-employed without employees. Such employment hardly generates employment for others.
- Ellembelle. Approximately 59% percent of the district population is economically active, and the rest are inactive. Out of the proportion of the economically active population, 94.8% percent are employed, with the proportion of males almost the same as that of females. Agriculture, forestry, and fishing constitute the occupation with the highest percentage of the employed population (35.2%) with the proportion of the male workers significantly higher (39.1%) than female workers (31.7%). This is followed by service and sales workers (22.5%) and craft and related trades (18.0%). Clerical support work and other occupations account for the least percentage of occupations for which people are employed in the district. Electricity, gas stream and air conditioning supply, information and communication and water supply, sewerage waste management and remediation activities represented industries recording the lowest percentages of the employed population in the district. Persons self-employed without employees represent the highest proportion of the employed population in the district (69.0%) with the percentage of females significantly higher (77.5%) than that of males (59.7%).

- Nzema East. Approximately 70% of the population 15 years and older are economically active as against 30% percent who are not economically active. Among the economically active population, 94.4% are employed whilst only 5.6 percent are unemployed. More than half (57.1%) of the employed population 15 years and older in the Municipality are engaged in skilled agriculture forestry and fishing. This is followed by manufacturing (11.2%), wholesale and retail (repair of motor vehicles and motorcycles) which employs 9.5% of the employed population. Apart from agriculture, forestry and fishing which employ 49.8% of females, manufacturing, wholesale, and retail employ 15.8% and 14.8% respectively. Approximately 65% of the people engaged are self-employed without employees. More females (69.8%) than males (59.9%) are self-employed without employees.
- Ahanta West. Approximately 75% of the population 15 years and older are economically active with 25% being not economically active. Among the economically active group, 94% are employed while 6% percent are unemployed. Agriculture, forestry and fishing is the main industry in the district that employs 38.1% of the workforce. This is followed by wholesale and retail; repair of motor vehicles and motorcycles with 17.9%; the manufacturing industry (15.6%) and accommodation and food service activities (7.5%). The distribution by sex shows that more males (42.5%) than females (34.3%) are employed in the agriculture, forestry and fishing industry while there are more females (25.8%) than males (8.8%) in wholesale and retail, repair of motor vehicle and motorcycle. Most of the population 15 years and older are self-employed without employees (63.5%) followed by those who are employees (19.9%) while the contributing family worker and the self-employed with employee(s) account for 5.8% and 4.2% respectively. A high proportion of females (75.7%) are self-employed without employees while for the same category, it is 49.3% for males.
- Sekondi-Takoradi Metropolis (including Effia-Kwesimintsim Municipal). Approximately 64% of the population aged 15 years and older are economically active, with 64.2% representing males and 63.6% representing females. Out of the economically active population, 57% are employed, male 57.3% and female 56.9%. The main industrial activities in Sekondi-Takoradi Metropolis are wholesale and retail; repair of motor vehicles and motorcycles (28.9%), manufacturing (16.8%), accommodation and food services activities (8.8%) and transportation and storage (7.8%) of the working population. A high proportion of females (39.4%) are working in wholesale and retail; repair of motor vehicles and motorcycles in industrial activities compared to 17.7% for males. The proportion of workers in the transportation and storage activity in the Metropolis is 14.9% for males as against 1.0 percent for females. Nearly half (47.2%) of the working population in the Sekondi-Takoradi Metropolis are self-employed without employees. Employees account for 36.6% of the employed population in the entire Metropolis. A greater proportion of females (63%) are self-employed without employees compared to males.
- Shama. Approximately 68.5 percent of the population is economically active and 31.5% are not economically active. Within the economically active population, 92.5% are employed and 7.5% are unemployed. Agriculture (including forestry and fishing) employs the majority (32.4%) of persons aged 15 years and older with significant proportions of both males (43.3%) and females (23.5%). After agriculture, the manufacturing sector is the second highest, which employs 23.4% of the population in the district. The manufacturing sector employs only 10.8% of the male population, compared to 33.7% of females. The construction sector employs only 4.3%, with a higher proportion of males (9.4%) than

females (0.1%). The data indicate that more females (20.9%) are engaged in wholesale and retail, repair of motor vehicles and motorcycles than males (7.8%). There are also more females (10.0%) than males (1.0%) in accommodation and food service activities.

5.3.9.4 Economic Activities: Agriculture

Agriculture (which includes both fishing and farming) is the main economic activity practised across the coastal districts, except for STM. An overview of each district's agricultural activities, based on the 2010 Census results, is provided below. Typical activities are shown in Figure 5.20.

- Jomoro. There are two main agricultural activities in the district namely, crop farming and livestock rearing. A high proportion of households are mainly engaged in crop farming (93.7%) in the district. These are engaged in growing cash crops like cocoa, coconut, oil palm and a range of food crops of which cassava and maize are the most notable. About 21% are engaged in livestock rearing while a small percentage are engaged in fish farming (0.7%) and tree planting (0.5%). In the urban areas 93% of agricultural households are engaged in crop farming and in the rural areas, the proportion of agricultural households engaged in crop farming is 94%. The proportion of urban and rural households engaged in livestock rearing was 14.3% and 23.7% respectively. The proportion of urban households (1.1%) engaged in fish farming is higher than that of rural households (0.6%). Tree planting is the agricultural activity least engaged in by agricultural households in urban (0.6%) and rural (0.4%) areas.
- Ellembelle. Agriculture continues to be the bedrock of the economy of Ellembelle District and the soil supports the cultivation of many different crops. Agro-processing cocoa has become the most predominant tree crop grown in the district because of the devastation of the coconut crop by the lethal yellowing disease (Cape Saint Paul's Wilt Disease). Other tree crops of economic importance include oil palm, rubber and citrus. Major food crops include cassava, plantain, and rice, vegetables such as garden eggs, and tomatoes as well as spices like pepper. Livestock includes cattle, sheep, goats, pigs, local poultry, and ducks.
- Nzema East. More households (77.2%) in rural areas are engaged in agriculture compared to the proportion of urban households (16.5%) who are in agriculture. Crop farming is the most common type of agricultural activity involving 94.7% of households in agriculture in the Municipality. Livestock rearing is also common in the Municipality engaging 33.3% of households involved in agriculture activities. Tree growing is not a common agricultural activity in the Municipality as only 0.3% of the households are engaged in this. Fish farming is a rare activity in the Municipality partly due to marine fishing, which is a major occupation for people in the Municipality. Only 0.2 percent of households in the Municipality engage in fish farming.
- Ahanta West. Out of the total district households, 47.2% are engaged in agriculture. Of the agricultural households, the majority (94.45%) are engaged in crop farming while 26.2% are in the rearing of livestock. Tree planting is not common in either urban or rural areas, as only 0.2% of households are engaged in this activity. Only a few (0.2%) of the households are engaged in tree planting. For the urban-rural distribution, 24.1% of urban households are into agriculture whereas 56.8% of rural households engage in agricultural activities. Crop farming is the main type of agricultural activity engaged in households in both urban (87.2%) and rural areas (95.6%). This is followed by livestock rearing which engages 25.0% of urban households and 26.4% of rural households. The predominant cash crop is oil palm cultivated on a large-scale plantation by Norpalm Ghana Limited. This is followed by rubber cultivation that is on a small scale by out growers to large-sized plantations

mostly owned by the Ghana Rubber Estate Limited (GREL). The major food crops produced include cassava, plantain, maize, yam, rice and vegetables such as carrots, cabbage, tomatoes and pepper. Food crop production is generally on a subsistence level with output per yield substantially low in the district due to traditional methods of farming that is predominantly by slash and burn with little mechanization.

- Sekondi-Takoradi Metropolis (including Effia-Kwesimintsim Municipal). Only 9.6% of the households in the Sekondi-Takoradi Metropolis are involved in agriculture. This is because the Metropolis is predominantly urban and the main economic activities are in the service and administration sectors. Out of the agriculture households, approximately 80% are engaged in crop farming and 31% in livestock rearing (some households are engaged in both). The proportion of households involved in fish farming is the smallest (0.2%). This pattern is the same in the urban and rural areas of the Metropolis. For urban areas, the majority of households are engaged in crop farming as the dominant activity (79.1%) and fish farming households the least (0.2%). This situation is the same in the rural areas, with crop farming households (87.9%), No household is engaged in fish farming in the rural communities. The most numerous livestock keepers are chicken keepers. They form 45.3% of all livestock keepers. Goat keepers are the second most numerous, forming 33.7% of all livestock keepers in the Metropolis.
- Shama. Out of the total households of the district, only 29% percent are engaged in agricultural activities. Agricultural activities by households in the rural areas of the district represent 76.4%, while in the urban areas, they constitute 23.6%. Crop farming (92.7%) constitutes the major agricultural activity, with rural and urban proportions of 94.8% and 44.3% respectively. Livestock rearing accounts for 20.5%, tree planting constitutes 3.1% and fish farming is 0.2%. More households are engaged in tree planting in urban areas (9.1%) than in rural areas (3.7%). The major agricultural activity in the urban areas of the district is crop farming representing 44.3%. Crop production is mainly on a subsistence basis and very few farmers are medium-scale producers. The major crops grown are cassava, plantain, cocoyam, maize, rice, oil palm and vegetables. Oil palm is the major cash crop produced in the district. Livestock rearing by households in the district is slightly higher in the rural areas (21.6%) compared to the urban areas (15.4%).

Plantain grown as food crops in Nzema

Cassava plants growing in Shama District

Coconut tree plantation in Jomoro

Rubber tree plantation in Ahanta West

Fish landing site in STM

Harvesting of wood for making charcoal

Source: ERM

Figure 5.20: Agricultural Activities in the Coastal Districts

5.3.9.5 Economic Activities: Fisheries

This section provides a brief overview of Ghana's fisheries sector from a perspective of its socio-economic and livelihoods contribution to the Ghana economy, based on information obtained from previous baseline descriptions

and secondary literature review, including published data from Lazar et al (2017) and the Fish and Agriculture Organisation (FAO) up to 2016 (reported in FAO, 2019[61]).

In Ghana, marine fisheries have been the most important aspect of the fishing industry in terms of local fish production, delivering more than 80% of the total fish supply. The fisheries sector contributes significantly to the local economy in the Western Region in terms of food security, employment and poverty alleviation. Nationally, the contribution of Ghana's fisheries sector amounts to 4.5% of the GDP, 12% of the agricultural GDP and 10% of the labour force (FAO, 2019).

The fishing industry in Ghana is based on resources from both marine and inland (freshwater) waters and coastal lagoons and aquaculture (Quaatey, 1997; NAFAG 2007, FAO, 2019).

There is a long tradition of both artisanal and commercial fishing in Ghana. Ghana's marine fisheries are spread along 550 km of coastline and concentrated on its approximately 24,300 km2 of continental shelf between 75 and 120 m depth. These waters form part of the Gulf of Guinea's Large Marine Ecosystem and are highly productive due to the Central West African Upwelling. This upwelling occurs twice a year: July-September (major), December-January (minor), and its strength is influenced by oceanic and atmospheric circulation. Therefore, this variability makes year-to-year fisheries productivity unreliable. The fish biomass is primarily composed of small pelagics: primarily round sardine, flat sardine, chub mackerel and anchovy. These species also support populations of larger predatory fish such as tuna, marlin, swordfish and sharks (collectively known as large pelagics). In addition to small and large pelagic fisheries, the upwellings support important demersal fisheries along the continental shelf.

The major commercial species landed are listed below.

Small Pelagics

- Round sardinella (*Sardinella aurita*)
- Flat sardinella (*S. maderensis*)
- European anchovy (*Engraulis encrasicolus*)
- Chub mackerel (*Scomber japonicus*)

Large Pelagics

- Skipjack tuna (*Katsuwonus pelamis)*
- Yellowfin tuna (*Thunnus albacares*)
- Bigeye tuna (*Thunnus obesus)*
- Swordfish (*Xiphias gladius*)
- Atlantic blue marlin (*Makaira nigricans*)
- Atlantic sailfish (*Istiophorus albicans*)

Demersal Species

- Cassava croaker (*Pseudotolithus senegalensis*)
- Bigeye grunt (*Brachydeuterus auritus*)

[61] http://www.fao.org/fishery/facp/GHA/en#CountrySector-SectorSocioEcoContribution

- Red pandora (*Pellagus bellottii*)
- Angola dentex (Dentex angolensis)
- Congo dentex (*Dentex congoensis*)
- West African Goatfish (*Pseudupeneus prayensis*)

Shellfish Species

- Cuttlefish (S*epia officinalis)*
- Squid (*Loligo vulgaris*)
- Octopus (*Octopus vulgaris*)
- Lobster (*Panulirus regius*)
- Deep-sea rose prawn (*Parapenaeus longistrostris*)
- Shrimps (mainly *Penaeus notialis, Penaeus kerathurus, Parapeneopsis atlantica*)

The marine fisheries sector comprises four main fishing subsectors (Lazar et al 2017).

- Artisanal fisheries.
- Inshore fisheries.
- Industrial Trawl fisheries.
- Tuna or large pelagic fisheries.

These are described in the following sections:

5.3.9.6 Artisanal Fisheries

The artisanal fishery involves the use of canoes or dug-out wooden boats with inboard or outboard engines. The fishing gears are diverse, including beach seine nets, purse seine nets, set nets, drift gillnets, and hook and line[62]. The small-scale or artisanal subsector accounts for about half of the total marine catch in Ghana which makes it important for the sustainability of the fisheries sector. Within the continental shelf, fishing is carried out by an important artisanal sub-sector operating from about 186 fishing villages and 292 landing beaches along 26 coastal metropolitan, municipal and district assemblies in the four coastal regions of Ghana (Lazar et al, 2017). Figure 5.21 shows a landing site located in the Western Region of Ghana.

[62] Article Determinants of Catch Sales in Ghanaian Artisanal Fisheries, published in January 2019, Sustainability 2019, 11, 298; doi:10.3390/su11020298, available at https://www.mdpi.com/2071-1050/11/2/298/ and accessed in June 2022

Figure 5.21: Fish landing site in the Western Region

Source: ESL Consulting Ltd (2021)

Artisanal fishers operate anywhere in the Ghana Exclusive Economic Zone (EEZ), although most fishermen operate in the inshore, shelf waters and do not venture out into the deeper offshore waters. However, artisanal fishermen have been observed in deeper waters near drilling installations. This could be a result of the fishermen believing the lights around the MODU attract fish and reduce catch (Attah 2018). Ghana also has an Inland Exclusion Zone (IEZ), which goes from 0 to 30 m depth. No industrial vessels are allowed into the IEZ, although it is reported that they do enter this zone, sometimes interfering with artisanal fishing activities (Lazar et al, 2017).

Artisanal fishers are mobile following the small pelagic fish stocks that in turn are dependent on the location of the upwelling, which can vary along the coast during the fishing season (Marquette et al 2002). The subsector is composed of multiplicity and high numbers of gears operated from a variety of sizes of dug-out canoes, powered by outboard motors with engines up to 40 hp (Lazar et al, 2017).

The 2016 fisheries statistical survey (known as a frame survey) estimated 11,583 active fishing canoes in the artisanal fisheries in Ghana. The artisanal fishery is open access with numbers fluctuating from 11,000 to 13,000 in the last 10 years due to migration and new entry, exit and regional migrations (Lazar et al, 2017). The government is trying to strengthen fisheries management and minimise overfishing through registration of all operation artisanal canoes.

Artisanal nearshore beach seine fishing uses locally constructed dugout canoes, paddles and nets. Equipment is purchased by a single boat owner and operated by a crew of between 30-40 individuals. Canoes are manned by a crew of between 9-15 individuals using paddles to travel between 200 m-800 m out to sea, before dropping nets and hauling them in by hand. Beach crews (often everyone including the boat crew) pull nets into shore using ropes, with between 30 and 50 individuals (including those that help with big catches) taking 4 to 7 hours to pull in a catch. Fishing is managed by a chief fisherman located in each village, responsible for determining where (beach segments and fishing grounds) and when (time slots) different fishing companies can fish, along with managing any disputes between fishing groups.

Artisanal offshore fishing uses the same type of dugout canoes (albeit slightly larger than beach seine canoes) but with an outboard motor. Offshore fishing is conducted 15 km from the shore at a bathymetric depth of 80 m but there are reports of offshore artisanal boats fishing around the MODU that is at distances of beyond 60

km from the shoreline. Offshore boats travel a distance of approximately 90 km along the coast, anywhere between Half Assini to the west of Ellembelle District to Cape Three Points and Princess Town to the east in Ahanta West District. Offshore crews of around five individuals per boat fish between 20 and 48 hours at a time. Offshore fishing companies do not appear to have specific fishing grounds and may land their catch anywhere depending on the currents.

The artisanal fishery plays an important role in coastal communities by providing employment, income, and a cheap source of protein. The major challenges they face are seasonality, small margins and low returns. The sector's performance is critical for the growth, economic development, and sustainability of the coastal communities. The returns accruing to artisanal fisheries are affected by several factors including limited value addition and consequent post-harvest losses, weak backwards-forward market linkages, poor infrastructure, low bargaining power, as well as low and lack of variety of catch. Expenses associated with fishing activities include fuel, food, labour, taxes, and other variable overheads.

Women are important players in the small-scale fisheries subsector in developing countries. Their participation rate in pre- and post-harvesting activities is estimated at 48%, and in Ghana, it is around 40%. Women's participation in the subsector is higher if only post-harvest is considered. In particular, women in Ghana have a vital role in the informal financing of fishing operations, partly due to a lack of access to financial support from other channels like bank loans. The marketing system and remuneration for the artisanal fishery take a number of forms. A proportion of the catch goes to wealthy middle-women, often known as 'fish mothers' or 'fish mongers' to cover any pre-financing arrangements; a portion is sold or given to the boat owner to cover fixed costs (boat and fishing gear); hired labourers may receive a portion of the catch as wages; and smaller portions are shared. Thus, fish may be sold through fish mothers as well as other female fish value chain agents including fish processors, fish retailers, food vendors, relatives, and spouses. Some spouses may also be fish mothers. Selling fish catch to fish mothers has less risk as it is a cash market, and usually, fish mothers can buy high volumes of fish landed. Fishers can obtain higher prices, especially from fish mothers who primarily serve distant regional, national, and in some cases international markets.

However, there are some disadvantages to selling to fish mothers. Fish mothers have often used their financing leverage to acquire and own fishing equipment used by the fishers and therefore control the production chain[63].

5.3.9.7 In-shore Fisheries

The inshore (or semi-industrial) fishing fleet consists of locally built wooden vessels fitted with inboard engines of up to 400 hp ranging between 8 m and 37 m in length. Vessels with lengths less than 12 m are referred to as small-sized while those between 12 and 22 m are referred to as medium-sized vessels (FAO, 2010). There are approximately 224 inshore vessels operating from seven landing centres. There are currently no shrimpers (Fisheries Commission, 2022).

These vessels are multipurpose and are used for both purse seining and bottom trawling. They operate as purse seiners during the upwelling periods and switch to bottom trawling for the rest of the year. They tend to fish in the same coastal waters as the artisanal fleet during the upwelling seasons.

The fleet exploits both small pelagic and demersal species. The purse-seiners target the small pelagic species

[63] As above

including Sardinella species, and chub mackerel, fishing in the same coastal waters as the artisanal fleet during the upwelling seasons.

Demersal species are targeted through trawling, with the small-sized vessels targeting species including grey triggerfish. The medium-sized trawlers exploit seabreams (blue spotted seabream and canary dentex), snappers (e.g., golden African snapper, Gorean snapper), grunts (e.g., bigeye grunt), croakers (e.g., red Pandora, cassava croaker) and groupers (e.g., white grouper) (FAO, 2010). Bottom trawling is undertaken in waters greater than 30 m depth and less than 75 m depths.

5.3.9.8 Industrial Trawl Fisheries

The industrial fleet comprises large, steel-hulled, foreign-built trawlers, shrimpers, tuna bait boats (pole- and line) and tuna purse seiners. The industrial fleet underwent an expansion in numbers after 1984 when the policy of the Government of Ghana targeted industrial fishing as a mechanism for promoting non-traditional exports. The registered and licensed number of industrial trawlers reached 90 in 2016[64] but there are 76 active vessels currently[65].

The industrial fleet has freezing facilities for preserving fish at sea and can stay for months at sea. With the introduction of the Fisheries Act 2010 pair trawling has been prohibited.

Trawlers are normally over 35 m in length and have engines of over 600 hp. As deep-sea vessels, they are required by the Fisheries Act of 2002 (Act 625) to operate outside the IEZ, i.e., in waters greater than 30 m depth, but as they cannot trawl in depths greater than 75 m their operational area is limited (FAO, 2010).

The trawlers mainly exploit the valuable demersal, including sole and flounders, groupers (e.g., white grouper) and cuttlefish (e.g., common cuttlefish) as well as shrimps and pelagic tunas. They also target other species including porgies or seabreams, jacks (e.g., false scad), snappers, croakers (e.g., cassava croaker), goatfish (e.g., West African goatfish) (FAO, 2010).

In the past, commercial shrimpers were up to 30 m in length with engines of over 350 hp and restricted by law to operate between latitudes 1° 45' W to 2° 30' W and 0° 15'E to 1° 12' E (between Shama and Axim) and in waters with a greater depth than 30 m. Commercial shrimping resumed in 1986 and the number of vessels increased to 22 (16 operational) by 1996 with the majority of shrimp landings being exported to Europe and the Far East. Shrimp production has declined since 1996 and there are only two shrimpers in Ghana at present, neither of which has been operational since 2009 with no shrimp landings recorded for 2009 or 2010. Many shrimping companies have converted their vessels to target other species. Despite Turtle Exclusion Devices (TEDs) being compulsory for shrimpers according to the Fishers Regulation 2010, Section 16, it is reported that not all these vessels use them (FAO, 2010).

[64] The trawl fleet is mainly operated by the Chinese under joint venture arrangements.
[65] Fisheries Commission, 2020. Fisheries Management Plan of Ghana: A National Policy for The Management of the Marine Fisheries Sector. Ministry of Fisheries and Aquaculture Development.

5.3.9.9 Tuna or Large Pelagic Fisheries

There are 30 tuna fleets operating in Ghana, consisting of 14 bait boats and 16 purse seiners (Fisheries Commission, 2020). They are licensed by the Fisheries Commission and managed by the International Commission for the Conservation of Atlantic Tunas, ICCAT, and operate offshore.

Most tuna vessels operate outside the continental shelf, with an area demarcated by FAO as "Major Fishing Area 34" being the main fishing location and tuna fishers usually fish in 60 to 450 m of water. The tuna fishing vessels catch mainly yellowfin tuna, skipjack tuna and bigeye tuna. Most tuna vessels are operated on a joint venture basis, with Ghanaian owners owning at least 50 percent of the shares, as required by the Fisheries Act 625 of 2002 (FAO, 2010). Table 5.10 summarises the fleets that exploit marine resources in Ghanaian waters.

Table 5.10: Ghanaian Fleet Exploiting Marine Resources in Ghana

Fleet	Vessel Type	Target Species	Gear	Number
Artisanal	Canoe up to 20 m	Small pelagics	Purse seine Gill nets	11,583
		Demersal	Hook and line, Bottom set net	
		Some large pelagic	Drift Gill Net	
Inshore	Small inboard boat (8-37 m)	Small pelagics	Purse seine	224
		Demersal	Trawl	
Industrial Trawl	Large Steel vessel	Demersal	Trawl	76
Tuna	Industrial vessels	Large pelagics	Purse seine	30
			Pole and Line	

Source: Fisheries Commission 2022

5.3.9.10 Illegal Unregulated and Unreported (IUU) Fishing in Ghana

There has been a decline in marine fish landings in Ghana impacting negatively on the livelihoods of fishing communities along the coast. A major contributing factor to the decline in fish stocks is illegal fishing practices in the fisheries sector because of weak law enforcement, competition among the fleet and perceived unequal treatment across the artisanal, semi-industrial, and industrial sectors. Illegal fishing is basically an infringement of regulations by licensed or legal vessels, or fishing activities by unlicensed vessels in a managed location.

Ghana is faced with several forms of IUU fishing practices, including the use of illegal fishing gears, overexploitation, overcapacity, light fishing, fishing with explosives, and illegal transhipment at sea, locally called 'Saiko'.

Saiko is the practice where industrial trawlers target the staple catch of small-scale canoe fishers and transfer it to specially adapted larger canoes at sea for sale at the local markets. An estimated 100,000 MT of fish were sold at landing sites in the country from Saiko activities in 2017, of which about 80 percent was reportedly landed

at the Elmina fishing harbour in the Central Region. Locally registered vessels co-owned by the Chinese have been noted as the main offenders in illegal fishing activities.

The substantial catch of small pelagic fish through saiko is unreported and not included in marine fishery statistics. Juveniles make up a significant portion of the Saiko catch, affecting the viability of the stock. Recent assessments suggest that Ghana's small pelagic fishery may collapse in the short term[66].

The transhipment of fish at sea from Ghanaian industrial fishing vessels to canoes is prohibited in Ghana's 2010 Fisheries Regulations. Lack of enforcement means that industrial trawlers lack the incentive to reduce their bycatch and artisanal fishers are demotivated to address their own destructive fishing practices. The saiko industry employs significantly fewer people than the artisanal sector, with 1,500 versus two million in the artisanal sector[67]. An average saiko canoe lands in a single trip the equivalent of around 450 artisanal fishing trips. While the Saiko industry has expanded rapidly, the catches of the artisanal fishery have been declining despite the increased fishing effort[68].

IUU has a regional dimension, and a regional approach and solutions are important to combat the problem. Besides national efforts by the Fisheries Commission, a regional fisheries organisation comprising Benin, Cote d'Ivoire, Ghana, Liberia, Nigeria and Togo, the Fisheries Committee for the West Central Gulf of Guinea (FCWC) was established in 2007 to facilitate cooperation in fisheries management between the member countries. The member States of the FCWC, within their national legal frameworks, have either banned transhipment at sea or require special authorisation. FCWC Conventions only permit transhipment at sea in emergency situations.

5.3.9.11 Fishing in the Six Coastal Districts in the Western Region

The two main types of fishing conducted in the villages in the six coastal districts in the AoI are nearshore beach seine fishing and artisanal offshore fishing. Commercial fishing and large vessels operating from the Sekondi-Takoradi Port can also be found in local waters. In addition to fishing, fishing-related activities such as fish processing and sale and coastal gathering are widely present in the coastal districts.

5.3.10 Economy

The Western Region is endowed with considerable natural resources, which gives it significant economic importance within the context of national development. It is the largest producer of cocoa, rubber, and coconut. The rich tropical forest makes it one of the largest producers of raw and sawn timber as well as processed wood products. A wide variety of minerals, including gold, bauxite, iron, diamonds, and manganese are either being exploited or are potentially exploitable. The recent discovery and production of oil and gas in commercial quantities have made the region the oil hub of the country.

An overview of fishing in the coastal districts in the AoI, based on 2010 Census Data, is provided below.

[66] Lazar, N., et al. (2018). Status of the small pelagic stocks in Ghana and recommendations to achieve sustainable fishing 2017. Scientific and Technical Working Group. USAID/ Ghana Sustainable Fisheries Management Project (SFMP). Coastal Resources Center, Graduate School of Oceanography, University of Rhode Island.
[67] Stop Illegal Fishing, TM-Tracking, FCWC Secretariat (2022). Transhipment: Issues and Responses in the FCWC Region.
[68] Stop Illegal Fishing, TM-Tracking, FCWC Secretariat (2022). Transhipment: Issues and Responses in the FCWC Region.

- Jomoro. Fishing plays an important role in the economy of the Jomoro District. It employs about 20% of its labour force and contributes to almost 50% of the total protein requirements. Active fishing activities occur in about 28 fish landing sites dotting the coast of Jomoro District. Fish landings have declined over the last 15-20 years, attributable in the first instance to a simple increase in population leading to over-fishing.
- Ellembelle. The district has 31 landing beaches, out of 90 in the Western Region. The major marine fishing season is between July and September with the minor season occurring in November-January. The common types of fish landed include sardinella and tunas. Fishing in the district is seasonal. During the major fishing season, economic activities in the district become very brisk with a lot of in-migration into the district capital. However, during the off-season period, there is a recession in economic activities, thus, creating seasonal unemployment among the population, which adversely affects the revenue of the District Assembly.
- Nzema East. The Municipality is a major player as far as marine fishing in the country is concerned. Of the 90 landing beaches in the Region, 13 are found in the Municipality. According to the 2016 Canoe Frame Survey (see Table 5.8), the Municipality had four fishing villages, 657 canoes, and 452 outboard motors. A comparison of data from previous years also indicates that the number of canoes in the Municipality is on the rise. This increase coupled with the use of unapproved fishing methods could lead to a decline in fish catch and thus negatively affect the economic wellbeing of fishers. The major fishing season is between July and September with minor seasons occurring in November to January. The common types of fish landed are sardinella and tunas. Considering the critical role of marine fisheries in the Municipality, the 2018-2021 MTDP identified it will be beneficial to provide coastal infrastructure such as modern fish landings and processing facilities. During the major fishing season, there are high levels of economic activity in the Municipality, especially in Axim. However, during the off-season, there is a recession in economic activities and unemployment levels rise.
- Ahanta West. Fishing activities are also very important economic activities for the people of the coastal areas in the Ahanta West District. Dixcove village in this district is noted all over the Western Region for its catch of sharks, tuna and lobsters. It is one of the oldest and most well-known fishing communities in the country. Other important fishing communities include New Amanful, Funkoe, Butre, Princess Aketekyi, Akwidaa, Busua, Adjua, Asemkor, Egyambra, Miemia and Cape Three Points.
- Sekondi-Takoradi Metropolis. Approximately 6% of the population is engaged in fishing, which is the most important activity of the agricultural sector. Fishing infrastructure includes the Albert Bosomtwi – Sam Fishing Harbour (built-in 1999), which is managed as part of Takoradi Port. It is located in Sekondi, approximately 25 km West of Takoradi Port and just North of Sekondi Naval Base. The Fishing Harbour comprises the Inner Fishing Harbour, the Canoe Basin, and the Outer Fishing Harbour (see Figure 5.22)
- Shama. Fishing activities are clustered into eight main zones: Shama Apo, Shama Bentsir, Anlo Beach, Samanadze, Abuesi-Abuesi, Amena Ano, Kesewo Kan and Broni-Bema landing beach. However, Aboadze, Abuesi and Shama are the main landing beaches with 1,500 registered seaworthy canoes.

Source: ESL Consulting Ltd (2020)

Figure 5.22: Fish Landed at Sekondi Fishing Harbour

Table 5.11: Districts Summaries of 2016 Canoe Frame Survey

District	Fishing Villages	Landing Beach	Pursing Nets	Beach Seine	Line	Set Nets	Ali Net	Drifting Net	One Man Canoe	Canoes	Total Motors	Fishermen
Shama	3	10	307	32	4	258	202	283	0	1,086	1,037	7,710
Sekondi-Takoradi	6	6	155	2	134	339	29	5	0	664	646	4,542
Ahanta West	20	20	174	26	112	400	68	264	63	1,107	794	6,031
Nzema East	4	13	176	13	119	224	22	66	37	657	452	5,405
Ellembelle	14	14	1	84	0	36	0	0	4	125	23	3,300
Jomoro	25	26	189	83	0	41	92	0	0	405	353	6,614
Sub-Total Western Region	**72**	**89**	**1,002**	**240**	**369**	**1,298**	**413**	**618**	**104**	**4,044**	**3,305**	**33,602**
Grand Total	**186**	**292**	**3,346**	**1,084**	**1,344**	**3,729**	**1,052**	**836**	**192**	**11,583**	**9,122**	**10,7518**

Source: Fisheries Commission, 2022

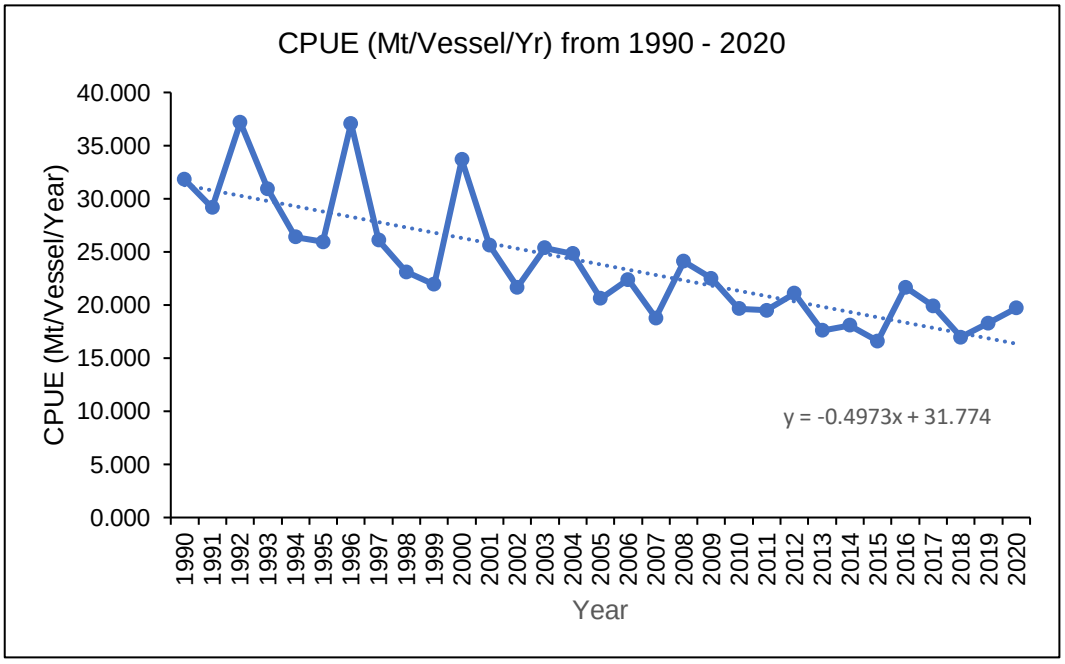
5.3.10.1 Fish Landings

Currently, the Ghanaian coastal fishing industry is plagued with declining fish stocks, overfishing, marine pollution, mangrove degradation, poor compliance and ocean acidification, and illegal, unregulated, and unreported fishing ((Dovlo et al. 2016; Lazar et al., 2018). The decline in pelagic stocks is said to be caused by the open-access nature of the artisanal and semi-industrial sectors. Illegal fishing and transhipment, known as 'Saiko', are also reported to contribute to the decline in pelagic stocks. This catch is reported to consist of a high proportion of juveniles (Environmental Justice Foundation, 2020).

The marine fisheries sector is estimated to generate approximately US$1 Billion in total revenue each year (World Bank, 2013), however, its contribution to the nation's gross domestic product (GDP) has declined from 1.5% in 2015 to 0.9% in 2019 due to largely overexploitation of the fisheries resources (Ghana Statistical Service, 2020).

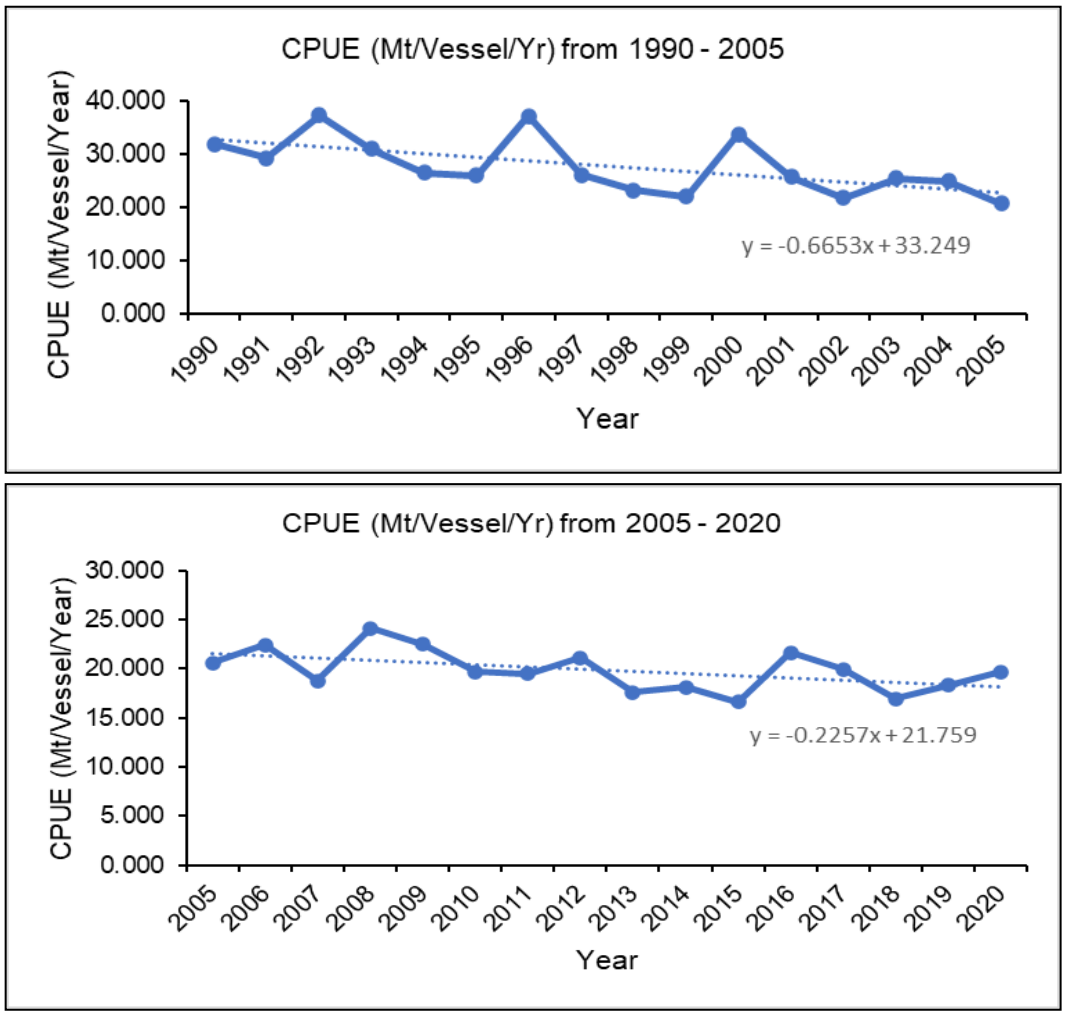
Of the 309,320 metric tons of fish caught in 2019, catch from artisanal fisheries make up about 170,149 metric tons which is about 55% of total marine capture fisheries. 44% of this is by motorised canoes while the remaining 11% is by non-motorised canoes. It is estimated that catch by motorized canoes is 10.60 metric tons per vessel while the catch by non-motorised canoes is 23.85 metric tons per vessel. (Fisheries Commission, 2020).

Figure 5.23 shows the Catch-Per-Unit-Effort (CPUE) from 1990 to 2020 from the Fisheries Commission of Ghana. It consists of the CPUE of the canoe, semi-industrial and industrial trawler sectors. The CPUE describes the catch in tonnes per vessel in a year. The figure shows a general decline in fish stocks over the past three decades (1990 - 2020). Wider fluctuations were evident during the first decade (1990 - 2000) compared to the latter two decades, indicative of diminishing stock due to overfishing. Figure 5.24 shows a rapid decline in stocks from 1990 to 2005 and a slower decline from 2005 to 2020.



Source: Fisheries Commission of Ghana, 2022

Figure 5. 23: Catch-Per-Unit-Effort (CPUE) from 1990 to 2020



Source: Fisheries Commission of Ghana, 2022

Figure 5.24: Varying stock declines from 1990 to 2005 and from 2005 to 2020

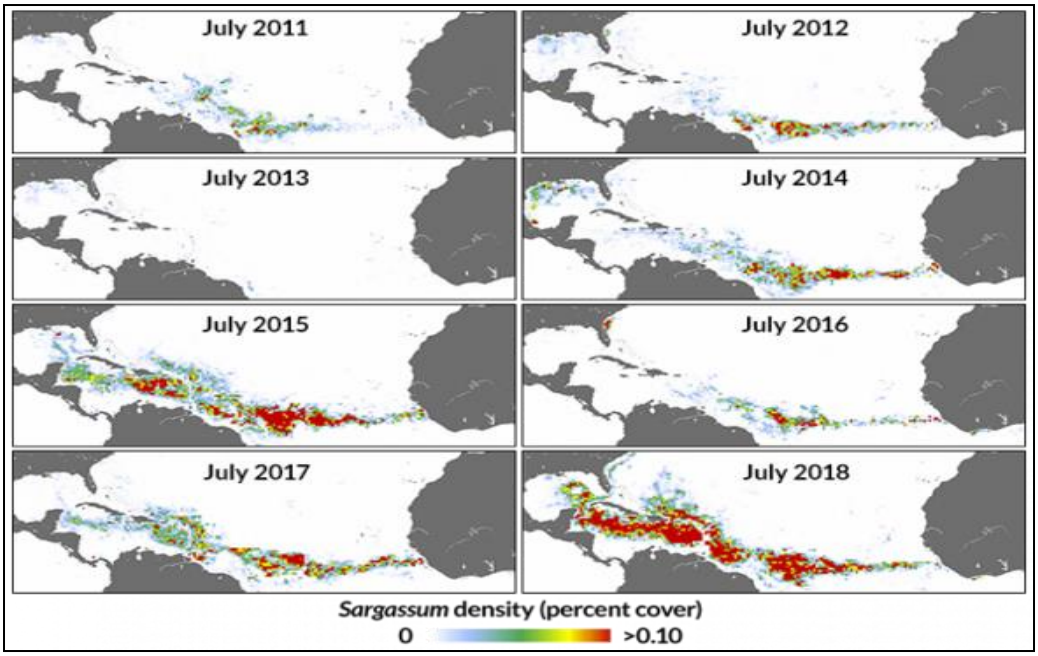
5.3.10.2 Presence of Sargassum and Perception of Fishing Communities

The arrival of Sargassum species on the beaches and in estuaries in the coastal regions of Ghana especially the Western Region was reportedly first recorded in 2009 (Addico & deGraft-Johnson, 2016). Since then, there have been several other incidents which have impacted negatively biodiversity, tourism, and the livelihoods of coastal communities, especially the fishing communities whose livelihoods are dependent on the fishing industry.

In Ghana, two indigenous rooted species of Sargassum have been recorded, namely *Sargassum vulgare*, and *Sargassum filipedula.* The species invading washing up on the coast are not rooted to the substratum but float in the open sea similar to those found in the Sargasso Sea in the Western Atlantic tropical region of the Northern Hemisphere (Szechy et al., 2012). The two exotic floating species of Sargassum have been identified as *Sargassum natans* and *Sargassum fluitans*.

Recent studies indicate that eutrophication of coastal waters off the Amazon Estuary leads to a disproportionate flourishing of the Sargassum sp. which are carried by the Equatorial counter-currents in large quantities to the Western

coast of Africa, in particular the Guinea coast (Figure **5.*25***25).



Source: UNEP, 2021

Figure 5.25: Record of Sargassum invasions across the Atlantic to West Africa from 2011 to 2018

Observations indicate that the beaching of Sargassum is prevalent on gently sloping beaches, especially along the western coast of Ghana. The first large influx of sargassum was reported in 2011 and the largest to date was in 2021 (see Figure 5.26) with other reports of further large quantities beaching between 2021 and 2022. The beaching of sargassum on the shores of Ghana, especially the Western Region, does not appear to be seasonal and can occur several times a year.

Source: ESL, 2021

Figure 5.26: Sargassum on the beach of a village in the Western Region (ESL, 2021)

With the first large deposition of sargassum along the shorelines of Africa and Ghana occurring in 2011, a few months after the start of commercial production of oil in Ghana, there was the perception amongst fishermen from villages in the coastal villages of the Western Region that these two events were linked. That perception still persists, and the fishing communities blame the oil and gas operators for the influx of sargassum on the shores of the coastal villages. The local fishermen believe the drilling activities scrape the seabed which dislodges attached seaweeds from the seafloor which are carried by the current waves to the shores.

Sargassum influxes negatively impact human well-being, activities, and livelihoods. Key areas that are impacted include the livelihoods of people living on the coast, marine transport, fisheries, and tourism. The large quantities of sargassum damage the aesthetic appeal of beaches and inhibit access to nearshore fishing. Beach seining, being the dominant artisanal method of fishing in the Western Region (up to the West of Axim), is affected by beached sargassum. Fishermen are unable to go over the beached sargassum to set their nets and have no space to drag the net onshore.

Partnerships have been developed among universities in Ghana, the Caribbean, and the United Kingdom to strengthen capacity and research on sargassum monitoring, reporting, management, value assessment and re-use (sartrac.org). This seeks to find a lasting solution to the sargassum, its scientific composition and possible uses for the future.

5.3.10.3 Oil and Gas Activities

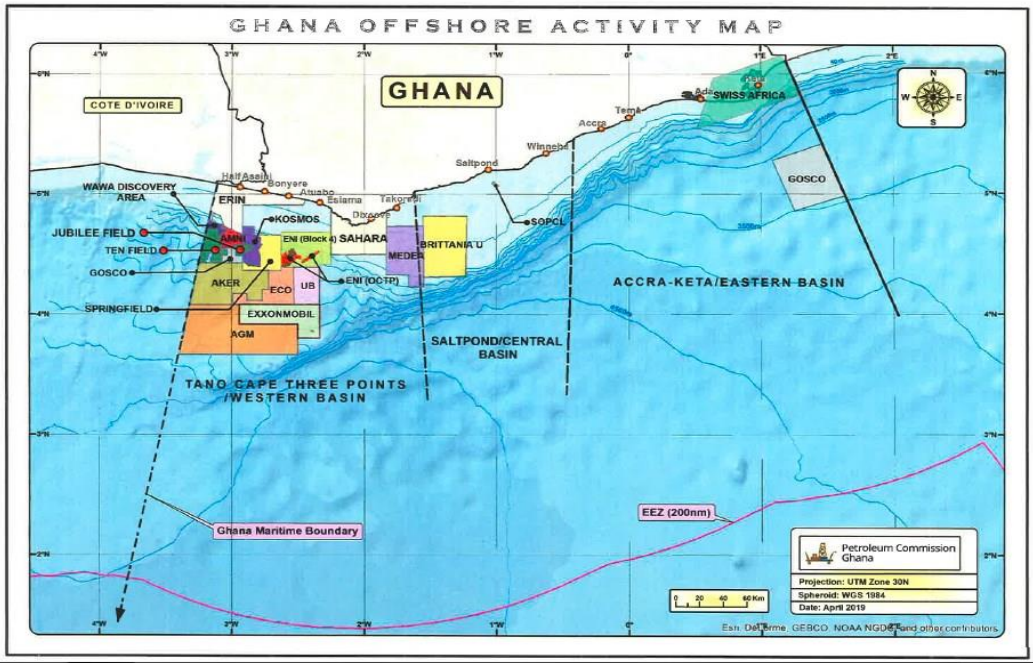
The discovery of oil and gas off the coast of Ghana's Western Region in 2007 greatly changed the country's development trajectory. Production began in 2010 and rapidly accelerated to reach 100,000 barrels per day in just four years[69]. Ghana's oil production is set to more than double over the next four years thanks to new fields coming on stream. Ghana's oil and gas industry is helping position it among the continent's fastest-growing economies[70].

Ghana has three offshore and one onshore petroleum basins, which comprise the Tano-Cape Three Points Basin/ the Western basin; the Saltpond Basin / central basin; Accra–Keta Basin / eastern basin and the onshore Voltaian Basin. The Western Basin is currently the most active of the four basins and includes the Deepwater Tano and Cape Three Point basins. The Jubilee Field straddles Tano and Cape Three Points, the TEN Fields are located in Tano, and the Sankofa Field is located in Cape Three Points. The Central Basin has Ghana's longstanding Saltpond field. The Eastern Basin includes both Accra and Keta Blocks, where exploration has been carried out without much commercial result to date. Lastly, the Voltaian Basin covers 40 per cent of Ghana's land mass and may have the potential for onshore petroleum extraction (Oxford Institute for Energy Studies 2018). Currently, there are 16 Operators with Petroleum Agreements in 17 Contract Areas as indicated by the Petroleum Commission of Ghana[71]. Figure 5.27 illustrates offshore concession areas as of 2019.

[69] Western Region Coastal Foundation website, https://www.dai.com/our-work/projects/ghana-western-region-coastal-foundation-wcrf

[70] Online article By Patrick Kwabena Stephenson in Accra and Honoré Banda, Posted on 3 September 2019, updated on 8 October 2019, available at https://www.theafricareport.com/16814/ghana-oil-production-to-double-to-over-400000bpd-in-next- four-years/

[71] https://www.petrocom.gov.gh/upstream-operators/



Source: Ghana Petroleum Commission (2019), https://www.petrocom.gov.gh/maps/

Figure 5. 27: Ghana Offshore Activity Map

The country also has an active midstream and downstream oil and gas sector including a refinery at Tema and numerous storage and distribution systems for refined products. The Ghana National Gas Company operate a gas processing plant at Atuabo in the Western Region, which receives gas from the Tullow developments. The Coastal Districts mainly have seen a development of oil & gas offshore exploration and production activities, with companies such as Eni, Tullow and Aker Energy investing in this sector and supporting the economic growth.

In 2016, the oil and gas sector created 15.000 jobs with Ghanaians being 82.5%. Tullow Ghana Ltd built a technical training centre at the Takoradi Polytechnic to provide skills to young people so they can be employed. In addition, there is the USAID Ghana Supply Chain Development Program that provides capacity support to small and medium enterprises and business service providers to participate in procurement tenders for contracts within the oil sector (Sam and Buckle 2017).

5.3.10.4 Mining

Large mining companies such as Gold Fields, Newmont, Kinross, and AngloGold Ashanti are present in the mining sector of Ghana. There are five major gold mines in the Western Region namely Teberebie and Iduapriem, Prestea/Bogoso, Tarkwa and Aboso-Damang gold fields.

AngloGold Ashanti has two wholly owned and managed operations in Ghana Ashanti (Teberebie) and Western Regions (Iduapriem). The latter is located 80 km north of Takoradi, adjacent to the Teberebie mine. In 2000, the operations of the Iduapriem and Teberebie mines were merged by AngloGold Ashanti.

Prestea/Bogoso gold mine is in southwestern Ghana, approximately 40 km from the Wassa Gold Mine. It is owned and operated by Golden Star Resources Ltd. Until 2018, production was being delivered from the Prestea

Open Pits and the Prestea Underground Gold Mine. In the second half of 2018, Prestea became an underground-focused operation with an operational life of 5 years.

Tarkwa is one of the largest gold mines in Ghana and it is owned and operated by Gold Fields Limited. Its mine is located in the southwest of the country, in the Western Region, 10 km north of Iduapriem. The mine is served by the main road connecting to the port of Takoradi some 60 km to the south on the Atlantic coast. The Damang concession lies to the north of and joins the Tarkwa concession, which is located near the town of Tarkwa. The area is served by access roads with established infrastructure, and the main road connects the mine to the port of Takoradi, some 90 km to the southeast. Abosso Goldfields (a subsidiary of Gold Fields Limited) holds a mining lease in respect of the Damang mine that expires in 2025. The mine's current reserves are estimated to last until 2024.

5.3.10.5 Informal Economy

More than seven in every ten (71.3%) of the total employed persons in Ghana were employed informally and 28.7% were engaged in the formal sector. The likelihood of working in a formal job is greater among females (31.7%) than males (27.2%). In addition, urban dwellers (31.0%) were more likely than rural dwellers (22.9%) to be engaged in formal employment. In the Western Region, 9.7% of the employed population 15 years and older was engaged in the informal sector, with females (10.8%) slightly greater than the male percentage (9.2%) (Ghana Statistical Service, 2019).

The informal sector in Ghana consists of various small-scale businesses, for example, producers, wholesalers, and retailers. Informal sector workers are largely self-employed persons such as farmers, traders, food processors, artisans, and craft workers.

The rural informal economy centres on the following.

- Agricultural activities focused on family farming units or community-owned assets. Farming is generally on a low technology basis dependent on family labour.
- Artisanal fishing is predominantly undertaken by males (between 18 and 40 years old) along Ghana's coastline. Women generally undertake processing activities, including the smoking, and marketing of fish, and this takes place in coastal villages.
- Rural agro-based processing activities of local crops. These include processing cassava, palm kernel, groundnut and copra oils, brewing distilling, and traditional soap making. These activities are generally undertaken by women (Osei-Boateng and Ampratwum, 2011).

The urban informal economy centres on the following.

- The services sector, for example, urban food traders, domestic workers and repairmen and women.
- In the construction sector, for example, masons, carpenters, and small-scale plumbers (mainly men between 18 and 40).
- The manufacturing sector includes food processing, textiles and garments, wood processing and metal works[72].

[72] Industry, according to International Standard Industrial Classification (ISIC), comprises value added in mining, manufacturing (reported as a separate subgroup), construction, electricity, water, and gas.

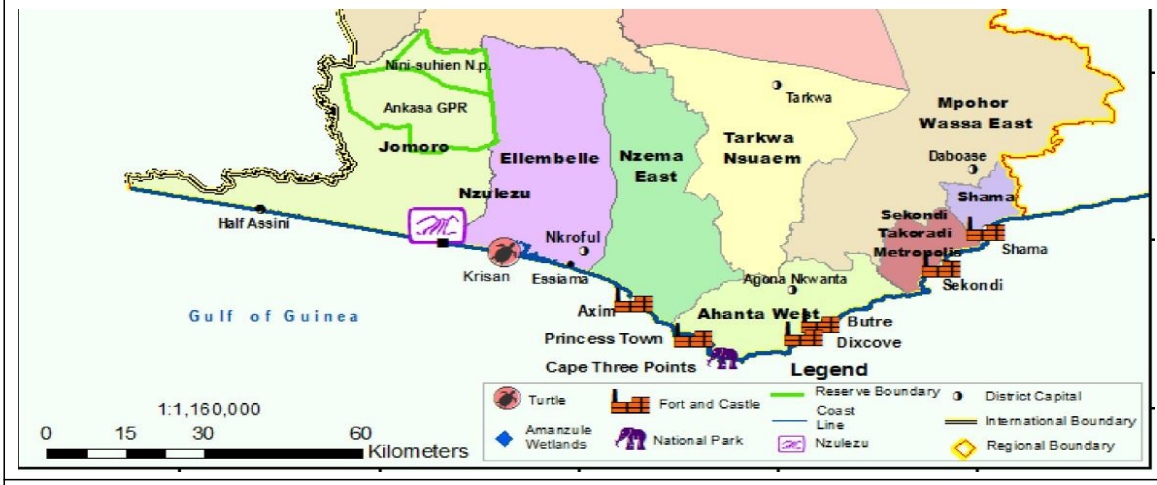
5.3.10.6 Tourism

Ghana has a wide range of natural, cultural, and historical attractions, which provides the basis for a growing tourism industry. Apart from the economic benefits, tourism is used to present Ghana's unique cultural, historical, and environmental heritage to the international community and to educate Ghanaians about their heritage.

The tourism potential in the Western Region is related to the number and extent of pristine tropical beaches as well as wildlife parks, forests and game reserves featuring tropical rainforests, inland lakes, and rivers.

There is currently little development in terms of coastal tourist resorts (i.e., associated with marine-based recreational activities such as diving and deep-sea fishing).

The primary tourist sites in the Western Region pertain to national parks or reserves, forts and cultural heritage and beaches. These are considered sites that can attract tourists but would still need associated infrastructure developed to boost tourism in the region. Figure 5.28 shows key tourist sites in the coastal districts of the Western Region.



Source: Ghana Statistical Service 2010

Figure 5.28: Tourist Sites in the Coastal Districts of the Western Region

An overview of tourism in the coastal districts in the AoI is provided below.

- Jomoro District**.** Places of attraction identified in the *Jomoro Municipal Assembly Final Medium-Term Development Plan 2018-2021* include Fort Appoloniain Beyin, Miegyinla community, Nzulezo (the village on stilts), Captain William's Tomb in Half Assini (capital) and the mystery site in Kengen. Except for Fort Appolonia, the other historical sites have not been well developed to attract tourists. These potential sites, when developed, could diversify tourism activities in the Municipality. Some of the beaches of Jomoro have been developed to attract tourists, for example, investors are developing beaches at Beyin. There are also a few hotels and guesthouses in place.

- Ellembelle District**.** The district has several tourist attractions, which include the birthplace and initial tomb of the first President of the Republic of Ghana, Dr. Kwame Nkrumah at Nkroful, a 70 km stretch of sandy

coastline that borders the district to the south, the navigable Ankobra River that links the northern and southern parts of the district, tracts of wetlands, crocodile pond at Baku. Popular hospitality facilities that exist include Maaha Beach Resort and Ankobra Beach Resort. However, the tourism industry is not well-developed in the district.

- Nzema East**.** The Municipality is rich in tourist attractions although most of these are still undeveloped. It is endowed with a huge potential for tourism development. Nzema East's capital Axim is the home of Sub-Saharan Africa's second oldest Fort. The Ahunyame mysterious rock formation is also an attraction for tourists. The district has sandy beaches, which provide conventional beach tourism. The navigable Ankobra River is another tourist attraction that provides tourists with the opportunity to enjoy riverboat trips. Hospitality facilities that exist to house visitors include the Axim Beach Resort (Figure 5.29, Right), Lou Moon Beach Resort and Ankobra Beach Resort providing excellent comfort in varieties ranging from traditional to continental.

- Ahanta West**.** Out of the eight forts in the region, four are located in the district namely, Fort Dorothie, Fort Metal Cross, Fort Batenstein (Butre) and Fort Groot Fredriechsburg. In addition, Cape Three Point Forest Reserve has been identified as having potential for ecotourism development or used as a canopy walk as is the case at the Kakum National Park located in the Twifo-Hemang Lower Denkyira District in Central Region. Besides that, Recerca è Corperazione (RC) have developed West Coast Tourism in three communities (Butre, Busua and Dixcove) with the view of promoting water-based tourism. Another potential for ecotourism development is the planned plantation of GREL and Norpalm Ghana Limited. Other potential sites that could be developed are the monkey sanctuary and the crocodile pond at PrincessTown and Egyambra respectively. Furthermore, the district has nice sandy beaches located at Funkoe Beach, Adjua Beach Victoria Beach at New Amanful, Busua Beach, Miemia Beach, Princess Town Beach, Cape Three Point Beach, Asemkow Beach (Hideout and Fanta Folly) and the Green Turtle and Safari Beach at Akwidaa.

- Sekondi Takoradi Metropolis. Tourist attractions include the site of the 17th century Dutch Fort Orange, the English Fort Sekondi, the sandy Paradise Beach, the Railway Museum, the Sekondi Historic District and the Whin River and Lagoon. Due to the increase in the population size of the Metropolis, more pressure is placed on the social amenities available as well as the accommodation facilities such as motels and hotel services. Therefore, diversification and expansion of tourism are priority intervention areas defined in the 2018-2021 STAM Medium-Term Development Plan.

- Effia-Kwesimintsim. The Effia-Kwesimintsim Municipality is endowed with cultural and ecotourism assets that provide significant opportunities for tourism development and quality job creation. Tourist attractions include the Kundum Festival, the Whin estuary as well as very good hotels within its catchment area.

- Shama**.** Tourism is not well developed but is represented by some hotels and recreation areas along the beach (La Bamba Beach Resort at Amenano and the Abuesi Beach Resort at Abuesi). There is a fort in the district, which could be developed into a tourist site. The estuary of the Pra River can also be developed to harness revenue for the district.

The annual 'Kundum' cultural festival takes place between August and October across the Ahanta and Nzema-speaking areas of the Western Region and attracts local people and tourists from elsewhere in Ghana and from abroad.

Overall, diversification and expansion of the tourism industry are considered key development opportunities to grow the economy of the coastal districts.

Figure 5.29: Typical Hotel in Anokyi (Left) and Axim (Right)

5.3.10.7 Gender-based livelihoods

Women continue to have lower status in society than men. In the past, women were considered more suited for childbearing and child upbringing while men were seen as more inclined towards the 'public areas' of work and finance. Though this trend is changing, women especially after the birth of the first child, continue to perform most of the household work and caregiving in their families despite working outside the home. As society is moving predominantly toward a market economy, the number of mothers entering the labour force is increasing every year, also mothers with preschool children are increasingly attending the labour force. Since women are entering the labour market, gender roles have changed considerably. Women's contribution to the family economy has made men somewhat alter their attitude and start helping with domestic chores. However, the invisible work of women remains largely unrecognized and undervalued[73].

According to the *WRCF Community Perceptions and Socio-Economic Survey (CPSES) Baseline Report (2016)*[74], both male and female heads of household in the six coastal districts are engaged in the fishing and farming sector (44% of men and 38% of women) with the women mainly engaged in fish processing (see Figure 5.30)

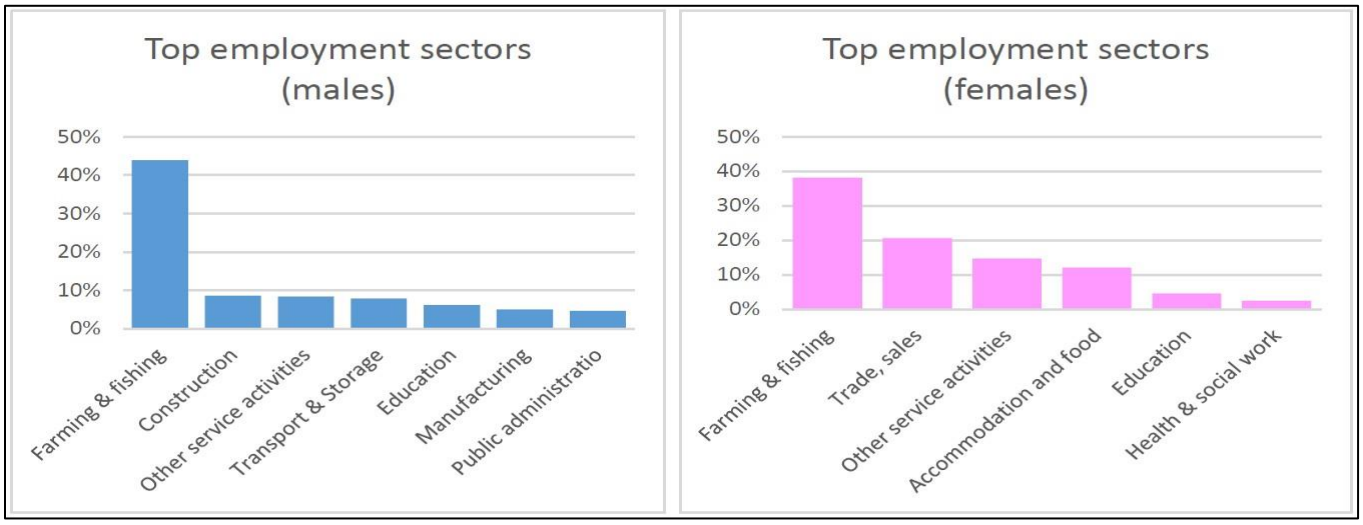
[73] Ahanta West Municipal Assembly Medium-Term Development Plan 2018-2021

[74] Study published on the WRCF website, available at http://wrcfghana.org/wp-content/uploads/2016/11/CPSES-Baseline- Report.pdf and accessed in June 2022

Source: Subsidies in Ghana's Marine Artisanal Fisheries Sector, October 2016, University of Rhode Island[75].

Figure 5.30: Women fish processors

Female heads of household are much more likely to be engaged in trade and sales (21% for women vs. 4% for men) and accommodation and food services (12% for women vs. 2% for men). None of the female-headed households was engaged in the transportation and storage, construction, or public administration sectors, all of which employed substantial numbers of men. The top employment sectors in the six coastal districts, by gender, according to a study conducted by the Western Region Coastal Foundation in 2016 are illustrated in Figure 5.31.



Source: WRCF Community Perceptions and Socio-Economic Survey (CPSES) Baseline Report (2016)
Source: Subsidies in Ghana's Marine Artisanal Fisheries Sector, October 2016, University of Rhode Island[76].

Figure 5. 31: Top employment sectors in the six coastal districts, by gender of head of household

[75] https://www.crc.uri.edu/download/GH2014_POL059_CRC_-FIN508.pdf
[76] https://www.crc.uri.edu/download/GH2014_POL059_CRC_-FIN508.pdf

An overview of women's roles in the coastal districts in the AoI is provided below.

- Jomoro. Most women in Jomoro Municipal are housewives and engage in petty trading. Women in the southern part of the Municipality (along the beaches) are involved in fishing activities while the others, away from the sea, assist their husbands in farming activities. Men are mostly dominant in leadership and other administrative functions. Women's representation in decision-making and formal employment is very limited[77].
- Ellembelle**.** Both women and men have equal opportunities to work in the formal and informal sectors. However, people acquire employment opportunities based on their expertise. Holistic approaches to community participation (old, young, male & female) are deployed as part of development processes. Traditionally, women play a significant role in the governance system with some communities having Queen mothers as part of their governance system[78].
- Nzema East. Women are engaged in raising pigs and are the predominant palm oil processors. They use traditional technologies that have a low oil recovery rate and imply a dependence on traditional stoves, which poses significant health challenges.
- Ahanta West. Even among couples where wives earn more than their husbands, women still maintain most of the responsibilities for the household. Further, many women deliberately work to make it appear that their husbands are in control.
- Sekondi Takoradi Metropolis**.** Approximately 82% are engaged in the private informal sector compared to 56% of the men. This indicates that women should be the focal point when developing strategic policy for the private informal sector, e.g., revenue collection and construction of markets. On the other hand, there are more men in the private formal (23%) and public (government) 18.7% sectors than females 8%, respectively 9.7%[79].
- Shama**.** Women are also engaged in the manufacturing of craft products, extracting oil palm and the processing of gari (cassava root, dried and ground into flour).

[77] Jomoro Municipal *Medium-Term Development Plan* 2018-2021, page 78
[78] Ellembelle District *Medium-Term Development Plan* 2018-2021, page 93
[79] Sekondi Takoradi Metropolitan Assembly *Medium-Term Development Plan* 2018-2021, page 87

5.3.11 Education

Ghana's Education Act (2008) structures the education system on three levels: basic, second cycle and tertiary, making the nine years of education at the basic level free and compulsory and allocating responsibility to District Assemblies for the pre-tertiary education. Senior High School education became free following an education policy in 2017.

The education system consists of:

- basic education or first-cycle education, consisting of two years of kindergarten, six years of primary school, and three years of junior high school (JHS).
- second-cycle education, consisting of three years of senior high school (SHS), technical/vocational; business and agriculture education; or an apprenticeship training of not less than one year; and
- tertiary education, consisting of Colleges of Education (COEs), polytechnics, universities, and other degree- and diploma-awarding institutions accredited by the National Accreditation Board.

In 2010, the percentage of people six years and older who never attended school was the highest in Jomoro and Nzema East, at just under one-third of the population, whilst in Sekondi-Takoradi this number was under 10%. On the other side of the spectrum, the Metropolis has the highest number of tertiary education graduates (2.9% compared to 0.5% in Jomoro or Nzema East). Table 5.12 presents education levels in the AoI, based on the 2010 Census data.

Table 5.12: Education levels (six years old and older) (2010)

District		Level of Education							
	Total	Never Attended (%)	Pre-Primary (%)	Primary (%)	JHS (%)	SHS (%)	Voc. (%)	Post-Sec. (%)	Degree or higher (%)
Jomoro	124,242	27.0	3.1	28.9	27.7	9.9	0.9	1.9	0.5
Ellembelle	73,213	22.6	3.2	28.3	31.3	9.6	1.3	3.1	0.7
Nzema East	50,138	26.6	3.9	29.7	30.1	6.6	1.0	1.8	0.5
Ahanta West	87,051	23.2	4.1	29.0	32.4	6.7	1.5	2.4	0.7
STMA	483,199	9.6	1.3	21.3	35.1	16.4	4.3	9.1	2.9
Shama	68,039	23.6	3.8	27.9	32.2	6.9	2.0	2.7	0.9

Source: Ghana Statistical Service (2010) *Voc: Vocational School, *Post Sec: Post-secondary.

5.3.11.1 Basic Education

Until 2015, primary education received the largest share of the Government of Ghana's education expenditures, to be then overtaken by JHS, SSH and tertiary as the number of teachers employed in the sector increased, according to the Ghanaian Ministry of Education[80]. Public schools' provision is complemented by a faster-growing private sector[81], which accounts for over 20% of the basic education and 6% of the SHS enrolment, albeit with substantial regional variations and a significantly lower percentage of trained teachers compared to public schools[82].
Gender parity in basic education was reached in 2011/12[83], and the aggregated data for each of the six districts would indicate the same conclusion (see Table 5.13 for enrolment data from 2016).

Table 5.13: Basic School Enrolment in Each District by Gender (2016)

District	Male	Female
Sekondi – Takoradi	54,495	55,455
Ahanta West	15,676	15,375
Ellembelle	18,042	17,294
Jomoro	20,940	20,430
Nzema East	12,909	12,412
Sharma	18,881	18,736

Source: Ghana Statistical Service - Education Statistics. Tracking progress in Ghana's basic level education across the district's 2010 – 2016, report dated June 2018

The provision of schools in the six districts within the AoI is presented in Table 5.14. The ratio of public versus private schools varies across the districts. For example, in Jomoro there are an equal number of public and private education institutions servicing the district's communities, whilst in Nzema East the majority of schools are public.

[80] Ministry of Education - Education Strategic Plan 2018 - 2030
[81] According to the Education Sector Analysis (2018), private schools made up about half of JHS and SHS created between 2011 and 2017, nearly three-quarters of kindergartens, and close to 90% of primary and tertiary institutions.
[82] Ministry of Education – Education Sector Analysis 2018
[83] As above, page 34

Table 5.14: The Number of Public and Private Schools in Each District

	Sekondi Takoradi	Jomoro	Ellembelle	Ahanta West	Shama	Nzema East
Kindergarten*	217	130	114	113	99	80
Primary*	227	130	111	107	95	74
Junior High School*	197	100	53	103	64	46
Senior High	19	3	4	3	3	-
Tertiary**	7	-	2	-	-	-
Technical and Vocational	-	-	1	1	3	-

Sources:
* Ghana Statistical Service - Education Statistics. Tracking progress in Ghana's basic level education across the district's 2010 – 2016, report dated June 2018
** Medium-Term Development Plans 2018 – 2021 of Sekondi-Takoradi, Jomoro, Ellembelle, Ahanta West and Shama

According to 2016 data provided by the Ghana Statistical Service, the ratio of students enrolled in basic education schools across the six districts is higher than 20%, reaching approximately 40% in Sekondi-Takoradi Metropolis (see Table 5.15 for a view of public and private enrolment split across the six districts)

Table 5.15: Enrolment in Public and Private Schools in the Six Districts

District	Public	Private
Sekondi – Takoradi	67,782	42,168
Ahanta West	31,051	13,561
Ellembelle	27,433	7,903
Jomoro	25,177	16,193
Nzema East	18,963	6,358
Sharma	24,553	11,944

Source: Ghana Statistical Service - Education Statistics. Tracking progress in Ghana's basic level education across the district's 2010 – 2016, report dated June 2018

Schools across the six districts face significant challenges in terms of access to electricity, access to sanitary facilities, adequate teaching resources and insufficiently trained teachers across all sectors, with corrective actions included in the Medium-Term Development Plan for 2018 – 2021 of each Assembly. Figure 5.22 shows a typical school in the Western Region.

Source: ESL, 2021

Figure 5.32: Typical School Facility in the Coastal Community in Western Region

5.3.11.2 Literacy Rates

According to UNESCO[84], in 2018 the literacy rate of Ghanaians 15 – 24 years was 92.49% with an insignificant gender gap. For the 15 – 64 age bracket it was 79.04% with an approximately 10% gender gap and for the people over 65, the rate was 50.93%, with an approximately 25% gender gap. The Ghana Statistical Services also reported 69.8% literacy among people 6 years and older in 2021[85].

Ghana Labour Survey (2015) states that aggregated literacy rates for both sexes 11 years and older are 63% (71.8% for males and 55.5% for females), with high urban-rural variations (74.5% in urban and 50.1% in rural areas). The same report provides Western Region data for urban areas which present very similar results as the national average for both men and women, but the data reported for rural literacy rates in Western Region is above the national values, with a 77.1% literacy rate for rural men and 57.6% literacy rate for rural women 11 years and older.

According to the Education Sector Analysis 2018 Report, only 54% of men and 43% of women who graduated basic education had acquired literacy skills that will persist through adulthood, thus only individuals who have completed Secondary High School education are considered by default to be fully literate.

5.3.11.3 Technical and Vocational Education

Although this sector has been developing steadily, there seems to be a mismatch between the skills supplied and the labour market demands, along with a lack of technical qualifications of the teaching staff, with poor learning outcomes, according to the Education Sector Analysis 2018 Report.

The Western Region Coastal Foundation (WRCF) and the Regional Maritime University signed a Memorandum of

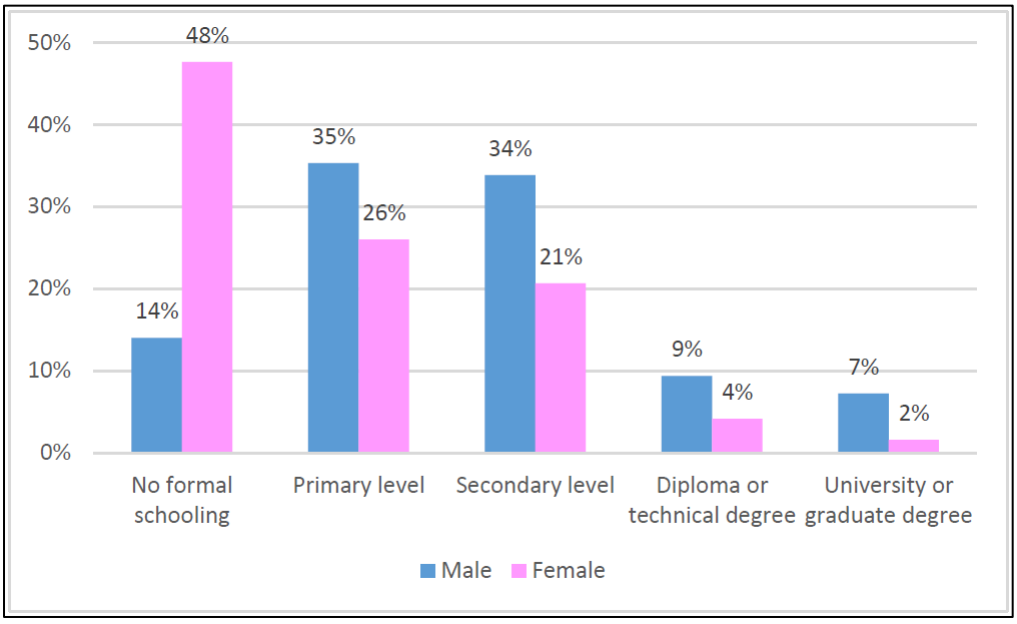
[84] Ghana Country Profile on UNESCO website, accessed on 16.06.2022. http://uis.unesco.org/country/GH
[85] Ghana Statistical Services, 2021.

Understanding (MoU) on 1 March 2019 to work together to develop competent job-ready technical graduates for employment in the industry. The partnership aims to align the training programmes of technical institutions with the needs of the industry by providing support for developing standards; accreditation for selected programmes and improved training facilities; developing a modern curriculum, and improved instructor training and industry experience.[86] This joint initiative will support developing skills in the oil and gas sector, thus contributing to enhanced access to employment benefits associated with oil & gas development projects.

5.3.11.4 Gender-Based Educational Level

Confirming national-level figures, the field study undertaken by WRCF in 2016 indicated that female heads of households in the six coastal districts were significantly less educated or formally employed, particularly as salaried or seasonal workers. Nearly half (48%) of female heads of households had received no formal schooling, compared to 13% of male heads of households. In terms of employment type, females were 1.7 times more likely to be casual workers, without contracts or job security, and nearly 2 times as likely to be unpaid, as their male counterparts[87].

Figure 5.33 illustrates the highest level of education of the household head in the AoI, based on a field study conducted by the WRCF in 2016.



Source: WRCF Community Perceptions and Socio-Economic Survey (CPSES) Baseline Report (2016)

Figure 5.33: Highest Level of Education of Head of Household in the Six Coastal Districts, by Gender

[86] Online article *WRCF signs MoU with RMU to improve skills to meet Industry needs - Western Region Coastal Foundation,* published on the WRCF website.

[87] Study published on the WRCF website, available at http://wrcfghana.org/wp-content/uploads/2016/11/CPSES-Baseline- Report.pdf and accessed in March 2020.

CHAPTER SIX

Stakeholder Involvement

- Rationale for Stakeholder Engagement
- Key Stakeholders Engaged
- Stakeholders Notifications
- Consultations Outcome

6.0 STAKEHOLDER INVOLVEMENT

6.1 The Rationale for Stakeholder Involvement

The Environmental Assessment Regulations, 1999 (LI 1652) underscore the need for stakeholder engagement in the Environmental Assessment process, as a means to involve all relevant project stakeholders as an opportunity to address their concerns, among others. Inadequate engagement or failure to engage relevant stakeholders stand a risk of public complaints to the EPA, triggering Public Hearing and thus, delaying the permit process.

The World Bank Group's Environmental Assessment Policy (OP 4.01) (1999) addresses the requirements for stakeholder consultation as part of the EA process. The key principles of the World Bank Operation Policies have been incorporated into the IFC Performance Standards (PSs). The IFC PSs on Environmental and Social Sustainability (2012) include specific detail on stakeholder engagement for an Impact Assessment process and provide guidance in planning for engagement activities. The PSs require clients to engage with affected communities through disclosure of information, consultation, and informed participation, in a manner commensurate with the risks to and impacts of the project on the affected communities. The guidelines include requirements for:

- Free, prior and informed participation of affected communities; and
- Disclosure of any measures to address issues of concern to affected communities.

6.2 Key Stakeholders Engaged

Stakeholder engagement activities were carried out specifically:

- Identify potential key concerns and expectations associated with the drilling operations;
- Assess the degree to which relevant stakeholder groups could be affected by the project;
- Dialogue on the main potential E&S constraints and risks requiring mitigation; and
- Obtain any relevant local knowledge that can positively influence the project planning and implementation.

The activity of this project is basically drilling exploratory wells and the location of the drillship is offshore deep water, about 70km from the shoreline. The stakeholder exercise undertaken considered and identified the stakeholders that would be directly affected as the fishermen, and hence consultations were focused predominantly on the fishing communities in six coastal districts in the Western Region. Two rounds of consultations were undertaken, the first one in October 2018 and the second one in July 2023 (see Appendix 1 for further details regarding participation).

Table 6.1 gives the list of stakeholder groups – fishing communities that were engaged.

Table 6.1: List of Stakeholders Engaged

DISTRICT	COMMUNITIES / FISHING VILLAGES/LANDING SITES			
SHAMA	***Shama***	• *Anlo Beach* • *Apo* • *Bentsir*		
	Abuesi	• *Abuesi*		
	Aboadze	• *Bronyi*		
	Bema	• *Ekrobem*		
STMA	*Ngyiresia* *Sekondi* *Essaman*	*Nkotompo* *Poase* *New Takoradi*		
AHANTA WEST	*New Amanful* *Funko* *Adjoa* *Asemkow* *Butre*	*Enyima ehu* *Punpuni* *Ampatano*	*Busua* *Upper Dixcove* *Lower Dixcove Achowa* *Akwadae*	*Ketakor* *Cape 3 Points* *Miema*
NZEMA EAST	***Lower Axim***	• *Nkakemu* • *Sika Santewase* • *Sika Ahwiado* • *Anto* • *Apewosika* • *Fante line* • *Boat Ase* • *Sukpom*		
	Upper Axim	• *Sowlo* • *Anto Brewire* • *Akyinim*		
	Domunli *Egyan*			
ELEMBELLE	*Ankobra* *Asanta* *Kikam* *Esiama* *Ampain* *Bakanta* *Anokyi*	*Sanzule* *Krisan* *Eikwe* *Ngalepole* *Ngalekyi* *Baku* *Atuabo*		
JOMORO	*Akabaku* *Benyin* *Elloyin* *Kangen* *Twenen* *Agyeza* *Ezinlebo*	*Egbazo* *Ahobre Kakraba* *Ahobre Kese* *Old Edobo* *New Edobo* *Antwebanso* *Bonyere*	*Ekpu* *Buakwa* *Mpaasem* *Nzimitianu* *Effasu* *New Town* *Metika*	
	Anomatuope	• *Ewe line* • *Fante line*		
	Half Assini	• *Fante line* • *Ewe line*		

The schedule and plan for the stakeholder engagements are presented in Table 6.2

Table 6.2: Schedule and Stakeholder Engagement Plan

DATE	DISTRICT	FISHING VILLAGES/LANDING SITES				VENUE	EXPECTED No. OF PARTICIPANTS
23 Oct 2018	**SHAMA**	***Shama***	• *Anlo Beach* • *Apo* • *Bentsir*			**Shama District Assembly Education Conference Room**	**30**
		Abuesi	• *Abuesi*				
		Aboadze	• *Bronyi*				
		Bema	• *Ekrobem*				
23 Oct 2018	**STMA (Secondi-Takoradi Metropolis)**	*Ngyiresia* *Sekondi* *Essaman*		*Nkotompo* *Poase* *New Takoradi*		**Esikado Palace/ Court - Sekondi**	**15**
31 Oct 2018	**AHANTA WEST**	*New Amanful* *Funko Adjoa* *Asemkow* *Butre*	*Enyima ehu* *Punpuni* *Ampatano*	*Busua* *Upper Dixcove* *Lower Dixcove* *Achowa* *Akwadae*	*Ketakor* *Cape 3 Points* *Miema*	**Dixcove Community ICT Center**	**30**
31 Oct 2018	**NZEMA EAST**	***Lower Axim***	• *Nkakemu* • *Sika Santewase* • *Sika Ahwiado* • *Anto* • *Apewosika* • *Fante line* • *Boat Ase* • *Sukpom*			**District Assembly Conference Hall**	**30**
		Upper Axim	• *Sowlo* • *Anto Brewire* • *Akyinim*				
		Domunli *Egyan*					

DATE	DISTRICT	FISHING VILLAGES/LANDING SITES			VENUE	EXPECTED No. OF PARTICIPANTS
30 Oct 2018	**ELEMBELLE**	*Ankobra* *Asanta* *Kikam* *Esiama* *Ampain* *Bakanta* *Anokyi*	*Sanzule* *Krisan* *Eikwe* *Ngalepole* *Ngalekyi* *Baku* *Atuabo*		**Esiama Sec. Tech. School**	**30**
30 Oct 2018	**JOMORO**	*Akabaku* *Benyin* *Elloyin* *Kangen* *Twenen* *Agyeza* *Ezinlebo*	*Egbazo* *Ahobre Kakraba* *Ahobre Kese* *Old Edobo* *New Edobo* *Antwebanso* *Bonyere*	*Ekpu* *Buakwa* *Mpaasem* *Nzimitianu* *Effasu* *New Town* *Metika*	**District Assembly Conference Hall**	**30**
		Anomatuope	• *Ewe line* • *Fante line*			
		Half Assini	• *Fante line* • *Ewe line*			

Notes:

1. Not all the fishing landing sites were invited-only those that undertake offshore fishing.
2. Invitation was limited to the executives of the fishing communities
3. Each community was given 30 copies of the flyer announcing the drilling activity by EcoAtlantic

Table 6.3: Second Round of Consultation Schedule and Engagement Plan

DATE 24 – 28 Jul	TIME		DISTRICT	DISTRICT CHIEF FISHERMEN/WESTERN REGION CANOE FISHERMEN COUNCIL (WRCFC)	VENUE	ANTICIPATED No. OF PARTICIPANTS
	AM	PM				
25 Jul 2023	10:00		SHAMA	*District Chief Fishermen*	SSNIT Conference Hall, Takoradi	3
			STMA (Secondi-Takoradi Metropolis)			3
			AHANTA WEST			3
	10:00		NZEMA EAST	*District Chief Fishermen*	SSNIT Conference Hall, Takoradi	3
			ELEMBELLE			3
			JOMORO			3
25 Jul 2023	10:00		WRCFC	Chairmen	SSNIT Conference Hall, Takoradi	9
Date	Time		INSTITUTION		Venue	EXPECTED No. OF PARTICIPANTS
	AM	PM				

DATE 24 – 28 Jul	TIME		DISTRICT	DISTRICT CHIEF FISHERMEN/WESTERN REGION CANOE FISHERMEN COUNCIL (WRCFC)	VENUE	ANTICIPATED No. OF PARTICIPANTS
	AM	PM				
25 Jul 2023	10:00		Petrleum Commission (PC) - Takoradi		SSNIT Conference Hall, Takoradi	2
25 Jul 2023	10:00		Ghana National Petroleum Corporation (GNPC)		SSNIT Conference Hall, Takoradi	2

6.3 Stakeholder Notifications

The stakeholder identified were notified for face-to-face engagement meetings. Table 6.3 provides the types of notifications served by the respective stakeholder groups.

Table 6.4: Stakeholder Notification

Type of Notification	Action Taken
Phone calls and personal interaction/visits	Phone calls and visits in person were made to District Chief Fishermen, informing them of the consultation process and proposing dates and times of meetings with the relevant groups. (See Appendix 1, 2018 for the Directory of Fishermen and landing beaches in the Western Region)
Distribution of the Background Information Document (BID)	A Background Information Document (BID) was prepared in English and distributed by hand at all meetings. The BID provides a description of the proposed project. See Appendix 1, 2023 for a copy of the BID.
Through word of mouth via Chief Fishermen.	The Chief fishermen were given prior notification about the meetings, who in turn informed the fisher folks within their communities.

The BID provided the purpose of the activity and an overview of the project. It also provided stakeholders with such information as the expected duration of the activity and the drilling rig specifications.

6.4 Consultation Outcomes

As indicated in Tables 6.2 and 6.3, community-level consultations were conducted from October 23 – 31, 2018 at the respective district assembly conference halls and the second round engagement was held on July 25, 2023, at the Takoradi SSNIT conference hall.

The general format for the joint district engagement meetings was as follows:

- Introduction by the engagement facilitator;
- Introduction of the Eco Atlantic representative and ESL Consulting team, as well as the participants from the various fishing communities in each district;
- Verbal presentation on the exploratory drilling activities and associated timelines, and the proposed mitigation and management plan for addressing potential environmental and social impacts;
- Brief presentations/remarks by the Chief fishermen of the communities represented; and
- Discussion of the associated issues, questions and sharing of information that may be relevant to addressing concerns and issues.

The outcomes of the engagement sessions are summarised in Tables 6.5 and 6.6 and 6.7. (See Appendix 1, 2018 and 2023 for evidence of participation and presentation materials)

Table 6. 5:Summarized Outcome of Institutional Consultations

Assembly	Issues of Concern/ Expectations	Responses
Ahanta West Municipality	Appeal for the establishment of more scholarship schemes for the children of the fishermen as well as increasing the existing Scholarship awards so more of their children may benefit.	Should Eco Atlantic come on board, it must ensure that the child must first pass to enter SHS; if the child does not pass he/she cannot be considered for an award. It is therefore important for the children to demonstrate high application in their studies in order to pass the JHS exams to qualify for an award. The quality of the basic level education is therefore critical for them. It will rather be more beneficial to consider shifting some scholarships to or establishing other such schemes at the basic levels to help the children study comfortably.

Assembly	Issues of Concern/ Expectations	Responses
Ellembelle District	Appeal for more scholarships for the children of the fishermen.	To qualify for an award, the child must first pass to enter SHS; if the child does not pass he/she cannot be considered for an award. It is therefore important for the children to demonstrate high application in their studies in order to pass the JHS exams to qualify for an award. The quality of the basic level education is therefore critical for them. It will rather be more beneficial to consider shifting some scholarships to or establishing other such schemes at the basic levels to help the children study comfortably.
	An appeal was made by the fishermen to, as part of EcoAtlantic's CSR, provide them with outboard motors offered at a discount, and if possible, set up a bank or a revolving fund for them.	Appeal noted, but this is a drilling stage, and if EcoAtlantic comes back for the real oil extraction the issue will be revisited.
	The proliferation of the seaweed, Sargassum, at the coastlines, especially at the shores of the coastal communities, is perceived to be caused by oil and gas activities. Fishermen will like to be present during the drilling to ascertain the claim.	Sargassum inhabits shallow waters and coral reefs. The area of operation is in deep waters and so the proliferation is not caused by oil and gas activities. It is a global issue.

	An appeal for the oil and gas companies to come together to establish a referral hospital in the district.	Appeal taken note of.
Jomoro Municipality	An appeal for the provision of outboard motors for the fishermen and scholarships for their children.	Appeal noted. However, EcoAtlantic is at the drilling stage to confirm if oil is in commercial quantity. If they come back, these appeals will be considered in all earnestness.
Nzema East Municipality	Any Social intervention by and responsibility of EcoAtlantic for the fisher folks in lieu of affected livelihood. The locals' involvement in operational activities. Provision in terms of compensation as the movement of the drillship may cause damage to the property of the fishermen, as well as disruption to their fishing activities, leading to financial loss.	This is just a month's drilling activity; if oil is confirmed in commercial quantity, EcoAtlantic will come back and seriously consider the issue of CSR. Other companies have set the pace by training 2 locals from each District as liaison officers. If EcoAtlantic comes back after oil is confirmed in commercial quantity, it will follow suit, and gradually the number of recruited locals will increase. Any damage is to be recorded and photos taken, and then presented to the PC to facilitate payment of compensation for any damage.

Assembly	**Issues of Concern/ Expectations**	**Responses**
Shama District	The area of EcoAtlantic's operation overlaps the fishermen's area of fishing activities and that is likely to disrupt the fishing activities of the fishermen. Local people are to be trained for emergency oil spill response, as well as taking them through GNFC to train as FSOs, and have them engaged on the supply/service/guarding vessels.	EcoAtlantic's area of operation is far behind Jubilee, in deep waters, and hence not really within the area of their fishing activities. EcoAtlantic has taken note of this.

STMA (Sekondi-Takoradi Metropolis)	The need to install buoys and lights to demarcate/indicate and warn of the 500m exclusion zone boundaries. Compensation for the disruption of fishing activities and loss of livelihoods during the period of operation is to be considered. Consideration and plans to recruit local people during the operations. Suggestion made for scholarships for their wards at secondary, tertiary and postgraduate levels. Call for proper communication and collaboration between companies and the fisher folks.	Buoy installation is feasible, and hence note is taken. However, it will require the involvement of the PC. The drilling activities span one month only, hence notice of the work plan will be enough to minimise disruption of fishing activities. This stage of activity is for drilling. When oil is confirmed in commercial quantity, local involvement and recruitment will be considered. Good suggestion, but better and more important to consider scholarship at the basic levels, that is the foundation, with attention drawn to the fact that various scholarships are being awarded at the secondary, tertiary and postgraduate levels by some companies. Note is taken.

Table 6.6: Summarised Outcome of Joint Engagement Meetings

Assembly	Issues of Concern/ Expectations	Responses
Ahanta West Municipality	Communities in the catchment areas of the oil and gas operations are not given priority in the provision of scholarship schemes and social amenities from the oil revenue.	The social investment by GNPC is a national investment, thus it covers the whole country. However, priority is given to the inhabitants of WR who are directly affected by the oil and gas operations. About 34% of the scholarships awarded in 2017/2018 was reserved for people of the Western Region.
Ellembelle District	An appeal was made to the operators in the oil and gas industry to resource leaders of the fishing communities to sensitise their members on the operations of offshore activities to minimise incursions to the Exclusion Zone.	This is a recurrent request, PC is developing guidelines on how to resource leaders of fishing communities to sensitise fishers on safe fishing practices, especially after such engagement sessions to disseminate the message.
Jomoro Municipality	The social investments that the district will benefit from the operations of EGL must be elaborate	A Community Liaison Officer has been tasked to solicit for the needs of the communities. The areas of interest for the company include health and education. The company will also explore the creation of artificial reefs to support the fishery sector.
Nzema East Municipality	Attribution of the dwindling nature of the fishing industry to the activities of offshore oil and gas industries, especially the creation of exclusion zone and fish attraction to such areas.	The exclusion zones are created for the safety of both fishermen and offshore installations. The fisher folks should be prepared to embrace the operations of offshore industries. There are currently more discoveries, so the number of FPSOs and other offshore installations is likely to increase in the future.
Shama District	Attribution of the emergence of sea weeds to the activities of oil and gas operations offshore.	The sea weed problem is a transboundary issue, which originates from the Caribbean. They are driven to the country's coast by ocean currents. The problem pre-dates commencement of oil and gas exploration and production in the WR.
Sekondi-Takoradi Metropolis	The use of light on the offshore oil rig has contributed immensely to the dwindling fish catch. The fishermen should be assisted to employ modern fishing methods as being practised in the Ivory Coast.	The FC is currently drawing up programmes and policies to improve the fishing sector. As part of this initiative, reserves zones (marine parks) on the oceans will be created to serve as breeding grounds.

Table 6.7: Summarised Outcome of the Follow-up Meeting.

Issue Category	Concerns/ Expectations/Suggestions	Responses
Benefits of the drilling project for the children of the fishermen.	What measures are in place for the children of fishermen whose livelihoods would be affected by the drilling project? Will there be any work opportunities for the children of the fishermen?	The Petroleum Commission is clear about the importance of incorporating local content into any petroleum project or activity. Therefore, if Eco Atlantic needs to hire personnel for the drilling project, local content requires that qualified locals be hired first.
Accidents	What precautions will be taken to prevent accidents or collisions between canoes and supply vessels? What contingency plans has Eco Atlantic put in place in the event of an accident?	To avoid mishaps, fishermen will be adequately notified of the period during which the project vessels/rigs will be operating. Eco Atlantic is not just concerned with taking precautions to prevent an accident; should one occur, Eco Atlantic will take steps to compensate.
Harassment and Extortion of Fishermen by Navy Officers	Given the harassment and severe beatings that fishermen have been subjected to by navy officers for some time now, following the replacement of community liaison officers with navy officers, what steps is Eco Atlantic taking to prevent harassment from navy officers if a fisherman enters the area where the drilling project is being carried out? EcoAtlantic should include indigenous fishing liaison officers to supplement the navy vessels.	The drilling project area would ideally be marked with buoys for visual identification of the exclusion zone and to help prevent the fishermen from entering the exclusion zone. In addition, ESL and Eco Atlantic will work with community liaison officers and the chief fishermen to educate local fishermen about safety and the importance of not crossing into the exclusion zones indicated with the buoys in order to maintain safety and peace between operators and fishermen. Note taken of suggestion.
No buoys in the project area where there are other existing FPSOs.	No buoys have been sighted at the project area even though other oil and gas companies, such as Tullow and Eni, have been working in the project area for several years. Will buoys be installed during the drilling project? If so, they should be appropriately designated around the FPSO to prevent nets from being dragged away by sea currents. Moreover, to avoid any interference with drilling operations, buoys should be placed in the advisory zone rather than the safety zone, which is 500 metres radius from the FPSO.	Concern noted. Eco Atlantic is committed to the safety of its employees, fishermen, other marine users, and the environment, which is why the exclusion zone exists, hence suggestion is noted for consideration

	If buoys cannot be installed for the drilling project, transponders can be used to demarcate the exclusion zone.	Suggestion noted.
Fisheries Impact Assessment	Will a Fisheries Impact Assessment be conducted as required by Section 93 of the Fisheries Act?	The EPA is responsible for determining what type of impact assessment goes into a particular project for Fisheries Impact Assessment. Given that the project is an exploratory drilling, which will last for about a month, EPA, in their screening, did not include a Fisheries Impact Assessment.
Office of Eco Atlantic in the Western Region	Is there an Eco Atlantic office in the Western region where fishermen can seek clarification when an issue arises?	Eco Atlantic currently does not have an office in the Western region. However, if an issue needs to be clarified, the addresses and phone numbers of Eco Atlantic and ESL are always available and open.
Vessel Identification	What kind of vessel will Eco Atlantic employ for the drilling project, and what is its name? How will the drilling vessel be identified?	The vessel Eco Atlantic will use for the drilling project is the Noble Venturer. Each vessel is identified by its unique colours and flag.
Sargassum seaweed Invasion	The fishermen raised the issue of Sargassum proliferation found on the coast as being the result of the seismic and drilling exploration activities taking place in the Deep-Water Cape Three Point Block, considering the fact that it was only in modest quantity before the oil and gas prospecting in the area began.	It was explained that the invasion of Sargassum seaweed on the Ghanaian coast was not caused by oil and gas activities, and that it originated from the Caribbean and swept across by ocean currents. The invasion of sargassum seaweed affects not only Ghana, but also other African coasts and the Caribbean coast.

CHAPTER SEVEN

Assessment of Potential Impacts

7.0 ASSESSMENT OF POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

The outcome of a consultation with EPA indicated that the key potential impacts and risks associated with offshore exploration drilling and related operations include oil spill risk and waste generation and disposal impacts.

Volumes of drilling waste may be generated from the extensive drilling fluids and chemical use at the drilling stage, as indicated by the offshore waste management companies consulted, who are always called to duty around the clock at such exploratory stages to handle such offshore wastes.

In addition, the physical footprint of the drillship and the required 500m Exclusion Zone around it were considered a source of concern for most of the fishermen. The strong perception of the fishers relates to the continuous decline in fish stock and poor catch, which rather unfortunately, they perceived to be caused by the attraction of the fish to the light on the drillship.

The specific potential impacts identified and assessed are as follows:

1. Drilling chemicals and discharges;
2. Waste generation and disposal;
3. Potential oil spill;
4. Physical presence of operations;
5. Underwater noise
6. Atmospheric emissions.

7.1 Impacts of drilling chemicals and discharges

The discharges and chemicals associated with the drilling process comprise:

1. Drill cutting and fluids;
2. Chemical discharges; and
3. Accidental releases.

7.1.1 Drill Cutting and Fluids

The potential sources of drill cuttings and fluids include:

- Drilling of riserless well section (top hole);
- Drilling of lower well sections with a riser when the cuttings are brought to the surface; and
- The use of drilling fluids (water base drill fluids and non-aqueous drilling fluids)

The main potential impacts associated with discharged cuttings and drilling muds to the sea include:

- Water and sediment contamination due to the drilling chemicals (ecotoxicity, biodegradability and bioaccumulation of muds and associated chemicals);
- Physical smothering of seabed communities, alteration of sediment characteristics and oxygen depletion; and
- Increased turbidity of the water column.

The main components of WBDFs (barite, bentonite, barium chloride, and trace metals) may be relatively harmless when heavily diluted in the sea, however, they commonly contain additives (with green, yellow and red hazard categories), that can be toxic, even in low concentrations (Wills, 2000). Polycyclic aromatic hydrocarbons (PAH) are the organic compounds sometimes present in used drilling mud and associated drill cuttings that pose the greatest risk of bioaccumulation and toxicity to marine organisms such as fishes (Neff 2005). Table 7.1 shows chemicals, their hazards category and planned quantities estimated to be used for the drilling operations.

The drilling program will lead to the discharge and further accumulation of 466 m^3 of treated drill cuttings per well. The discharge of the cuttings would result in the alteration of the chemistry of the seabed, especially, around the immediate vicinity of the wells including elevated levels of barium, low levels of trace metals associated with barium sulphate ($BaSO_4$) and organic enrichment.

Studies by Tullow in 2009 in relation to the Jubilee area revealed a diverse macrobenthos community (252 species of polychaetes, crustaceans, molluscs and echinoderms) assemblage in shallow water areas compared to the deep waters (Section 5.2.2). The community assemblage was a function of water depth (Ansari et. al., 2002: Rex et. al., 1993).

The benthic community in the immediate vicinity of the wells (typically 100 -500m^2 cuttings footprint) would be affected as the feeding and respiration of some seabed fauna would be impaired and others smothered (Cranford *et.al.,* 1999; Grant and Briggs, 2002). The benthic communities would be lost due to the accumulation of thicker layers of cuttings discharged around the well. The composition and population of the benthic fauna would also change over time, as others replace the species unsuited to the characteristics of the new sediment (Strachan, 2010). This impact is of low significance in the immediate vicinity of the wells, considering that only one (1) well is planned to be drilled in over 950km^2-area block in water depth with a less diverse macrobenthos community.

Moreover, the residue of NADFs (Saraline 185v base oil) and other viscosifiers, adhere to drill cuttings (109m^3) – see Table 3.4 NADF sections) after treatment. When these cuttings are discharged, some of this aromatic substance disperses partially in deep waters under strong currents before reaching the sea floor. Studies by Brandsma and McKelvie, (1994) have shown that the risk of water-column impact is low due to the short residence time of cuttings as they settle to the sea floor and the low water-solubility and aromatic content of the base fluid. The low-toxicity NADFs, with green and yellow hazard categories, are not toxic in the water column. However, the natural faunal community will be modified to a degree depending on the chemical toxicity of the base fluid, oxygen depletion due to NADF biodegradation in the sediments and physical impacts from burial or changes in grain size as well as the sensitivity of the fauna species present. This impact is of major

significance

The suspension of fine particles of drilling mud and cuttings discharged into the water column would create a turbid environment affecting some kilometres from the point of discharge. Studies by Patin (1999) show that the increased turbidity may result in altering the balance of production/destruction processes in the surface layer of seawater, however, this effect will be limited in time and area, hence, of minor significance.

7.1.2 Drilling Chemicals and other Discharges

The chemicals and other discharges include:

- Cement and well clean-up and testing chemicals; and
- Deck drainage, bilge and ballast waters are possibly contaminated with traces of hydrocarbons from drill ships, supply and support vessels.

7.1.2.1 Cement and Chemicals

The effects of cement losses to the seafloor and chemical discharge are localised and minor. An estimated quantity of 1500MT cement class G would be used in drilling all the wells. Quantities of cement may escape to the seabed, although small and containing only low-toxicity chemicals. The recommended cement discharge should not exceed 10% of the cement use and will be minimised wherever possible.

7.1.2.2 Deck Drainage, Bilge Water and Ballast Waters

Water that accumulates in the drains and bilges of the drill ships and other support vessels is likely to become contaminated with low levels of hydrocarbons and other chemicals, introducing invasive species, and therefore affecting water quality. Unmanaged discharge of this water to the sea represents a potential impact on local water quality and marine organisms.

Depending on where it was taken on board, ballast water may contain harmful micro-organisms, marine organisms from other locations and contaminated sediments in suspension. Ballast water is taken on board as appropriate to maintain safe operation and manoeuvring of the vessels.

The main potential impacts associated with ballast water include:

- discharge of ballast water that contains oil or other potential polluting chemicals may affect water quality; and
- the possibility that invasive foreign (alien) species and pathogens may be introduced into Ghanaian waters that can adversely affect native marine biodiversity.

7.2 General Waste

The potential types of waste to be generated will include:

1. Non-hazardous solid waste;
2. Hazardous solid waste;
3. Hazardous liquid waste; and
4. Domestic waste.

Waste will be collected and segregated into the above classifications and returned for onshore treatment, recycling, controlled incineration or controlled landfill by an EPA-approved waste contractor. The estimated volumes/qty of each waste category are identified in Table 3.7. The processing and end point of each waste is shown in Table 7.1.

Improper disposal or deliberate disposal/dumping of non-hazardous or hazardous solid waste at sea as a means of avoiding waste transfer and treatment will be against the MARPOL Conventions.

Domestic waste to be generated will include sewage and food waste. Approximately $3.6X10^6$ litres of sewage (for the 180 crews) will be generated offshore. Sewage contains bacteria and worm cells which could replicate when disposed on floating objects on the sea. Food waste will be macerated and discharged in accordance with MARPOL 73/78. Due to the large volume of the sea and its salinity, the likely impact will be insignificant.

Table 7.1: Waste Stream Processing and End Point

		Waste Type	Source	State	Process for Handling, Sorting, Storing, and Treatment for each Waste Stream	End Point' for each constituent part of the waste stream.
NON HAZARDOUS	Landfill	General Waste – Domestic Waste (blue Bins, package, bin waste)	blue bins	Solid	Sort and Landfill	Sekondi Takoradi Metropolitan Assembly (STMA) Landfill site, Sofokrom
		Plastic (non-contaminated and not including drums and chem containers)	Bottles, cups wrapping	Solid (shredded)	Sort and Recycle	• Cyclus Plastic Recycling Ltd, Abransa
		Glass	Jars, Bottles	Solid (crushed)	• Washing of compatible chemical [a]* (acid, base or food) contaminated glass containers. Followed by Crushing and Burial at the designated Landfill site • Incineration of incompatible chemicals (amine, alcohol, or other organic reagents) in contaminated glass containers. Followed	Sekondi Takoradi Metropolitan Assembly (STMA) Landfill site, Sofokrom
		Paper & Cardboard	Domestic	Solid (bailed)	• Sort dirt or food - contaminated papers & cardboard, Shred and Landfill • Sort uncontaminated papers & cardboard, Bail and Recycle	• Sekondi Takoradi Metropolitan Assembly (STMA) Landfill site, Sofokrom • Super Paper Co. Ltd, Tema: Recycled paper and cardboard products (e.g. toilet rolls, egg crates, insulation materials, etc.)
		Polystyrene	packaging	Solid	• Food packaging: Sort and Landfill • Non-food packaging: Incinerate	• Sekondi Takoradi Metropolitan Assembly (STMA) Landfill site, Sofokrom • Thermal Energy, gaseous products of Incineration
		Rubber (tyres and others)	rubber goods	Solid (shredded)	Sort, Shred and Incinerate	• Thermal Energy, gaseous products of Incineration • Stabilise ash for permitted applications (blocks and bioremediation additives) • Recycle bottom metals as scrap metals
		Composite Materials	packaging	Solid	packs, etc.) at the designated Landfill site • Incineration of other composite materials (e.g. fibreglass-absorbents, fibreglass plastics, etc.) into ash or calcined materials. Followed by the recycling of ash into blocks and/or Landfilling of calcined materials from Incineration	• Sekondi Takoradi Metropolitan Assembly (STMA) Landfill site, Sofokrom • Thermal Energy, gaseous products of Incineration • Recycle ash or calcined materials into blocks or landfill
	Recycle	Cooking Oil & Grease	Kitchen oils and grease trap	Sludge	Incineration of cooking oil & Grease	Thermal Energy, gaseous products of Incineration
		Electrical goods	Broken items	Solid	Dismantle, Sort and Recycle/ Incinerate	• Thermal Energy, gaseous products of Incineration • Stabilise ash for permitted applications (blocks and bioremediation additives) • Recycle sorted metals components and bottom metals as scrap metals • Recycle sorted plastic components as scrap plastics
		Wood (uncontaminated)	Pallets, packaging	Solid	Reuse of non-chemical contaminated wood wastes for firewood and other construction purposes [b]	Thermal Energy (firewood), makeshift wooden structures such as benches, hen coop, etc.
		Ferrous & Non-Ferrous metals	Scrap metals	Solid (loose, crushed)	• Washing of compatible chemical [a]* (hydrocarbon, acid or base) contaminated metal containers. Followed by Crushing and Recycling • Ragging of non-compatible chemicals (polyol, isocyanates, etc.) contaminated metal containers. Followed by the Incineration of	Ferro Fabrik Ltd, Tema. Products include Iron rods for construction, Steel balls for the mining industry, etc.

HAZARDOUS	Hazardous	Waste Oily Water	Slops, Tank Cleaning slops	Liquid	Sedimentation, Oil-Water Separation, pH balancing and Coagulation, Flocculation, Solids separation, Zeolite and GAC Adsorption for ions, colour and odour removal [d]	Treated effluent is mainly discharged into the creek, which goes through a wetland and finally into the sea
		Hydrocarbon Contaminated Sludge and Slops	Slops, Tank Cleaning slops	Liquid	Sedimentation, Oil and Water Separation and bioremediation of contaminated solids	• Recovered oil for Recycling • • Treated effluent discharged to drain • Remediated soils for permitted applications (sub-base for road construction, filling material, blocks, etc.)
		Tank cleaning slops	Tank Cleaning slops	Liquid	Sedimentation, Oil and Water Separation and bioremediation of contaminated solids	• Recovered oil for Recycling • Treated effluent discharged to drain • Remediated soils for permitted applications (sub-base for road construction, filling material, blocks, etc.)
		Waste Oil Based Mud	Mud waste	Liquid	Sedimentation, Oil Separation and bioremediation of contaminated solids	• Recovered oil for Recycling • Remediated soils for permitted applications (sub-base for road construction, filling material, blocks, etc.)
		Waste Water Based Mud	Mud Waste	Liquid	Sedimentation, Water Separation and bioremediation of contaminated solids	• Treated effluent discharged to drain Remediated soils for permitted applications (sub-base for road construction, filling material, blocks, etc.)
		Waste Cement Slurry Mixes	Mud Waste	Liquid	Sedimentation, Water Separation and bioremediation of contaminated solids	• Treated effluent discharged to drain Remediated soils for permitted applications (sub-base for road construction, filling material, blocks, etc.)
		Contaminated Brine	Mud Waste	Liquid	Dilution with treated and/or fresh water. Followed by wastewater treatment	Treated effluent is mainly discharged into the creek, which goes through a wetland and finally into the sea
		Waste Oils -engine/base/hydraulic	Engines	Liquid	Sedimentation and Oil Recovery. Followed by the Recycling of recovered oils and treatment of contaminated solids (sediments)	• Recovered oil for Recycling Remediated soils for permitted applications (sub-base for road construction, filling material, blocks, etc.)
		Oily Rags	Engines	Solid	Incineration of oily rags into ash. Followed by the recycling of ash into blocks	• Thermal Energy, gaseous products of Incineration • Stabilise ash for permitted applications (blocks and bioremediation additives)
		Oil Filters	Engines	Solid	Incineration of oil filters. Followed by the recycling of ash into blocks and processing of incineration scrap metals for recycling	• Thermal Energy, gaseous products of Incineration • Stabilise ash for permitted applications (blocks and bioremediation additives) • Recycle bottom metals as scrap metals
		Flammable Liquids	Thinners, volatiles	Liquid	Incineration of Flammable liquids	Thermal Energy, gaseous products of Incineration

HAZARDOUS	Batteries	Lead Acid, Lithium Ion etc	Solid	• Carbon-zinc and Alkaline batteries are crushed and bioremediation together with other compatible wastes for bioremediation • Lead-acid batteries are dismantled and segregated into components for onward treatment and recycling/disposal	• Remediated soils for permitted applications (sub-base for road construction, filling material, blocks, etc.) • Acid is neutralised, treated and discharged; Plastic casing is cleaned* and recycled; Lead is recycled • Stored batteries for recycling
	Paints and Empty Paint Containers	Paints	Liquid	Incineration of paints and paint cans. Followed by the processing of scrap metals from incineration for recycling	• Thermal Energy, gaseous products of Incineration • Recycle bottom metals as scrap metals
	Dry Bulks	Bulks	Solid powder	Stabilisation of bulk wastes (barite, bentonite, calcium carbonates, etc.) with sand and cement into blocks [f]	Remediated soils for permitted applications (sub-base for road construction, filling material, blocks, etc.)
	Wood (contaminated)	Pallets, packaging	Solid	Incineration of contaminated wood or wood packaging. Followed by the recycling of ash into blocks	• Thermal Energy, gaseous products of Incineration • Stabilise ash for permitted applications (blocks and bioremediation additives)
	Empty Hazardous Plastic Chemical Containers	Mud chemicals, other products	Solid	• Washing of compatible chemical [g]* (hydrocarbon, acid or base) contaminated plastic containers. Followed by Shredding and Recycling • Ragging of incompatible chemicals (polyol, isocyanates, etc.) in contaminated plastic containers. Followed by the Incineration of	• Cleaned, Shredded plastic containers for Recycling [h] • Thermal Energy, gaseous products of Incineration
	Empty Hazardous Metal Chemical Containers	Mud chemicals, other products	Solid	• Washing of compatible chemical [g]* (hydrocarbon, acid or base) contaminated metal containers. Followed by the processing of incineration scrap metals for recycling • Ragging of incompatible chemicals (polyol, isocyanates, etc.) in contaminated metal containers. Followed by the Incineration of	• Cleaned, Crushed metal containers for Recycling • Thermal Energy, gaseous products of Incineration
	Aerosol Spray Can	Paints	Solid/ Liquid	Deaeration of aerosol fluids into drums. Followed by Incineration of aerosol fluids and processing of aerosol cans for recycling	• Thermal Energy, gaseous products of Incineration • Crushed hazardous cans for Recycling
	Bulbs and Fluorescent Tubes	Bulbs and tubes	Solid	Controlled crushing of bulbs. Followed by the extraction of mercury and Landfilling (burial) of crushed glass	• Recovered mercury for Recycling • • Burial of crushed glass at a designated Landfill
	Sanitation & Clinical Waste Bins	Swabs, dressings	Solid	Incineration of Sanitation & Clinical waste bins/containers	• Thermal Energy, gaseous products of Incineration • Stabilise ash for permitted applications (blocks and bioremediation additives)
	Medical Containers	Swabs, dressings	Solid	Incineration of Medical containers	Thermal Energy, gaseous products of Incineration and by-products such as ash, glass and metals from incineration
	Radioactive Waste	NORM	Solid	N/A	N/A
	Residue Acidic Waste	muds	Liquid	Dilution, Neutralisation and Wastewater Treatment	Treated effluent is mainly discharged into the creek, which goes through a wetland and finally into the sea
	Residue Alkaline Waste	muds	Liquid	Dilution, Neutralisation and Wastewater Treatment	Treated effluent is mainly discharged into the creek, which goes through a wetland and finally into the sea

7.3 Potential Risk of Oil Spill

The potential sources of an oil spill during the proposed drilling operations include:

- Blow-out from the well;
- Storage container failure (fuel oil or lube oil); and
- Damage sustained during a collision, grounding or fire.

The potential for spills to occur from the proposed drilling programme will be limited by the hydrocarbon inventories present on the drill ship and support vessels and the nature of the potential hydrocarbons present in the target formation and how they are managed.

7.3.1 Spill Modelling

The potential oil spill and thresholds which have been modelled into three scenarios for drilling activities in the DWCTPW are captured in Tables 7.2 and 7.3.

The limitation of the modelling is that a probability plot represents the chance (as a percentage) of an area of sea surface experiencing contamination from a spill and is not a true reflection of the extent that a potential spill would cover. Any comparison of stochastic outputs should be made after consideration of both, the period/ duration of the scenario and the quantity of oil that is potentially beached.

Table 7.2: Stochastic Oil Spill Scenarios Modelled

Description	15-Day Blowout (Jan to March)	10-Day Blowout (Jan to March)	10-Day Blowout (Apr to Jun)	Diesel spill from the drillship (Jan to March)
Well Latitude	04° 08' 43.64" N			
Well Longitude	002° 54' 55.91" W			
Release Rate and Duration Mass Released	95,296 bbls/day for 15 days	95,296 bbls/day for 10 days	95,296 bbls/day for 10 days	Instantaneous 1,000 bbls
Total Volume and Mass Released	1,429,440 bbls 196,877 MT	952,960 bbls 131,252 MT	952,960 bbls 131,252 MT	1,000 bbls 138 MT
Total Model Duration	43 days	43 days	43 days	43 days
Depth of Release	2,150 m	2,150 m	2,150 m	surface
Nearest Shoreline	~100 km, near Ahobre, Ghana (Cape Three Points = 110 km)			
Nearest Maritime Boundary	~42 km, Cote d'Ivoire			

Table 7.3: Thresholds used in the interpretation of oil spill modelling

Category	Threshold	Justification
Shorelines	100 ml/m^2 (approx. equal to 86 g/m^2).	• The International Tank Owners Pollution Federation (ITOPF) guidelines for the recognition of oil on shorelines (ITOPF, 2011) include shoreline oil density. The definition for 'light oiling' is selected as the most appropriate threshold and is described in the guidelines as equivalent to a volume threshold of 0.1 litre/m^2, or less than 0.1 litres of oil per metre strip along a 2 m deep beach which is assumed in the model. • The 0.1 litre/m^2 threshold (considered a 'stain' or 'film') is assumed as the lethal threshold for invertebrates on hard substrates and sediments (mud, silt, sand, gravel) in intertidal habitats based on Owens & Sergy (1994) and French-McCay (2009). This would be enough to coat the animal and likely impact its survival and reproductive capacity, while stain <0.1 litre/m^2) would be less likely to have an effect (French-McCay, 2009).
Sea surface	0.3µm (microns) - rainbow sheen	Interpretations of the significance of surface oil thickness vary widely. The presence of a visible sheen is likely to interfere with other users of the sea such as fishing operations and a visible sheen can occur between 0.04 and 0.3µm as identified by the Bonn Agreement Oil Appearance Code (BAOAC). This is highly dependent on weather conditions, and the lower level of 0.04µm is only visible under ideal conditions. Tests performed by O'Hara and Morandin (2010) indicated that significant changes in feather structure did not necessarily occur at a thickness of 0.04µm, but began to be visible at 0.1µm. In the interpretation of modelling outputs, the UK requirements for Oil Pollution Emergency Plans require outputs to identify sheens to a level of 0.3µm. Oil spill response in the form of containment, and dispersant use is normally not attempted when oil is below a thickness of 5µm.

The results for the stochastic modelling are presented in Table 7.4. The stochastic modelling results for the well blow-out scenarios suggest that:

Beaching will occur for all scenarios, with the volume beached, coastline impacted and the minimum arrival time dependent upon the original release volume and event type.

Ghana's coastlines are likely to be impacted by oil beaching, with a probability of 100% in the well-blow-out scenarios (Scenario 1 and 2). The probability of beaching for the marine diesel spill (Scenario 3) is no greater than 10%.

The minimum predicted time to reach shore is around 2.83 days (Scenario 2). This corresponds to metocean and meteorological conditions experienced between January and March, although seasonal differences are not particularly significant and similar beaching times occur for the other scenarios.

The maximum mass of oil beaching is 23,081 tonnes, corresponding to the worst-case scenario modelled (Scenario 1).

Table 7. 4: Stochastic modelling results

Description	15-Day Blowout (Jan to March)	10-Day Blowout (Jan to March)	10-Day Blowout (Apr to Jun)	Diesel spill from the drillship (Jan to March)
Total Volume Released	95,296 bbls/day for 15 days	95,296 bbls/day for 10 days	95,296 bbls/day for 10 days	Instantaneous 1,000 bbls
Depth of Release	2,150 m	2,150 m	2,150 m	surface
Fate of Oil				
Max Mass Accumulating on Shore (Tonnes)	35,000 m3 (In 40 days)	28, 000 m3 (In 30 days)	30, 000 m3 (In 35 days)	38 m3 (In 1 day)
Minimum Arrival Time (Days)	3 days, 1 hour	2 days, 22 hours	2 days, 20 hours	2 days, 23 hours
Max Mass on Surface (Tonnes)	89,000 m3 (In 18 days)	71, 000 m3 (In 11 days)	58, 000 m3 (In 11 days)	135 m3 (In 1 day)
Time for Emulsion Viscosity to exceed 10,000 cSt	1 day, 3 hours	1 day, 3 hours	-	-
Time to cross maritime boundary	1 day, 18 hours	1 day, 18 hours	2 days, 0 hours (Cote d'Ivoire)	1 day, 18 hours (Cote d'Ivoire)

7.3.2 Oil Spill Modelling Scenarios

Scenario 1: Relief Well Drilled

The quantity and spill persistence of the released hydrocarbons suggests a large surface signature of contamination with the spilt hydrocarbon predominately transported to the north and east of the release site (Figure 7.2). Along the West-African coastline (Cote d'Ivoire to Nigeria), the chances of beaching are between 0% and 90% and the maximum mass of oil shown to come ashore in any one simulation is 35,931 tonnes (Table 7.4). The shortest arrival time calculated in any one simulation is 3.1 days.

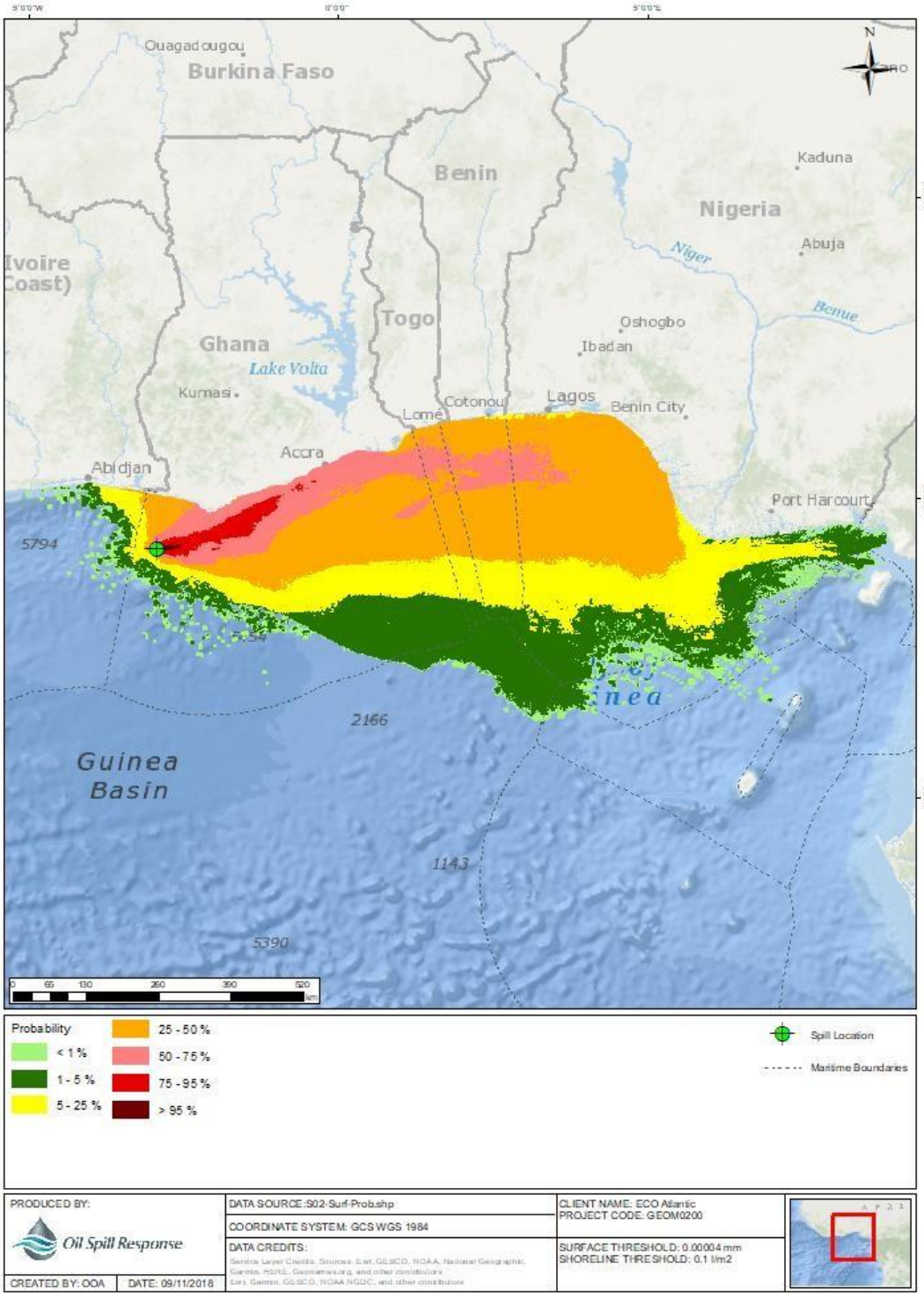


Figure 7. 1: Probability that a cell could be impacted by a 15-day well blowout between January and March (Scenario 1)

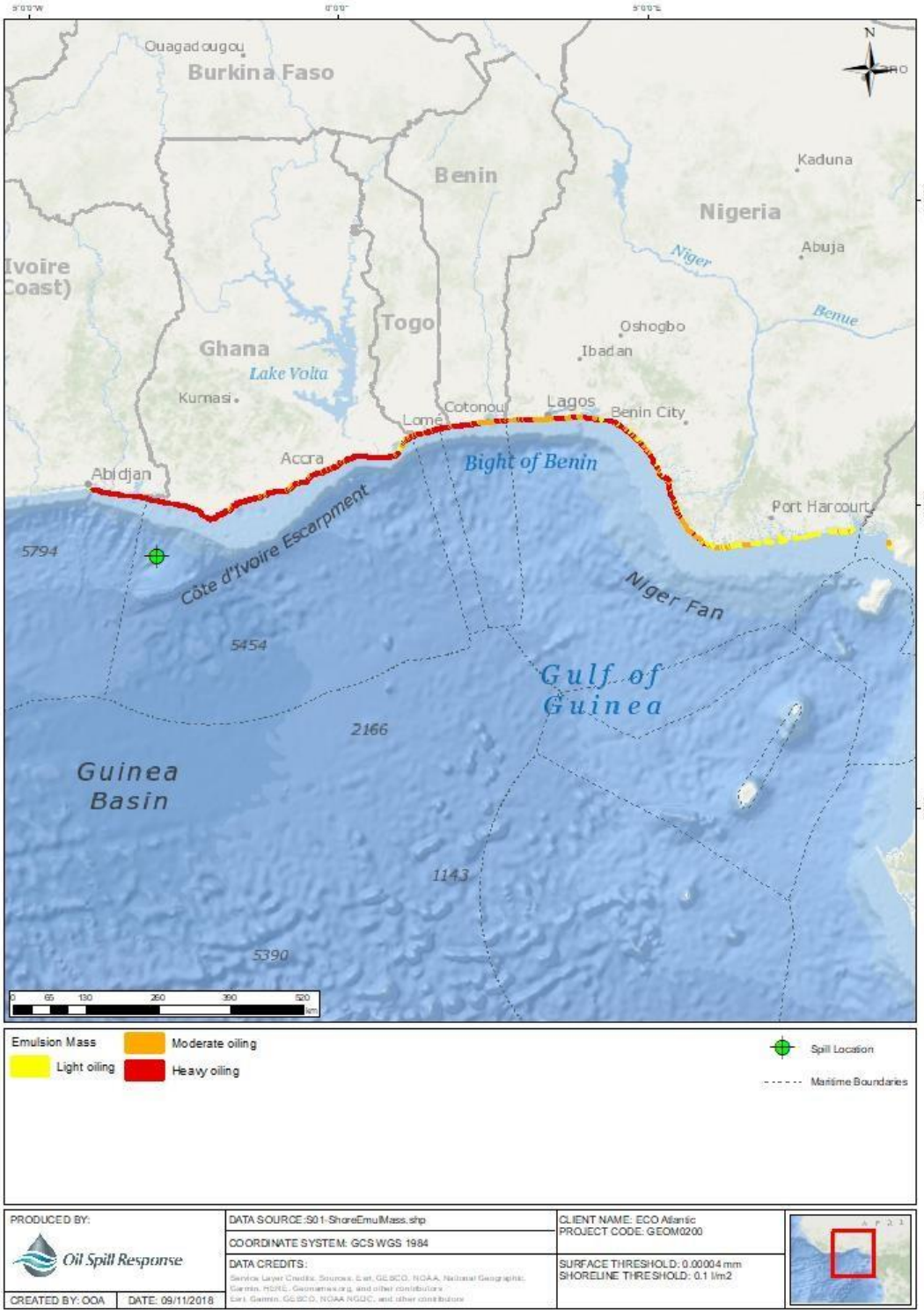


Figure 7.2: Shoreline contamination based on emulsion mass from a 15-day well blowout between January and March

Scenario 2: Probabilistic outcome

The quantity and spill persistence of the released hydrocarbons suggests a large surface signature of contamination and the spilt hydrocarbon is predominately transported to the north and east of the release site (Figure 7.3). Along the Ghanaian coastline, the chances of beaching are between 30% and 85% (Figure 7.4). The maximum mass of oil shown to come ashore in any one simulation is 28,000 tonnes with the shortest arrival time calculated in any one simulation to be 2.8 days (Table 7.4). The P50 mass of oil onshore is 29,000 tonnes and the P50 arrival time is 10 days, 4 hours.

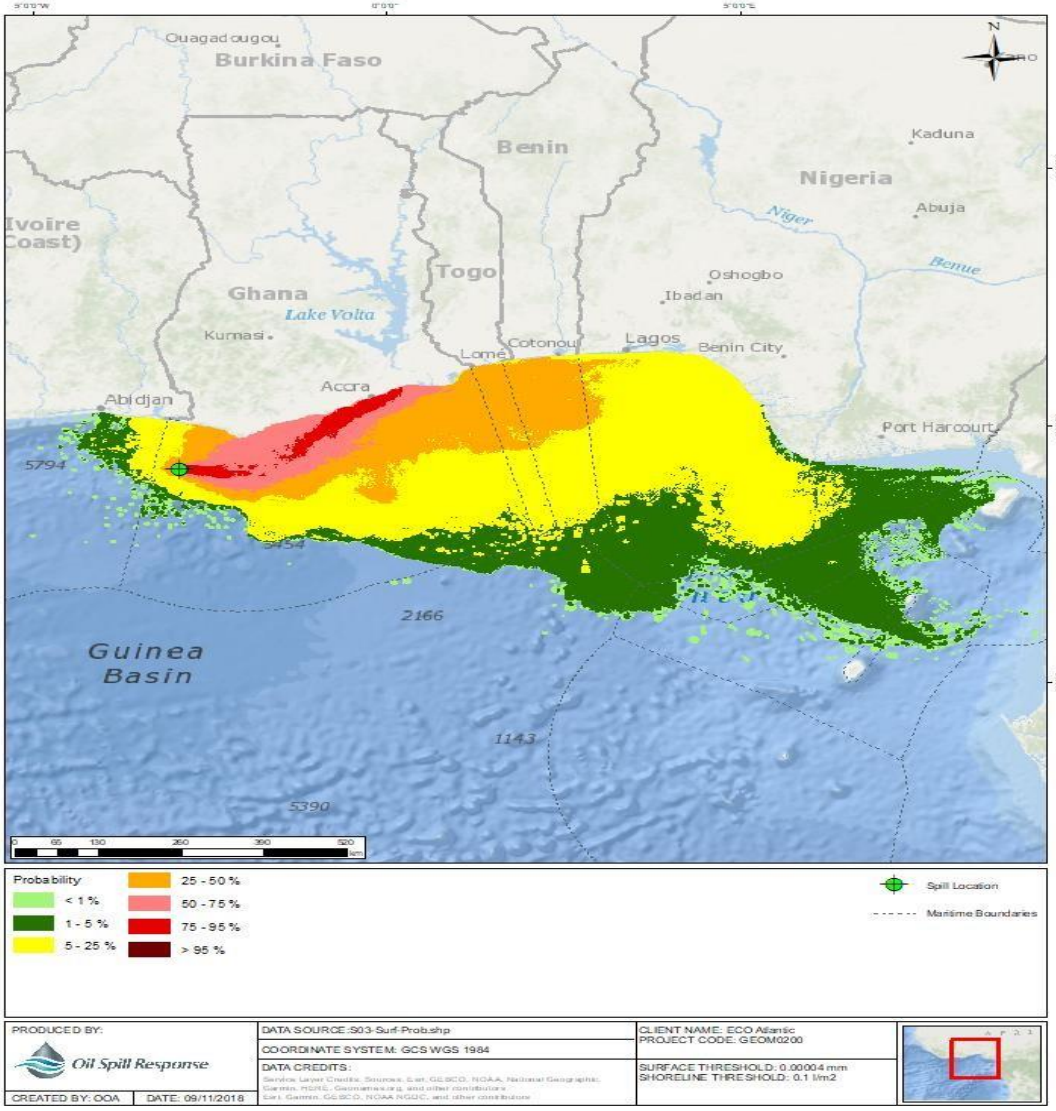


Figure 7.3: Probability that a cell could be impacted by a 10-day well blowout between April and June. (Scenario 3)

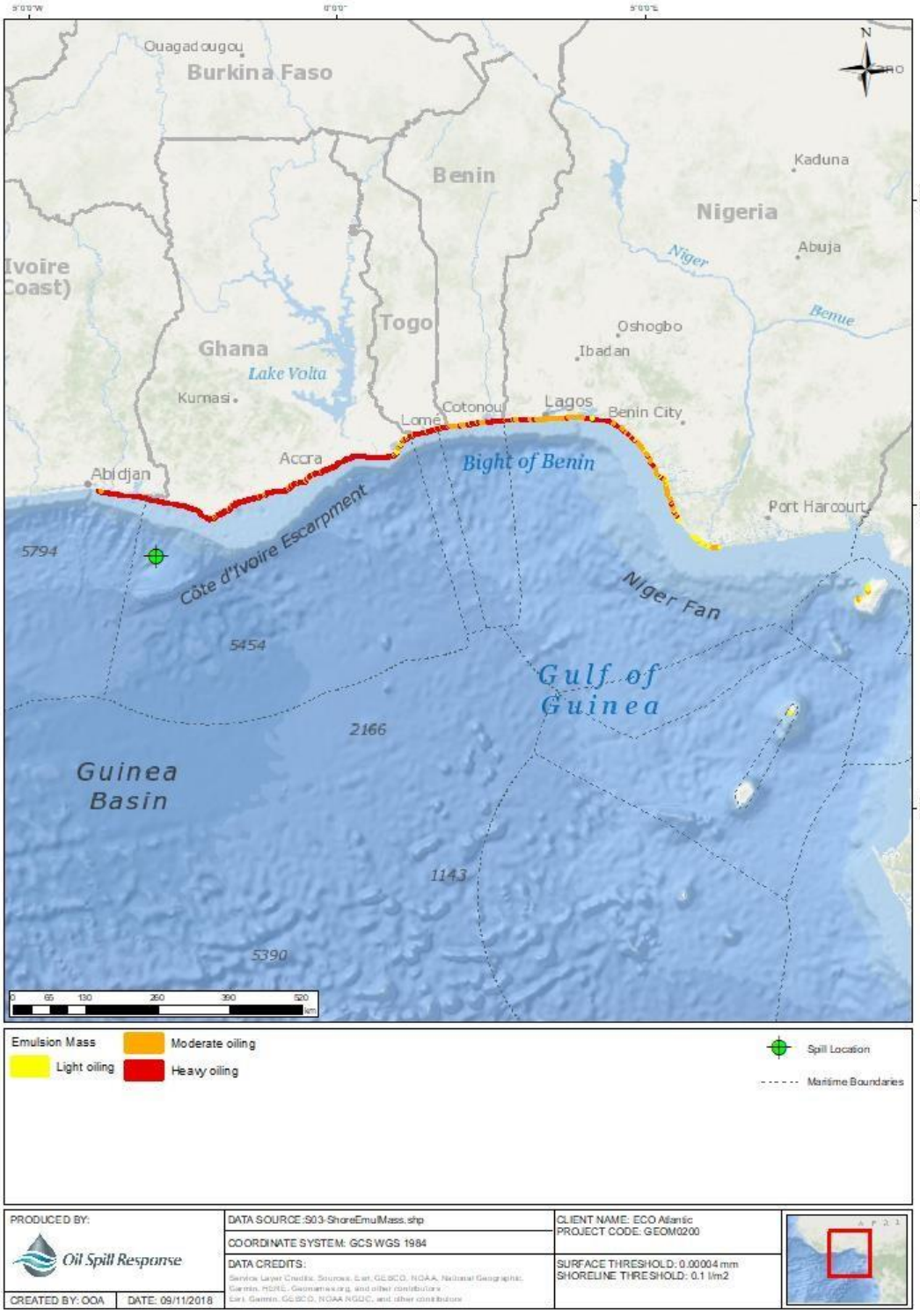


Figure 7.4: Shoreline contamination based on emulsion mass from a 10-day well blowout between April and June

Scenario 3: Marine Diesel Spill

The quantity and spill persistence of the released hydrocarbons is lower than the crude oil, and evaporation is much higher (Figure 7.5). The spilt hydrocarbon is predominately transported to the north and east of the release site (Figure 7.6). Along the Ghana coastline, the chances of beaching are between 0% and 5% (Figure 7.5). The maximum mass of oil shown to come ashore in any one simulation is 38 tonnes (Table 7.4). The shortest arrival time calculated in any one simulation is 2.86 days. The highest probability of mass of oil on shore is a P10 of 38 tonnes, with an arrival time of 2.9 days.

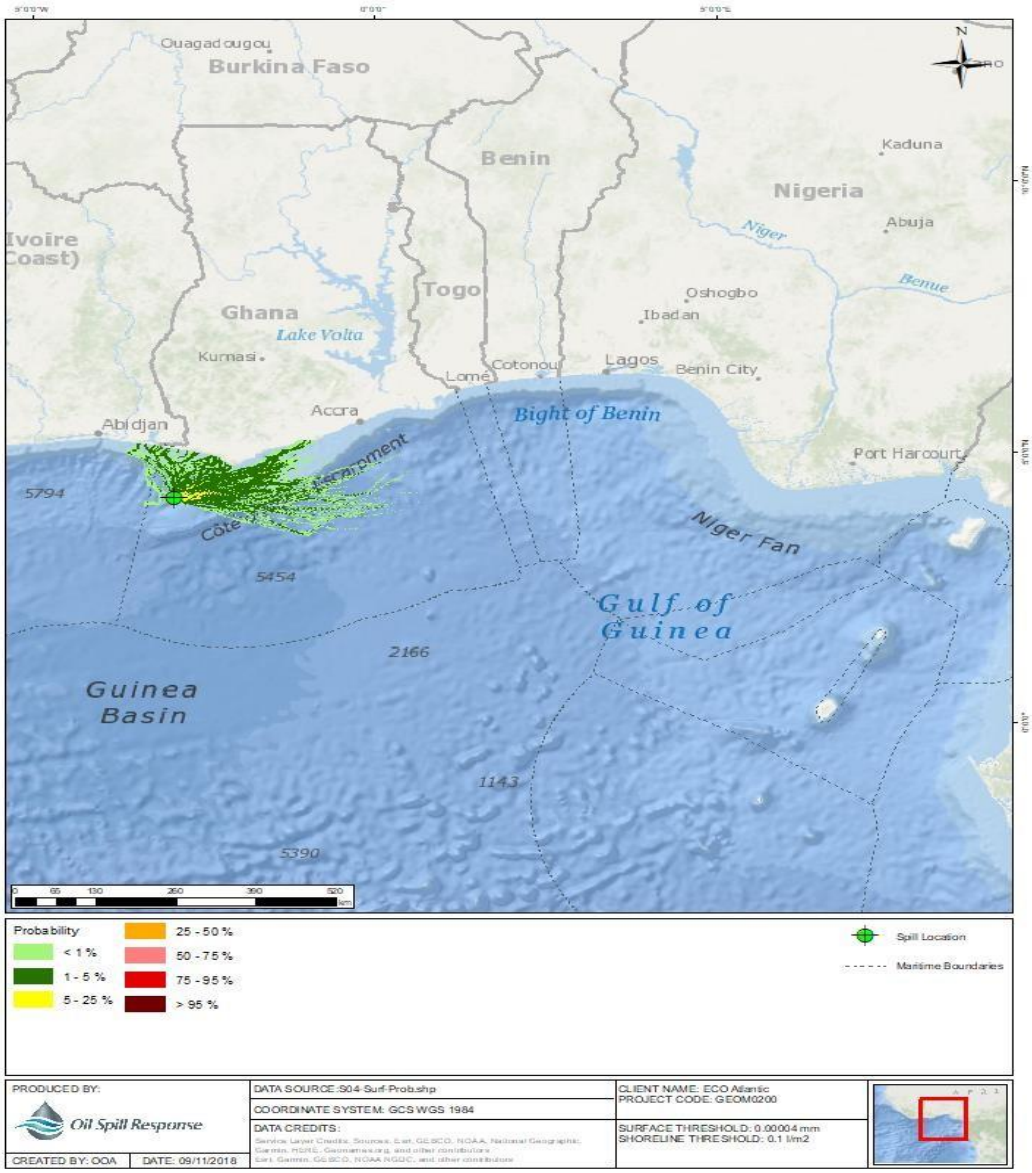


Figure 7. 5: Probability that a cell could be impacted by an instantaneous diesel spill between January and March

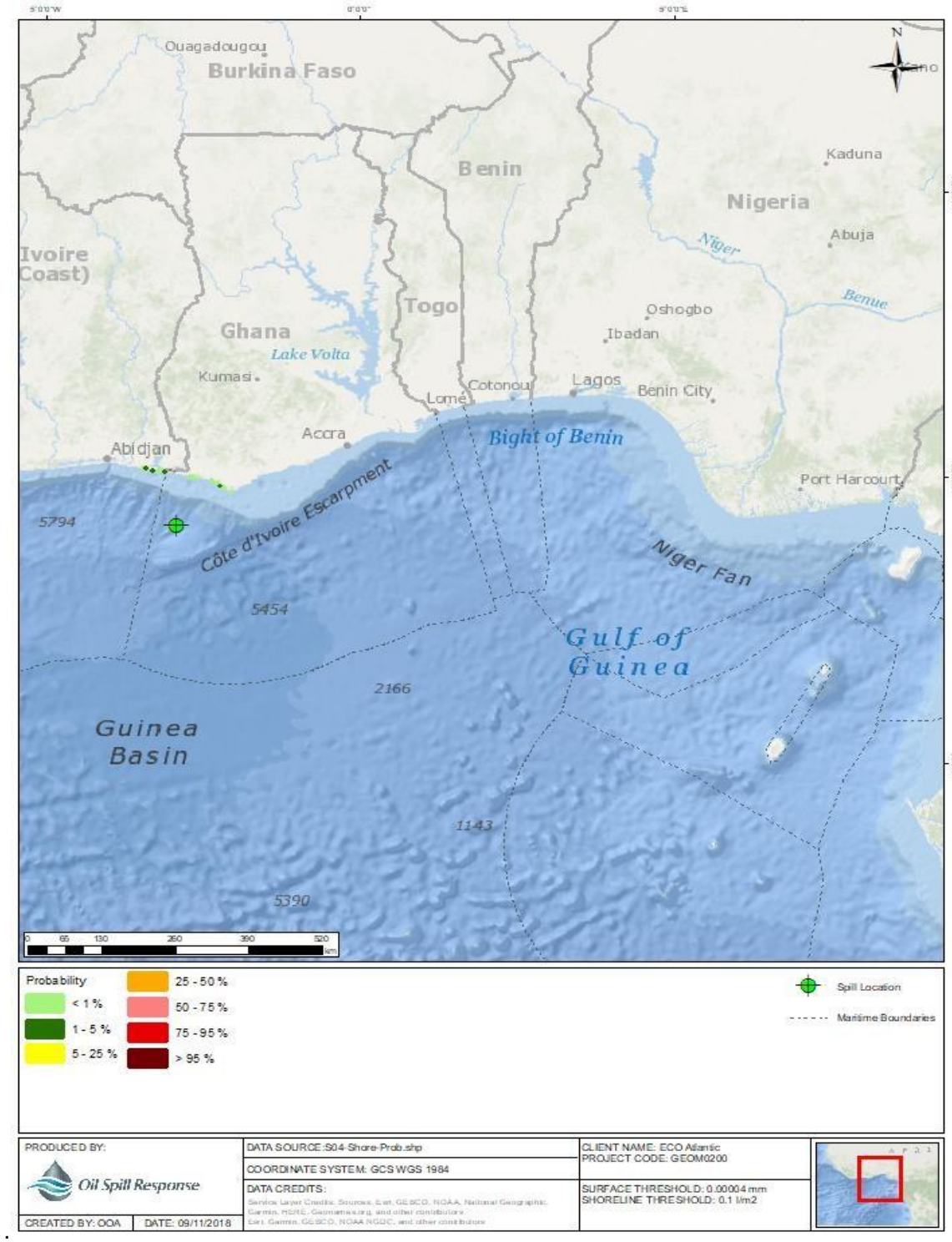


Figure 7.6: Probability that a shoreline could be impacted by an instantaneous diesel spill between January and March

7.3.3 Discussion of Impact

Oil will undergo natural, physical, chemical and biological changes called weathering when released. Weathering alters the chemistry of ocean water, making it toxic for fishes and other organisms higher in the food web, including mammals. Oil is most toxic the first few days after the spill, then weather loses some of its toxicity.

An oil spill in the marine environment will have a destructive effect on water quality and will pose a threat to marine life. In the event of a spill, oil from the surface may disperse and contaminate the water column, creating damaging effects on water quality, delicate marine habitats and breeding areas. This could pose a threat to a wide range of marine fauna and seabirds. The great species diversity forming important marine ecosystems that constitute live support basis, and support to livelihoods of coastal communities would be destroyed.

Fish kill could be widespread from high exposure to emulsified or freshly spilt oil in surface and shallow waters and wetland habitats. Fish gills may be clogged causing asphyxiation. Many small and large pelagic fish species and benthic organisms as well as their habitats could be destroyed. These, however, are essential links in the global food chain and may also lead to the destruction of areas for breeding adults, eggs and larvae.

Waders and sea turtles on sandy beaches could seriously be impacted. Estuaries could suffer severe ecological damage. Considering that drilling operations will take place within the turtle nesting and hatching period there could be a significant impact on turtles. The impact of a spill would to some extent be lessened by the fact that the coastline is exposed to moderate wave action from the South Atlantic and natural processes will assist in removing any oil that accumulates on sandy beaches.

The impact of a large oil spill on rocky shores in the vicinity of Cape Three Points is also a serious concern. It is known that the rocky shores support a wide range of organisms in the intertidal zone, much of the fauna and flora is attached (unlike most sandy-beach organisms that burrow) and will be exposed to the full toxic effects of an oil spill. Subsistence harvesting of intertidal invertebrates (e.g. whelks, bivalves) does occur in Ghana and livelihoods will be affected by oil pollution along the rocky zone (*Nyarko & Evans, 1998).*

Fishing would be difficult or impossible in areas directly affected by a spill. Vessels and gear would be fouled and landed fish contaminated making the fish unwholesome. Fishermen could be compelled to stop fishing. Such action would directly affect the fishers, fishmongers and other players in the fish supply chain, their livelihoods and families, resulting in a reduction in both food and economic resources

The potential impacts from an oil spill are assessed to be of severe significance due to regional impact, high persistence and potential transboundary pollution.

7.4 Impact of Physical Presence on Operations

The drilling vessel is expected to be on-site for approximately 120 days per well. During this time, the physical presence of the drilling vessel, as well as noise and lights from drilling activities, may affect marine biota such as plankton and fish, marine mammals, sea turtles and birds.

Noise and lights from the drilling vessel may temporarily affect the behaviour of marine mammals, sea turtles and birds (e.g., by causing attraction or avoidance). Also, vessels other than those associated with the project will be temporarily excluded from a 500-meter buffer zone around the rig for safety reasons. Due to the distance from shore and shipping lanes, no impacts on fishing or shipping are expected.

7.4.1 Impacts on Plankton and Fishes and Fishery Resources

Plankton may be attracted to lights associated with offshore structures. Fish larvae are strongly attracted to lights at night (Victor, 1991). Light emissions from operations are likely to have negligible impacts on planktonic communities due to the small area of ocean affected. The presence of the drilling vessel will attract fish, providing shelter and food in the form of attached fouling biota (Gallaway and Lewbel, 1982). Offshore structures typically attract fish and create an “artificial reef” which is considered a beneficial impact. The effect, either positive or negative, is likely negligible for a single, temporary facility.

7.4.2 Impacts on Benthic Communities

With an extended deployment while on the well location, the drilling vessel will acquire a biofouling community. After 120 days, there will be significant fouling communities covering near-surface areas of the drilling vessel that are not treated with anti-biofouling agents or are not regularly cleaned of fouling communities. Fouling organisms will regularly slough off from the drilling vessel and provide organic material to benthic communities below, although the volume of organic inputs and their effect will be minimal in the water depths involved.

7.4.3 Impacts on Marine Mammals

Some marine mammals may avoid the drilling vessel area due to noise. Others might be attracted to fish populations around the rig. The most likely impacts would be short-term behavioural changes such as diving and evasive swimming, disruption of activities or departure from the area. In order of increasing severity, they are 1) audibility; 2) responsiveness (behavioural effects); 3) masking; and 4) hearing loss, discomfort or injury (physical effects). The levels of sound produced during drilling are sufficient to be audible and to produce behavioural responses, but much lower than those known to cause hearing loss, discomfort or injury.

Low-frequency noise from offshore drilling activities can be detected by marine mammals (Richardson et al., 1995). Mysticetes (baleen whales such as the humpback, minke and Bryde’s whales) are more likely to detect

low-frequency sounds than are most odontocetes (e.g., dolphins), which have their best hearing in high frequencies. There is no other drilling activity in the area, so this would represent a novel source. However, noise associated with drilling is relatively weak in intensity, and the animals' exposure to these sounds will be transient. Some of the noise (from vessel engines and propellers) will be similar to the existing noise associated with shipping traffic in the region.

7.4.4 Impacts on Marine Birds

It has been noted that the presence of offshore structures has had both a positive and negative impact on birds. Some birds may be attracted to offshore structures because of the lights and the fish populations that aggregate around these structures. Birds may use offshore structures for resting, feeding or as a temporary shelter from inclement weather (Russell, 2005). However, birds migrating over water at night have been known to strike offshore structures, resulting in death or injury. The relatively short-term presence of a single drilling vessel and support vessel(s) 60 km offshore is unlikely to have any significant impact, either positive or negative, on seabirds or migratory birds.

7.4.5 Impacts on Recreation, Aesthetics or Tourism

Offshore structures such as drilling vessels and platforms typically are visible from shore at distances of 5 to 16 km, with small structures (e.g., a single drilling vessel) barely visible at 5 km from shore. On a clear night, lights on top of offshore structures may be visible to a distance of approximately 32 km. Since the drilling vessel and support vessels will be located 60 km from the nearest shoreline, they will not be visible from shore and will have no impact on nearshore recreational activities, aesthetics or tourism. With the possible exceptions of deep-sea fishing and yachting, it is not expected that any other recreational activities will be conducted in the vicinity of or near the drilling location.

Transiting support vessels will be visible to shoreline visitors as they enter and leave the shore base during support operations. The additional support vessel trips resulting from the exploratory drilling program are not expected to adversely affect recreation activities, aesthetics or tourism in the area of the shore base.

7.4.6 Impacts on Fishing, Shipping and the Maritime Industry

The presence of drill ships and support vessels and drilling activities may interfere with other marine activities,

e.g. fishing and shipping. The impacts of fishing activities are expected to be of minor importance. All vessels (including fishing boats) will be excluded from a 500-m radius around the drilling vessel for safety reasons during drilling would mean that an area of about 0.79km2 would be excluded for commercial fishing and shipping.

Any inconveniences associated with the safety (exclusion) zones are expected to be minimized by advance consultation with fishermen. Due to the distance from shore and the restriction of fishing activities in the area where the well will be drilled, no significant impacts on fishing are expected when the drilling vessel is in position at the well locations.

Due to the distance from shore and the absence of fishing activities in the area where the well will be drilled, no significant impacts on fishing are expected when the drilling vessel is in position at the well locations. The drilling vessel will not be positioned near any major shipping lanes and will be well-marked with all the appropriate navigational markers. No impacts on shipping or maritime operations are expected.

Support vessels will enter and leave their shore base, producing a minor incremental increase in port activity. The additional support vessel trips resulting from the exploratory drilling program will not adversely affect shipping and vessel traffic.

7.5 Underwater Noise

Noise characteristics of a typical semi-submersible drilling unit conducting routine drilling activities and various support operations (e.g., support vessels and helicopters) and sound emanating from them can be expected to be continuous at a level of approximately 154 dB (re 1 µPa at 1 m) while drilling, with most energy in the low-frequency bands. During non-drilling periods, sound source levels from the drill ship will originate only from diesel generators, cranes and crew activity aboard the rig. Supply vessels in transit to and from the rig will produce transient sounds in the 128 to 158 dB (re 1 µPa at 1 m) range, with predominant low-frequency components. The supply vessel remaining on standby near the drilling rig will produce lower but continuous sound levels, as it is expected to be either anchored or tethered and remain idle while on station. Similarly, transient helicopter visits to the rig will produce predominantly low-frequency sound source levels of 162 dB (re 1 µPa at 1 m), with the highest sound levels to be experienced directly below the aircraft.

7.6 Atmospheric Emissions

The drilling vessel will emit air pollutants, including CO, NOx, SOx, VOCs and particulates, as well as greenhouse gases such as CO2 and CH4. Support vessels and helicopters will also emit air pollutants from the combustion of diesel fuel (vessels) and aviation fuel (helicopters). Quantities have not been estimated for helicopter emissions, but the emissions are assumed to have a negligible impact on air quality, both offshore and onshore.

Drilling and support vessel engines and generators will emit air pollutants into the atmosphere during drilling and transit. The pollutants, emitted principally from diesel engines and fugitive emissions from fuel tanks, vents and other emission points, are the same as those generated by other ship traffic in the region. There will be temporary, local impacts on air quality near the drilling vessel, but no effects on onshore air quality in coastal communities are expected due to the well site distance from shore.

Air pollutant emissions from the drilling vessel and support vessels are expected to be rapidly diluted and dispersed in the offshore atmosphere. There may be some decrease in ambient air quality within several hundred meters around the rig site during drilling. Support vessel emissions will produce minor impacts on air quality along transit routes (i.e., between the drilling vessel on location at the well site and the onshore support base). There will be negligible impacts on air quality from helicopter traffic along travel routes. At each well site, there will be minimal, localized impacts on air quality from the controlled burning of small quantities of formation liquids or gases generated during well testing.

CHAPTER EIGHT

Mitigation Measures

- Introduction
- Chemical and Discharge Handling and Disposal
- Waste Handling and Disposal
- Oil Spill Prevention and Response Measures
- Physical Presence Impacts Mitigation
- Underwater Noise Mitigation Measures
- Atmospheric Emissions Control Measures

8.0 MITIGATION MEASURES

The assessment revealed a number of significant potential project impacts for which mitigation measures will be required to ensure environmental soundness, social acceptability, health and safety protection and project sustainability. While some of the measures will be in-built into the project design, others will be implemented during project execution. Other measures will also aim at enhancement, especially of beneficial impacts. The following mitigation measures have been defined to address the afore-evaluated impacts:

1. Drilling chemicals and discharges handling and disposal;
2. Waste handling and disposal measures;
3. Oil spill prevention and response;
4. Physical presence impacts mitigation measures;
5. Underwater noise mitigation measures; and
6. Atmospheric emissions control measures.

8.1 Drilling Chemical and Discharge Handling and Disposal

8.1.1 Drill Cuttings and Fluids

In drilling the new well, seawater with viscous sweeps will be used to drill the upper sections (36-inch and 26-inch) (see Table 3.6).

Saraline 185v, an environmentally friendly synthetic NADF (yellow and green hazard category (See Table 3.4)) with low aromatic content, would be used to drill the lower section of the well (17 ½" and 12 ¼").

Ghana EPA has approved Saraline 185v for use in drilling. Cuttings to be generated during drilling of the 17- 1/2" and 12-1/4" holes with Saraline 185v will be removed and the mud reconditioned and re-circulated.

The drillship will be equipped with solids control equipment to remove drilled solids from the mud. Drill cuttings and fluids will pass through solids control equipment (Figure 3.6) to remove most of the drilling fluids (estimated up to 98%) from the cuttings. The Ghana EPA requires that the percentage of oil on cuttings (%OOC) should not exceed 2% before discharge; failure of which attracts a surcharge. Larger solids are retained on the screen, passed through the cuttings dryer and discharged to the seabed. The liquid phase of mud and solids smaller than the wire mesh would be passed through the screen and sent to a centrifuge for further separations of smaller solids from the mud before being discharged to the seabed via caissons. The clean drilling fluid would be reused.

8.1.2 Marine Discharge

Measures to minimize cement and chemical discharges include:

- Use of cement which poses little or no risk to the environment (mostly green and yellow chemicals);
- Control of operations covering materials storage, wash-downs and drainage systems;
- Storage of chemicals within bunded areas and away from any discharge point from the drill ship, vessel, or onshore storage location;
- Material safety data sheets (MSDS) would be provided for all chemicals stored on board; and
- Implementation of good housekeeping measures to minimize the amount of cement, mud and associated chemicals entering the drill ship drainage system.

The bilge water separator receives the deck drainage and grey water. Discharged bilge water will observe the approved Ghanaian discharge limitation of 15 ppm hydrocarbons and will not have a sheen on the water surface. Water to be discharged will be re-circulated through the treatment system until these conditions are met, or it will be back-loaded to onshore for treatment and disposal with a registered waste agency. Some key mitigation measures to be implemented to ensure the impact on water quality and marine organisms are reduced from deck drainage, bilge and ballast waters discharges include:

- All oily or contaminated drainage from the drilling unit and vessels will pass through an oily water separator (as certified by MARPOL, which is equipped with sensors and an alarm to limit discharge) for treatment before being discharged;
- Use of oil discharge monitors to ensure oil-in-water content targets are not exceeded. Records will be maintained of all discharges and oil content to verify controls in place are working effectively;
- Treatment of all discharges from the drill ship and supporting vessels in accordance with the MARPOL convention;
- Regular maintenance of the treatment equipment;
- Continuous water quality monitoring;
- Supply vessels are required to have a ballast water management plan and ballast water exchange at least 200nm from the nearest land and in water at least 200m deep – in compliance with the *International Convention for the Control and Management of Ships Ballast Water & Sediments* requirements, before entering the Ghanaian EEZ. The ballast water management plans eliminate the potential risk of invasive alien species introduction through ballast discharge;
- Use of MARPOL-certified approved oil/water separator with alarm indicating exceeding oil values;
- Separated drainage system for hazardous and non-hazardous areas on the drill ship; and
- Inclusion of coamings around the main decks of the ship to contain leaks, spills and contaminated wash-down water to minimise the potential for uncontrolled overboard release.

8.2 General Waste Handling and Disposal Measures

The key measures to control general waste during drilling operations are presented below with a flow chart (Figure 8.2) showing the waste handling methods:

- A waste management plan will be developed and implemented to specify appropriate storage, handling and disposal practices for each type of solid waste (see Table 7.1);
- Solid and non-recyclable materials will be transported onshore for proper disposal in an EPA-approved facility;
- Waste will be packaged and transported to appropriate (EPA registered and approved) waste management companies in Ghana for approved endpoint disposal or recycling or retained on the ship for recycling at an approved facility;
- Waste will be safely transported using approved vehicles on an approved route to the treatment facility/landfill site;
- Waste will be segregated offshore for appropriate end-point disposal/recycled;
- Waste transfer note(s) and waste transfer waybill (tracking) would be issued before transport;
- Trained personnel will handle and transport hazardous and non-hazardous waste from offshore to quayside;
- Macerated waste discharges will meet MARPOL 73/78 Annex V and national requirements;
- The waste management shall be in accordance with the laws of Ghana as well as Marpol;
- Sanitary waste from the drilling rig will be treated to MARPOL 73/78 and Ghanaian standards in the on-board Hamworthy/ST1AC sewage treatment plant before being discharged; and
- Discharges will have no floating solids, will not cause discolouration of the surrounding waters and will have less than 1 mg/l of residual chlorine.

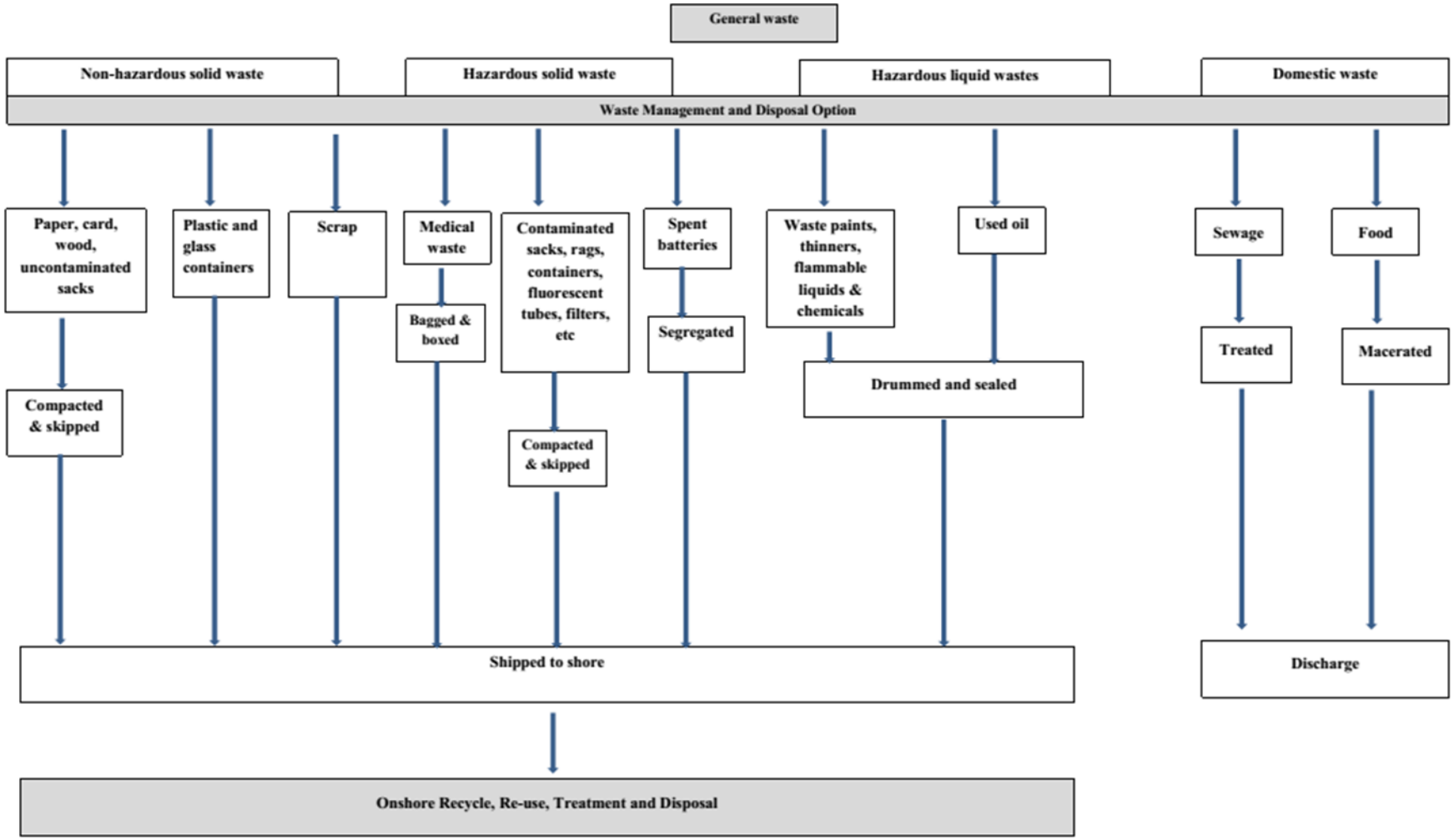


Figure 8.1: Flow Diagram showing Management Options for Drilling Waste

8.3 Oil Spill Prevention and Response

EGL will implement a wide range of preventative and mitigation measures to reduce or eliminate the risk of oil spills. Drilling wells will be built with layers of steel pipe casing and cement. This will prevent releases of oil and gas in the subsea reservoirs from escaping to the seafloor or ocean surface. The wells will be capped with a blowout preventer (BOP) (Figure 8.3). The blowout preventer will be installed at the wellhead to control a rupture of the well in the event of a release of pressure from the reservoir.

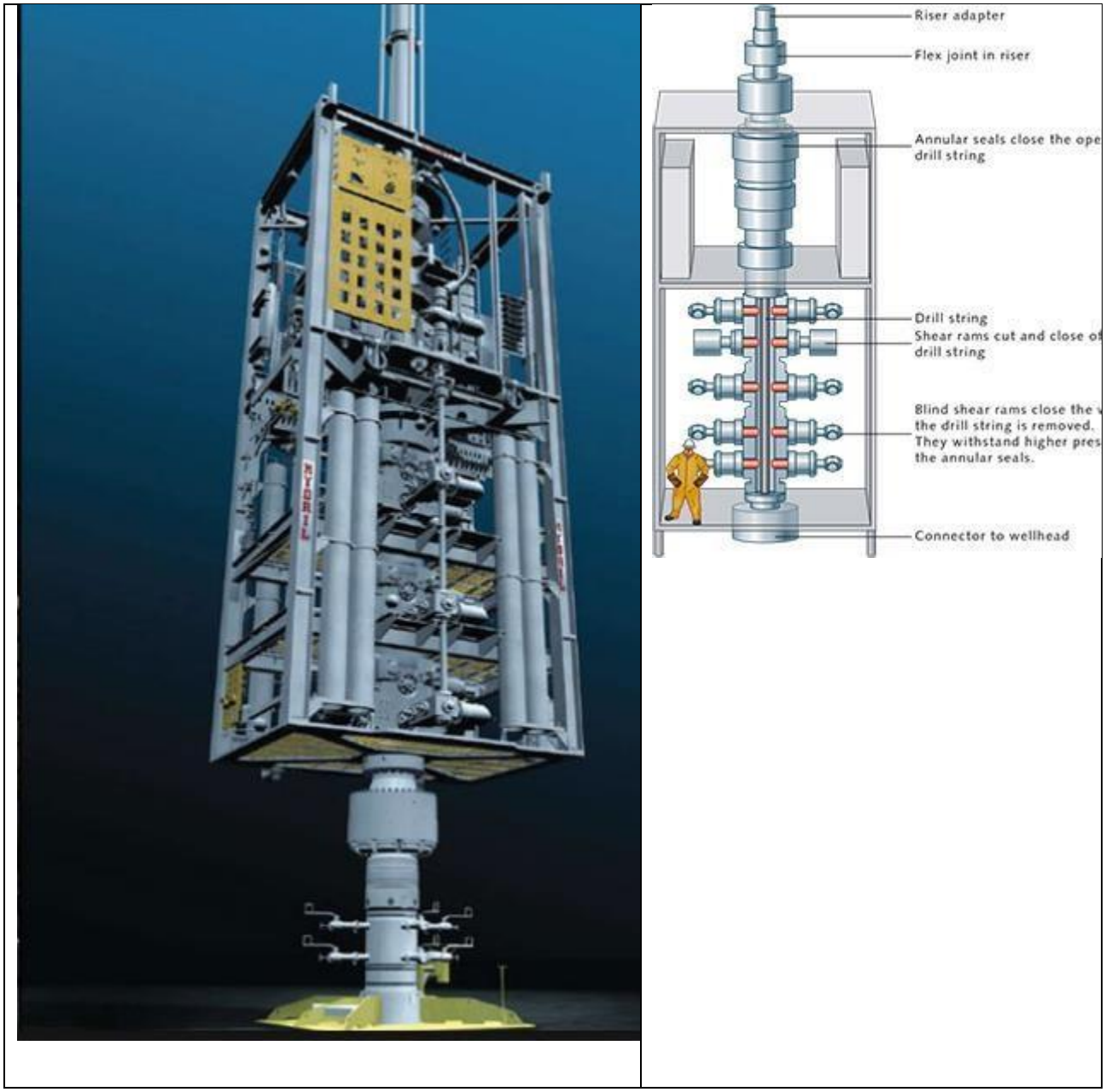


Figure 8.2: Blowout Preventer

8.3.1 Tier 1 Oil Spill Response

The drillship and supply vessels will be equipped with a variety of small-scale (Tier 1) spill response equipment stored at strategic locations on the vessel, including items such as absorbent rolls, absorbent pads, absorbent socks, absorbent booms, drain covers, absorbent bags, absorbent gloves, goggles, Tyvek suits, signage and plastic waste bags. Crews will be trained in the use of onboard equipment in the event of a spill.

A typical Offshore Containment/Recovery (Vessel Package) will be made up of these.

- 200m offshore boom
- Hydraulic boom reel
- Power pack and hydraulic air inflator
- Tow bridles
- Hydraulic hose-sets and reels
- Buoys
- Spares kits
- Offshore skimmer
- Diesel-hydraulic power pack
- Ancillaries and PPE sets
- DNV certified container
- Hydraulic boom reel

8.3.2 Tier 2 and 3 Oil Spill Response

The world-renowned well control company, Boots and Coots (now part of Haliburton, Inc.) of Houston, Texas has been contracted by EGL. Boots and Coots will provide prevention and contingent plans during drilling operations. EGL has established a global contract with the Oil Spill Response Limited (ORSL) of Southampton, England. OSRL which is owned by 42 major oil and gas companies, provides response and preparedness services to its members. OSRL will quickly respond with logistical support and techniques in the event of a Tier 2 or 3 spill. Equipment such as dispersants ((Corexit 9500 and Slickgone) (Figure 7.4 a)) and high-speed containment systems/booms (Figure 7.4 b) will quickly be dispatched to help control spills. An Embraer 110 Bandeirante aircraft which has a dispersant spray system with a capacity of 2,000 litres, as well as a surveillance equipment package, will be dispatched from Accra by the OSRL in an event of a spill.

In addition, EGL together with GNPC will immediately inform and liaise with the Ghana Oil Spill Contingency System in the event of a tier 3 spill. The Ghana Port & Harbour Response team will be contacted.

a. Dispersant stored in Accra

b. High-Speed Containment booms

Figure 8.3 Oil Spill Response Equipment

In addition to the above, a wide range of preventative and mitigation measures will be implemented to reduce or eliminate the risk of oil spills, including:

- Managing potential drilling hazards, such as shallow gas, and following established drilling safety standards to minimize the risk of well control loss;
- Comprehensive operational planning and risk assessment and provision of suitable specification equipment for drilling (BOP etc.);
- Support vessels will have onboard Shipboard Oil Pollution Emergency Plans (SOPEPs) which comply with IMO codes for the prevention of oil pollution;
- Both drill ship and support vessels will be equipped with modern communication and navigation equipment, minimizing the risk of a collision;
- As far as possible, support vessels with an established track record of operating offshore West Africa and familiar with weather and operating conditions in the area will be used;
- Risk approach procedures and poor weather operational restrictions for vessels and helicopters;
- Any re-fueling will only be undertaken during daylight and in working weather conditions.
- Non-return valves were installed on fuel transfer hoses, and all refuelling operations were supervised at all times from both the supply boat and the drill ship.
- Lube and hydraulic oil will be stored in tanks or sealed drums which pose a minimal risk of spillage. In addition, drums and storage tanks for hydrocarbons will be well secured and stored in bonded areas, all of which will be properly maintained and inspected;
- Training of key personnel in oil spill response;
- Competency assessments will be conducted for the crew; and

- Establish grievance mechanisms for all sea users including local fishing communities. Ghanaian Social Responsibility Coordinator is responsible for meeting with local fishing communities to address any grievances.

In the unlikely event of the BOP failing during a blowout, a device known as a capping stack will be imported and installed on top of the BOP to kill the flow. Drilling a relief well might also be considered to intersect the blown well and capture the flow.

8.3.3 Oil Spill Contingency Plan

A specific Oil Spill Contingency Plan (OSCP) will be developed for the proposed drilling programme in line with the requirements of the Ghana National Contingency Plan and The International Convention on Oil Pollution Preparedness, Response and Co-operation 1992 (OPRC) which provides a framework for international co-operation for combating major oil pollution incidents. The plan will be based on the internationally recognized 3-tiered response system for assessing the severity of oil spills. The purpose of the three levels is to establish, as soon as possible, the correct level of response needed to combat the spill.

Tier 1

Small spill occurring at or near drill ship or support vessels; EGL and/or the drilling contractor's capabilities sufficient for clean-up; Low environmental impacts; sensitive environmental features not impacted. Spills can be handled by ERV with oil spill equipment on board.

Tier 2

Medium spill that requires external and/or regional support for adequate spill response. EGL is a member of the Oil Spill Response Limited. OSRL will provide support in the event of a Tier 2 spill. Aerial dispersants, booms and other equipment will be provided by OSRL. Any use of dispersant in the event of a Tier 2 spill will be done following consultation with local authorities. Boots and Coots will provide prevention and contingent plans.

Tier 3

Large spills (e.g. blowouts) that can have potentially significant environmental impacts and/or spills moving out of Ghanaian waters to another country. OSRL will assist clean-up and recovery efforts in the highly unlikely event of a Tier 3 spill. OSRL mobilization time is around 30-40 hours which is adequate to prevent oil from reaching the coast. In addition, EGL together with GNPC will immediately inform and liaise with the Ghana Oil Spill Contingency System

8.3.4 Residual impact

The risk of spills can be reduced by comprehensive management and operational procedures. Operational spills are typically small and, given the distance of proposed wells from the shore, will pose no risk to the coastline. The residual impacts of small spills are therefore considered negligible. The risk of large oil spills is the main environmental concern associated with the proposed drilling programme. Spilt oil can have a number of environmental and economic impacts.

The greatest environmental sensitivity to oil spills would be the presence of vulnerable and protected coastal ecosystems and marine resources. Lagoons and estuarine wetland habitats are particularly sensitive as they tend to support greater species diversity. Oil entering an open lagoon or wetland would result in slow recovery rates of the ecosystem as there is little wave action to remove the oil; oil components also tend to adhere to the flat substrate preventing removal by tides. Given the ecological diversity of much of the Ghanaian coastline, it is considered to be highly sensitive to impacts in the event of a large oil spill. Provided that an effective and timely spill response is put in place, the overall impact from a blowout is likely to be reduced to a major significance, where medium-term (>2 years) damage to the ecosystem occurs with a likelihood of recovery within 10 years.

Transboundary impacts have a low probability of occurring for all except a major blowout and are assessed to be of moderate significance provided the proposed mitigation measures are implemented.

8.4 Physical Presence Impact Mitigation Measures

Communication with all relevant stakeholders regarding the interaction of the drilling with their activities is a major step to ensuring a harmonic relationship between fishing, shipping and drilling operations. A Community Liaisons Officer (CLO) will be employed who would interact with fisher folk to issue warnings and notifications and also note their grievances. EGL will through established Ghana Maritime procedures, inform all operators before bringing in the drillship.

Operations will be undertaken giving cognizance to all environmental, social, and safety regulations at all times. The helicopters that will transport personnel to and from the drillship will use a direct line-to-shore route to prevent it from passing along sensitive or quiet coastal areas. There will be proper planning of activities regarding drilling operations to reduce material (e.g. fuel, supplies, food, etc.) consumption and to adhere to the 6-month duration of the entire exercise. The following is a summary of mitigation measures that will be observed:

- Extensive communications with Ghanaian maritime and port authorities, fishing vessels and communities that utilize the Deep Water Tano area before, during and after the drilling program.

- Adherence to all international and national shipping regulations.
- Implementation and monitoring of an exclusion zone with a 0.5 km radius from the drill ship throughout the drilling program.
- Reporting breaches of exclusion zone to local authorities.
- Full-time presence of the Fisheries Liaison Officer (FLO) on board the standby vessel.
- Monitoring of vessel traffic by supply vessels.
- Standard communication with other sea users and Notices to Mariners will be implemented through the national regulatory authorities.
- Follow best international practices and procedures for suspending/ abandoning the well and removing seafloor hazards.
- Planning resource consumption in consultation with national authorities.

8.5 Underwater Noise Mitigation Measures

The following mitigation measures will be observed to avoid disturbance to marine mammals:

- Equipment and generators will be regularly serviced;
- Vessel movement will be minimized in the vicinity of marine mammals (cetaceans and pinnipeds); and
- Vessels will not be permitted to intentionally approach or chase marine mammals and, where practicable, will alter course or reduce speed to further limit the potential for disturbance due to noise.
- Seismic operations will be performed with pre-start checklists to minimize any acoustic impact on mammals within the vicinity of the rig.

8.6 Atmospheric Emission Control Measures

The following measures will be put in place to mitigate the impacts of atmospheric emissions:

- Regular maintenance of engines, compressors and generators;
- Minimise crew change and flight logistics
- Minimise marine traffic logistics.

CHAPTER NINE

Provision of Environmental and Social Management Plan

- Drilling Chemicals and Discharges Management Plan
- Waste Management Plan
- Oil Spill Management Plan
- Physical Presence Impact Management Plan
- Underwater Noise Control Management Plan
- Atmospheric Emissions Control Management Plan

9.0 PROVISIONAL ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

9.1 Introduction

The Provisional Environmental and Social Management Plan (PESMP) for the Exploration Drilling Project outlines the main mitigation and monitoring measures in an actionable mode.

Action Plans cover the following:

1. Drilling Chemicals and Discharges Management Plan;
2. Waste Management Plan;
3. Oil Spill Management Plan;
4. Physical Presence Impact Management Plan;
5. Underwater Noise Control Management Plan; and
6. Atmospheric Emissions Control Management Plan.

9.2 Provisional Environmental and Social Management Plans

Table 9.1 Drilling Chemical and Discharges Management Plan

Source of Impacts	Nature of Impact	Mitigation Measure	Monitoring Parameters	Monitoring Responsibility
• Top hole section drilling (WBDF and cuttings discharged) • lower hole section drilling (NADF and cuttings discharged)	Direct: • Low levels of oil/ chemicals released; • Smothering of the seabed fauna around well sites. • Localized turbidity. • Depletion of oxygen in surface sediments. Indirect: • Pollution of the local ecosystem, • loss of seafloor habitat Cumulative: • Increase in background levels of contaminants BaSO4, trace metals; • Loss of biodiversity	• Well design optimization to minimize cuttings and mud discharges. • Use of Group III NADF (Saraline 185v) with very low aromatics content, making it significantly less toxic. • NADF will be re-conditioned and re-used. • The use of efficient solid control (recovery) equipment to recover mud before cuttings discharge and to minimise oil on cuttings (OOC) to as low as possible. • Quantities of cement required will be calculated as accurately as possible to prevent excess use and loss. • Controlled operations covering material storage, wash-downs and drainage systems • MSDS would be provided for all chemicals stored onboard. • Logging and subsequent reporting of chemical use and discharge for all wells.	• Quantities of WBDF and NADF used • Quantities of cuttings with associated WBM discharged • Quantities of cuttings with the residue of NADF discharged • Quantities of NADF re-cycled and re-used • Records of oil on cuttings (%) achieved after recovery	Drilling Engineer / EHS Manager/ OIM/ Mud man/ EHS Manager OIM/ EHS Manager OIM/ Drilling Supt./ EHS Manager
• Welling construction (cement release) • Well completion (chemical discharge	***Direct:*** Low-level toxicity impacts marine biota. ***Indirect:*** Pollution of local ecosystem ***Cumulative:*** Increase in background levels of contaminants; Loss of biodiversity		• Chemicals discharged • Breakdown of discharged chemicals	

Run-off/ wash water discharge	***Direct***: Low levels of oil and chemicals entering marine environment ***Indirect***: Pollution of local ecosystem ***Cumulative***: Increase in background levels of contaminants; Loss of biodiversity	• Separated drainage system for hazardous and non-hazardous areas on the drill ship • The concentration of oil in water discharged is to be restricted to less than 15 ppm in line with MARPOL requirements • Use of MARPOL-certified approved oil/water separator with alarm indicating exceeding oil values • Regular maintenance of the treatment equipment. • Continuous water quality monitoring • Strict adherence to the rules governing the discharge of ballast waters at sea • Operational controls covering materials storage, wash-downs and drainage systems • Maintaining a high level of housekeeping on-board • Use of only low toxicity chemicals on-board	• Quantities of ballast water to be discharged (m^3) • Quality of effluent to be discharged • Quantities of chemicals to be used • Records of maintenance of equipment • Reports on water quality	OIM/ Drilling Supt. OIM/EHS Manager OIM/EHS Manager Mechanical Engineer OIM/ Drillship &Vessel Masters OIM/EHS Manager OIM/EHS Manager OIM/EHS Manager
Ballast water discharge	***Direct***: Introduction of invasive alien species ***Indirect***: Change of local ecosystem ***Cumulative***: Change of wider ecosystem			

Table 9.2 Provisional Management Plan for General Waste

Source of Impacts	Nature of Impact	Mitigation Measure	Monitoring Parameters	Monitoring Responsibility
General Waste Management				
Non-hazardous solid waste Hazardous solid waste Hazardous liquid waste Domestic waste	Direct: • Injury and fatality of marine organisms Indirect: • Unsightly marine scenery Direct: • Damage to the kidney of marine organisms resulting in fatalities • Affect the reproductive capacity of marine organisms Direct: • Affect the reproductive systems of marine organisms Indirect: • Reduce the surface tension of the immediate marine environment Indirect:	• Development and implementation of project-specific Waste Management Plan • Development and implementation of operations specific waste management procedures • Use of approved and licensed waste contractors for waste transfer, disposal, recycle and incineration • Project generated wastes will be recorded and reported • Waste management awareness training will be organised for all personnel • Maceration of food waste prior to disposal in accordance with MARPOL 73/78 Annex V	• Quantity of waste generated • Quantity of waste transported onshore • Audit waste management •	EHS Manager/ Drilling Supt. OIM / Vessel Master OIM/EHS Manager

	• Affect the movement of migratory marine organisms			

Table 9.3 Provisional Oil Spill Management Plan

Impacts (Source)	Nature of Impact	Mitigation	Monitoring Parameter	Monitoring Responsibility
Well Blowout	***Direct:*** Physical oiling and toxicity impact marine biota and wildlife, contamination of coastal habitats ***Indirect:*** Habitat loss, Political problems from transboundary issues. Issue of waste disposal, reputation damage. Shoreline damage and loss of livelihood for coastal communities **Cumulative**: Accumulation of oil or chemicals in the food chain and sediments. Loss of biodiversity and revenue	Comprehensive operational planning and risk assessment and provision of suitable specification equipment for drilling (BOP, etc.). Non-return valves were installed on fuel transfer hoses, and all re-fuelling operations were supervised at all times from both the supply boat and drill ship. Re-fuelling will only be undertaken during daylight and in working weather conditions Regular maintenance and inspection of equipment and high spill risk points Lube and hydraulic oil will be stored in tanks or sealed drums which pose a minimal risk of spillage. In addition, drums and storage tanks for hydrocarbons will be well secured and stored in bunded areas, all of which will be properly maintained and inspected.	Hydrocarbon release rate(bbl./h) Percentage of • Oil Recovery • Oil dispersed into the atmosphere • Oil dissolved • Oil Beached • Coastal zone impacted	Toolpusher Senior Drilling Engineer Drilling Superintendent.
Small hydrocarbon Spills (drill ship and support vessels)	***Direct:*** Localised toxicity effects on marine biota ***Indirect:*** Localised pollution of ecosystems. Cumulative: Negligible		Percentage of • Oil Recovery • Oil dispersed into the atmosphere • Oil dissolved • Oil Beached • Coastal zone impacted • Impacted species • Number of small spills • Breakdown of Chemicals loss (t)	OIM Drilling Superintendent. Vessel Master EHS Manager/

			• Quantity of Hydrocarbon loss	
Collision (Loss of drillship)	***Direct:*** Physical oiling and toxicity impact marine biota and wildlife ***Indirect:*** Reputation damage ***Cumulative:*** Accumulation of oil or chemicals in the food chain and sediments. Loss of biodiversity and revenue.	Approach procedures and poor weather operational restrictions for visiting vessels and transfer operations at the drill ship. Support vessels will have onboard Shipboard Oil Pollution Emergency Plans (SOPEPs) which comply with IMO codes for the prevention of oil pollution;	Total Volume (m^3) Percentage of • Oil Recovery • Oil dispersed into the atmosphere • Oil dissolved • Oil Beached • Coastal zone impacted (%) Impacted species	OIM Drilling Superintendent. Contract department
For all spills		Availability of sufficient spill response and clean-up equipment on the drill ship and support vessels for initial spill response Training of personnel with respect to the handling and deployment of oil spill recovery equipment. OSRL is to be mobilised in the event of any significant spill (Tier 2 or 3).	Company's statistics on oil spills Frequency of spill response exercises Number of trained personnel Response Equipment	Drilling Superintendent. EHS Manager

Table 9.4 Physical Presence Impact Management Plan

Sources of Impacts	Nature of Impact	Mitigation Measure	Monitoring Parameters	Monitoring Responsibility
• Installation of drilling facilities • Movement of support vessels • Lighting and flaring on the drill ship	***Direct:*** Collision between sea mammals and drilling facilities; Inaccessibility (to fishermen) of areas marked as exclusion zones ***Indirect:*** minor dip in fishermen's income due to coincidence of drilling with peak fishing season ***Cumulative:*** more exclusion zones creation in addition to existing ones	• Continuous communication with all stakeholders (institutions, fishermen, etc. on EGL drilling activities • Effective patrolling of the exclusion zones to prevent incursions • Dedication of an ERV to attend to any accidents • Provision of nose masks and eye goggles to workers close to emission sources • Proper planning of resource use to minimize the frequency of movement of supply vessels	• Record keeping of incursions, accidents, etc. • Supervision of efficient resource use • Seeking feedback from stakeholders with regard to operations	• Fisheries Liaisons Officer • Contractors • EHS Manager / Drillship &Vessel Master • OIM/ EHS Manager/ Drillship &Vessel Masters

Table 9.5 Underwater Noise Management Plan

Sources of Impacts	Nature of Impact	Mitigation Measure	Monitoring Parameters	Monitoring Responsibility
Drillship and support vessel	***Indirect:*** Potential behavioural changes in marine mammals and fish	• Good operational controls and minimisation of noise through equipment and generator maintenance. • Equipment kept idle when not in use. No firing VSP array if marine mammals are observed within 500m of the array (until at least 20 minutes after the last sighting) • Use of soft start procedure.	Marine mammal Observations	Mechanical Engineer OIM/ Drillship &Vessel Masters OIM / MMO OIM/ EHS Manager

Table 9.6 Atmospheric Emissions Control Management Plan

Sources of Impacts	Nature of Impact	Mitigation Measure	Monitoring Parameters	Monitoring Responsibility
• Flaring of hydrocarbons (oil and gas) • Combustion of fossil fuel by vessel engines, helicopters and generator sets • Fugitive gases (VOCs) from fuel and chemical storage.	***Direct:*** Air pollution, emission of GHGs and particulates ***Indirect:*** Pollution of ecosystems; Human health effects ***Cumulative:*** Contribution to acidic rain and climate change	• Only the required quantities of crude oil required for appraisal will be produced and flared • Effective combustion technology will be used for flaring • Regular maintenance of engines, compressors and generators • Provision of nose masks and eye goggles to workers close to emission sources	• Quantities of crude oil produced • The maintenance schedule of machinery • Estimated fuel emissions(t): ○ CO_2 ○ CO ○ NOx ○ SOx ○ CH_4 ○ VOCs • Test flaring (crude, t): emissions as above • Use of PPEs	• Mechanical Engineers/OIM • Contractors • EHS Manager / Drillship &Vessel Master • OIM/ EHS Manager/ Drillship &Vessel Masters

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APPENDIX 1

OCTOBER 2018

Directory of Fishermen and Landing beaches in the Western Region.

Attendance Sheet

Photographs

JULY 2023

Minutes of Meeting

Attendance Sheet

Photographs

Letters of Notification and Reminders

Background Information Document (BID)

Project Presentation

October 2018

Directory of Fishermen and Landing beaches in the Western Region.

Attendance Sheet

Photographs

DIRECTORY OF FISHERMEN AND LANDING BEACHES IN THE WESTERN REGION OCTOBER 2018

SHAMA

NAME OF CHIEF FISHERMAN	COMMUNITY	CONTACT NO.
Nana Konduah	Ebuesi	0243681060
Nana Effirim	Shama Bentsi	0242522193
Nana Ackon	Shama Apo	
Nana Eduafo	Aboadze	0243932886

STMA

NAME OF CHIEF FISHERMAN	COMMUNITY	CONTACT NO.
Nana Kwesi Ackon	Ngyiresia	0201035517/0553135573
Nana John Awortwe	Nkotompo	0244567412
Nana John Kwamina Atoabo	New Takoradi	0506561433
Nana Yankey	New Takoradi	0275892746
Nana Ekow Ackon	New takoradi	0271024035
Nana Dawur	Poasi	0201411162
Nana Kow Kotu	Essikado	0244830529
Nana Kweku Oye Adom	Essikado	0241152905

AHANTA WEST

NAME OF CHIEF FISHERMAN	COMMUNITY	CONTACT NO.
Nana Papa Yalley	New Amanful	0275385538
Nana Gyaben	Funkoe	0546831524
Nana Kweku Ackon	Adwoa	
Nana Kojo Awortwe	Pumpune	0200909066
Nana Badu Kwame	Asemkow	0571944694
Nana Enuahu	Enuahu	0579885738
Nana Kwamina Mensah	Ampatano	0570102668
Nana Abi Sebrah	Anlo Beach	
Nana Ekow Essoun	Butre	0502291511
Nana Akotsia	Busua	0206570021
Nana Essel	Upper Dixcove	0545845578
Nana Ebow Ansah	Lower Dixcove	0241476224

Nana Kweku Dadzie	Turom	0202705692
Nana Armoo Tawiah	Achonma	
Nana Ekra Payine	Akwidae	0246484934
Nana Thomas Adde	Cape 3 Points	0509444771
Nana Yalley	Princess Akatakyi	0246875026
Nana Donto	Princess Town	0246399743
Nana Miezan Assuah	Miaemia	0201397477

NZEMA EAST

NAME OF CHIEF FISHERMAN	COMMUNITY	CONTACT NO.
Nana Anan	Brewire	0544101993
Nana Kojo Perge	Apiwosika	0541045399
Nana Panyin	Anto Apowosika	0546029353
Nana Etwi Erzan	Upper Axim	0200653895
Nana Bentsil	Lower Axim	0243634081

DIRECTORY OF FISHERMEN AND LANDING BEACHES IN THE WESTERN REGION OCTOBER 2018

ELLEMBELLE

NAME OF CHIEF FISHERMAN	COMMUNITY	CONTACT NO.
Nana Ebambey	Asanta	0249475819/0544183195
Emu Yanson	Atuabo	0246559618
Christopher Andoh	Baku	0201693763
John Akossey	Ngalechie	0272481440
Kwaw Bonzo	Eikwe	0272364892
Kwabina Mesolo	Krisan	0547859185
Nana Kofi Ansah	Sanzuley	0553253470
Nana Nicholas Blay	Sanzuley	0272286336
Nana John Ackah	Bakanta	0503680272
Nana Yanle Melewia	Esiama	
Nana Bequen	Esiama	0200653508
Nana John Mc Carthy	Ankbra	0545907463
Nana Robert T.Blay	Anochie	0271584924

JOMORO

NAME OF CHIEF FISHERMAN	COMMUNITY	CONTACT NO.
Nana Emmanuel Odwiri	Half Assini	0245065869
Nana Ibrahim Quansah	New Town	0243046988
Nana Opaku	Efasu	0272211730
Nana Thomas Aikins	Mangyea	0500372012
Nana Kojo Tanko	Allomatuape	0242433365
Nana Kojo Attah	Mpeaasem	0506035898
Nana Kojo Chia	Metika	0246753028
Nana Kwamina Asiedu	Ekpu	0545930367
Nana Kwaw Ackah James	Edobo	0547113388
Nana Kayah	Ahobre No.2	0549510773
Nana Kwaw Brim	Ahobre No.1	0248786956

Nana Kwaw Mensah	Enzinlibo	0245543933
Nana Emmanuel Quansah	Bonyere	
Nana Kojo Quansah Korsah	Agyeza	0506035898
Nana King Bobo	half Assini Ewe Community	0246316933
Nana Kojo Blaychie	Kengen	0279312642
Egya Akesse	Elloyin	0241303979
Nana Kojo Sam	Beyin	0247788113
Egya Ade Agyallu	Ekabaku	0245364189

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TRANSPORTATION ALLOWANCE

District: SHAMA 23-10-2018

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
10	Nana Effirim IV	Shama	Shama		0248449155		[signature]
11	Nana Kojo Konduah	"	Abuesi		0243681060		[signature]
12	Addo-Blankson Richardson	"	"		0274903439		[signature]
13	Seidu Sam	"	"		0249367494		[signature]
14	Fredrick Ottoo	"	"		0249665218		[signature]
15	Kofi Rerkson	"	Shama		0244109413		[signature]
16	Nana Egyin	"	"				
17	Nana Mohammed Odenvir	"	Aboadze		0578096060		[signature]
18	Abudu Kojo Ngorme	"	"		0243533893		[signature]
19	Kojo Salifu	"	"		0249784378		[signature]
20	Kojo Adu	✓	Apo		0556149406		[signature]
21	Mercy Wilson		Kokohen		0242990601		[signature]
22	Samuel Doukor		Aminano		0548210121		[signature]
23	~~Nana~~ Kofi Pagu	✓	Abuesi				[signature]

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TRANSPORTATION ALLOWANCE

District.....SHAMA - 23-10-2018.....

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
1	John Kennedy Attipoe	Shama	Ankobeach		0544044213		
2	Nana Ano-Bassaw	Shama	Apo		0246824399		
3	NANA ADAM EDUAFO	~~ABOADZE~~	ABOADZE		0243932882		
4	PETER KING ESSOUN	SHAMA	ABOADZE		0203003886		
5	KORNYA DUKU	SHAMA	ABOADZE		0249404850		KD
6	Afua Ginnah Aheden	Shama	Ankobeach		0246412483		
7	Kwasi Mensah	Shama	Apo		0550911838		
8	Peter Essel	Shama	Ankobeach		0548046157		
9	Nana Kafabee	Shama	Aminass		0245535254		

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TRANSPORTATION ALLOWANCE

District..... STMA 23-10-2018

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
1	NANA KWEKU OYE ADOM	STMA	ESSIKADO		0241529 05		
2	JOHN ASTE-MENSAH	STMA	ESSIKADO		0243446 22		
3	NANA KWESI ACKON	STMA	NGYRESIA		0553135573		
4	EKOW SUKO NYIMPA	STMA	NGYRESIA		0275431734		
5	KWESI NKETSIA	STMA	NGYRESIA		0248398774		
6	EMMANUEL ANSAH	STMA	SEKONDI		0277419532		
7	EVANS NII TACKIE ANNAN	STMA	SEKONDI		024386912		
8	ERIC TETTEH ASHONG	STMA	SEKONDI		0548785553		
9	JOHN TETTEH ANSAH	STMA	SEKONDI		024823068 4		
10	ISAAC QUARSHIE	STMA	SEKONDI		0242519120		
11	JOHN ANORTWE	STMA	NKOTOMPO		0244567412		
12	PETER ARTIN	STMA	NKOTOMPO		0277322533		
13	EMMANUEL KWAKORA	STMA	NKOTOMPO		0570396672		
14	PETER ESHUN	STMA	ESSIKADO		0506334254		

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TRANSPORTATION ALLOWANCE

District: STMA 23-10-2018

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
15	SAM KOFI COBBINAH	SEKONDI	SEKONDI	5 Km.	0278294[illegible]		[signature]
16	Joe Etru Ghartey	Sekondi	Sekondi	8 Klm	0243624975		[signature]
17	Maud Owusu	Sekondi	Sekondi		0277763822		[signature]
18	Nana Kow Kotu	Sekondi	Sekondi		0244430529	For	[signature]
19	Elizabeth Ahiru	STMA Sekondi	Sekondi		0547468222		[signature]
20	Gladys Ocran	STMA	Sekondi		0276338099		[signature]
21	Evlyen Tetteh	STMA	Sekondi		0209251891		[signature]
22	Cecilia Annan	STMA	Sekondi		0208134949 0242112478		[signature]
23	Edward Hughes-Dadzie	STMA	Sekondi		0208107466 0246657804		[signature]
24	George Nortey	✓	✓		0201459634		[signature]
25	John K Atoabo	STMA	New Tadi		0506561433		[signature]
26	Kojo Bosomtwe	STMA	✓ ✓		0265451785		[signature] For
27	Samuel Tetteh	STMA	✓ ✓		0243359217		[signature]
28	EKOW BRACE	S.T.M.A	SEKONDI		0203882455		[signature]
29	Michael Quashigah	Sekondi	Sekondi		0246447805		[signature]
30	Frederick Tekyi	S.T.M.A	✓				[signature]

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TRANSPORTATION ALLOWANCE

District... EHLEMBELE 30-10-2018

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
1	Samuel Yankson	Ellemb.	Atuabo	2.1 km	0245519698		
2	Kwadjo Kpole	Ellemb.	Esiama		0551130389		
3	Nyameke Ebisah	Ellemb.	Asenda	5 km	0202081978		
4	Steven Dabunkah	Ellemb.	Asenda	5 km	0205558235		
5	John Kwafo	Ellemb.	Asenda	5 km	0207758863		
6	Andrews Esamsey	✓	Asanta	✓	0547371699		
7	Joseph F. Esamsey	✓	✓	✓	0249475819		
8	Wanampe	✓	Esiama	—	0200959370		
9	Patrick Eshun	✓	✓	—	0551523633		
10	✓ Ezuah	✓	✓	—	0502270917		
11	John Awotwe	✓	Krisan	16	0202121136		
12	Kweku Abedu		✓	16	0241442285		
13	James Amo	✓	Bakatna	16	0278970557		
14	John Ackah	✓	Bakanta	16	0503680272		

TRANSPORTATION ALLOWANCE

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District: Ellembelle-30-10-2018

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
15	Ato Kenyah	Ellemb	Bakanta	16 km	0505115377		[signature]
16	Alfred nyameke	✓	Bakanta	16 km	0547949391		[signature]
17	Asuah	✓	~~Bakanta~~ Eikwe	16 km	0550636465		[signature]
18	Peace Donko	✓	Krisan	16 km	0242836645		[signature]
19	LORD S. K. CUDJOE	✓	Aiyinase		02431053R		[signature]
20	Frances Erzah	✓	Eikwe		0549435208		[signature]
21	Paull Arlloo	✓	Eikwe	7	0541019126		[signature]
22	Samuel Arthur	✓	Ankobra		0508512720		[signature]
23	Daniel Arche	.	~~A~~	7	0504989560		[signature]
24	Mr ~~Tayue~~ Tawiah	✓	✓		0508990387		
25	Nicolas Lord	✓	Ankobra	7	0509125989		[signature]
26	John Mccatte	✓	Ankobra	7	0205024539		[signature]
27	ISAAC NKRUMAH		NKROFUL		0243558991		[signature]
28	James Nkrumah	✓	Esiama	.	0545957211		48

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TRANSPORTATION ALLOWANCE

District..... KLEMBELLE - 30-10-2018

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
29	Christopher K Andoh	Ellem	Baku		020693763		
30	Patrick Armah Kojo	✓	✓		0570404615		
31	Nana Kobena	✓	Krisan		0547859918		

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TRANSPORTATION ALLOWANCE

District.....Jomoro – 30-10-2018.....

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
1	Nana Thomas Aikins	Jomoro	Manyaa		0275911507		
2	✓ Kojo Arthur	✓	Mempeasem		0504762003		
3	✓ Kwesi Opakoh	✓	Effasu		0554475117		
4	✓ Kwaminah Kayah	✓	Ahobre 2		0549510773		
5	Kwame Kweinoh	✓	✓		0241155217		
6	Moses Aidooh	✓			0249897167		
7	Nana Ibrahim Kwansah	✓	New Town		0243046988		
8	Kobinah Attah	✓	✓		0244912772		
9	Kweku Mborah	✓	Manyaa		0274917117		
10	Nana Solomon Ackah	✓	New Edoke		0554550202		
11	✓ Kwaa Mensah	✓	Ezenelibo		0245543933		
12	✓ Kwaa Appreni	✓	Ahobre 1		0248786956		
13	✓ Kwaminah Seidy	✓	Ekpu		0545930367		
14	✓ Kojo Kyiah	✓	Metika		0246753028		
30	Bossun Maamah Essel	✓			0558263057	✓	

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TRANSPORTATION ALLOWANCE

District..... Jomoro - 30 - 10 - 2018

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
15	Nana Emma. Odwire	Jomoro	H/Assini		0245065869		
16	Solomon Odwire	✓	✓		0243669615		
17	Paul Forson	✓	✓		0240527739		
18	Kwame Akwaa	✓	✓		0247677865		
19	Kwame Essel	✓	✓		0241447525		
20	Kofi Adam	✓	✓		0248775303		
21	Kojo Kumah	✓	✓		0246892418		
22	Kojo Antwi	✓	✓		0201663557		
23	Kweku Entsie	✓	✓		0543074042		
24	Kobinah Afful	✓	✓		0243496668		
25	Kwaa Mensah	✓	✓		0247917569		
26	Kojo Wahab	✓	✓		0249093778		
27	Kojo Attah	✓	✓		0546553722		
28	Kojo Amissah	✓	✓		0557905018		
29	Nana Kwame Korsah	✓	Anlomatuope		0242438365		

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TRANSPORTATION ALLOWANCE

District..... NKEMA EAST 31-10-2018

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
1	Kwadwo Opoku-Mensah		[illegible]		0501301692		
2.	Nana Kofi Annan		Upper Axim		0544101993		
3	Kobina Yatah				0243004572		
4	Kobina Gyasi				0248217215		
5	Joel Nyankam				054129971		
6	Michel Nyame				0249121564		
7	Kofi Sam				0545949722		
8	Egya Kwesi				0201911255		
9	Nana Kofi Bentil				0243634081		
10	Nana Nii Noi ~~Oppong~~ Nortey				0508136025		
11	Joseph Tetteh				0554480277		
12	Kwesi Afian				0203880227		
13	Nana Kwesi Bin				0208187976		
14	Sefolen Kwesi				0208176528 ~~0208187976~~		

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TRANSPORTATION ALLOWANCE

District..... Nzema EAST 31-10-2018

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
15	Egya Andor		Upper Axim / Lower Axim		0551127985		
16	Nana Boboewusi		V		0505556715		
17	Nana Kojo Panyin		V		0546029358		
18	Anthony Adjei		V		0244711514		
19	Fatakuu Obinedzeho		V		0557715935		
20	Nana Kofi		V		0201668180		
21	Ebenezer Afful		V		0244181722		
22	Ekow Awotwe		V		0546617756		
23	Papa Musah		V		0204252554		
24	Kobina Nyame Yie		V		0244115397		
25	Francis Kwofie		V		0202259881		
26	Kofi Awanbe		V		0273184052		
27	Papa Kwesi Enu		/				
28	Nana ATSU EZARH Emmanuella Eshun		.				
29	Emmanuella Eshun						
30	Joseph Kweku Abeka						

ECO ATLANTIC Ghana Limited

TRANSPORTATION ALLOWANCE

District... Ahanta West (Boxus) 31-10-2018

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
1	Nana Papa Yalley		New Amanful		0547469514		
2	Hana Olando		Princess Town		024639974 3		
3	Hana Yalley		Aketakyi		0246875026		Kathy
4	Hana Ekra Penyin		Akwidae		0246484934		
5	Nana Badu Kwame		Asemko		0571944694		
6	Nana Gyaaben		Funko		0546831524		Jake
7	Nana Koja Awortwe		Pumpuna		0200909066		KW
8	Nana Asamah		Enywanky		0546587510		
9	Nana Thomas Ade		Cape 3 Points		0554457171		
10	Nana Kwaku Nyaku		Busua		0275141612		
11	Nana Kow Esson		Butri		0506610756		
12	Nana Ebo Ansah		Dixcove		0241476224		
13	Nana Baffoe		Dixcove		0248807120		
14	Miezah Assiah		Miemia		0509007593		

ECO ATLANTIC Ghana Limited

TRANSPORTATION ALLOWANCE

District..... ATWIMA WEST 31-10-2018

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
15	Nana Kofi Essoun		Adjoa		0202545424		
16	Nana Kwaku Dedzie		Dixcove		0202705692		
17	Nana Francis		Dixcove		0240258993		
18	Emmanuel Bentum		Dixcove		0553902855		
19	Kofi Esson		Dixcove		0844658754		
20	John Affel		Dixcove		0557469315		

Photographs of 2018 Consultations

GROUP PICTURE WITH CHIEF FISHERMEN AND SOME FISHERMEN AT STMA, ESSIKADO CHIEFS PALACE, ON THE 23 RDOCTOBER, 2018

GROUP PICTURE WITH CHIEF FISHERMEN AND SOME FISHERMEN AT STMA, ESSIKADO CHIEFS PALACE, ON THE 23 RDOCTOBER, 2018

GROUP PICTURE WITH CHIEF FISHERMEN AND SOME FISHERMEN AT AHANTA WEST DISTRICT, DIXCOVE FISHERMEN SHED, ON THE 31ST OCTOBER, 2018

GROUP PICTURE WITH CHIEF FISHERMEN AND SOME FISHERMEN AT NZEMA EAST DISTRICT, NZEMA EAST DISTRICT ASSEMBLY, ON THE 31 ST OCTOBER, 2018

GROUP PICTURE WITH CHIEF FISHERMEN AND SOME FISHERMEN AT ELLEMBELLE DISTRICT, ESSIAMA CHIEFS PALACE, ON THE 30 TH OCTOBER, 2018

GROUP PICTURE WITH CHIEF FISHERMEN AND SOME FISHERMEN AT JOMORO DISTRICT, HALF ASSINI FISHERMEN SHED, ON THE 30 TH OCTOBER, 2018

June 2023

JULY 2023

Minutes of Meeting

Attendance Sheet

Photographs

Letters of Notification and Reminders

Background Information Document (BID)

Project Presentation

MINUTE OF MEETING

ECO ATLANTIC STAKEHOLDER ENGAGEMENT MEETING

Minutes of Meeting

In Attendance: **Western Region District Chief Fishermen**,
Western Region Canoe Fishermen Council,
ESL Consulting Limited,
Eco Atlantic Ghana.

Venue: **SSNIT Conference Room, Takoradi** Time: **9:54 am** **Date:** 25/07/2023

ATTENDANCE**: 34**

Mr. Kenneth Agbi (ESL) opened the meeting by inviting one of the attendees (a fisherman) to pray. Mr. Kenneth Agbi then introduced himself and the ESL team, and this was followed by self-introductions from the other attendees. Mr. Kenneth Agbi then hinted at the purpose of the meeting, which was to provide information about the Eco Atlantic DWCTP Exploratory Drilling project and to solicit the views and concerns of the District Chief Fishermen about the project.

S/N	Issue	District Chief Fishermen's Concerns / Views	ESL / Eco Atlantic Ghana Response / Remarks
1	Benefits of the drilling project for the children of the fishermen.	What measures are in place for the children of fishermen whose livelihoods would be affected by the drilling project? Will there be any work opportunities for the children of the fishermen?	The Petroleum Commission is clear about the importance of incorporating local content into any petroleum project or activity. Therefore, if Eco Atlantic needs to hire personnel for the drilling project, local content requires that qualified locals be hired first.
2	Accidents	2a. What precautions will be taken to prevent accidents or collisions between canoes and supply vessels? 2b. What contingency plans has Eco Atlantic put in place in the event of an accident?	To avoid mishaps, fishermen will be adequately notified of the period during which the project vessels/rigs will be operating. Eco Atlantic is not just concerned with taking precautions to prevent an accident; should one occur, Eco Atlantic will take steps to compensate.
3	Harassment and Extortion of Fishermen by Navy Officers	3a. Given the harassment and severe beatings that fishermen have been subjected to by navy officers for some time now, following the replacement of community liaison officers with navy officers, what steps is Eco Atlantic taking to prevent harassment from navy officers if a fisherman enters the area where the drilling project is being carried out?	The drilling project area would ideally be marked with buoys for visual identification of the exclusion zone and to help prevent the fishermen from entering the exclusion zone. In addition, ESL and Eco Atlantic will work with community liaison officers and the chief fishermen to educate local fishermen about safety and the importance of not crossing into the exclusion zones indicated with the buoys

		3b. EcoAtlantic should include indigenous fishing liaison officers to supplement the navy vessels.	in order to maintain safety and peace between operators and fishermen. Note taken of suggestion.
4	No buoys in the project area where there are other existing FPSOs.	4a. No buoys have been sighted at the project area even though other oil and gas companies, such as Tullow and Eni, have been working in the project area for several years. 4b. Will buoys be installed during the drilling project? If so, they should be appropriately designated around the FPSO to prevent nets from being dragged away by sea currents. Moreover, to avoid any interference with drilling operations, buoys should be placed in the advisory zone rather than the safety zone, which is 500 metres radius from the FPSO. 4c. If buoys cannot be installed for the drilling project, transponders can be used to demarcate the exclusion zone.	Concern noted. Eco Atlantic is committed to the safety of its employees, fishermen, other marine users, and the environment, which is why the exclusion zone exists, hence suggestion is noted for consideration Suggestion noted.
5	Fisheries Impact Assessment	Will a Fisheries Impact Assessment be conducted as required by Section 93 of the Fisheries Act?	The EPA is responsible for determining what type of impact assessment goes into a particular project for Fisheries Impact Assessment. Given that the project is an exploratory drilling, which will last for about a month, EPA, in their screening, did not include a Fisheries Impact Assessment.
6	Office of Eco Atlantic in the Western Region	Is there an Eco Atlantic office in the Western region where fishermen can seek clarification when an issue arises?	Eco Atlantic currently does not have an office in the Western region. However, if an issue needs to be clarified, the addresses and phone numbers of Eco Atlantic and ESL are always available and open.
7	Vessel Identification	7a. What kind of vessel will Eco Atlantic employ for the drilling project, and what is its name? 7b. How will the drilling vessel be identified?	The vessel Eco Atlantic will use for the drilling project is the Noble Venturer. Each vessel is identified by its unique colours and flag.
8	Sargassum seaweed Invasion	The fishermen raised the issue of Sargassum proliferation found on the	It was explained that the invasion of Sargassum seaweed on the Ghanaian

		coast as being the result of the seismic and drilling exploration activities taking place in the Deep-Water Cape Three Point Block, considering the fact that it was only in modest quantity before the oil and gas prospecting in the area began.	coast was not caused by oil and gas activities, and that it originated from the Caribbean and swept across by ocean currents. The invasion of sargassum seaweed affects not only Ghana, but also other African coasts and the Caribbean coast.

Closing

Mr. Kenneth Agbi (ESL) thanked the fishermen and other attendees for their time and emphasized that their suggestions and concerns would be included in the report. The meeting concluded at 11:52 am.

ATTENDANCE SHEET

ECOATLANTIC OFFSHORE EXPLORATORY DRILLING PROJECT

STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Stakeholder: CHIEF FISHERMEN **Meeting Location:** SSNIT CONFERENCE Room **Date:** 25-07-2023

#	Full Name	Sex	~~Institution~~ District	Position	Phone Number	Email	Signature
1	Dominic I. Dadzie	M	AHANTA EAST	FIN. SEC.	0244458660	kwakudee22@gmail.com	
2	JOHN D. ESHUN	m	NZEMA EAST	PRO	0240745611	jdeshun9x@gmail.com	
3	CHRISTOPHER K. ANDOH	M	ELLEMBELE	~~FISH~~ CHIEF FISHERMAN	0201693763	P.O. BOX 10 Beyin	
4	EBO ROBBINA	M	ELLEMBELLE	CHIEF-FISHERMAN	0274290503	P.O. BOX 10 Kwesian	
5	Nana Gyaaben		Ahanta west	Chief fisherman	0546331574	P.O.BOX 12	
6	Nana Ecow Essoun	M	Ahanta West	Chief fisherman	0247950008		
7	Nana Papa Yalley	M	Ahanta West	Chief fisherman	0547469514		
8	Nana Kojo Kapeku	M	Nzema East	Chief fisherman	0550318456		
9	Nana Emm. Adwire	m	Assiin (Jomoro)	✓	0245065869		
10	Nana Thomas Aikins	M	Jomoro	✓	0542211758		
11	Michael Nokoe	m	Nzema East	Ex. member	0208198515	michaelnokoe@gmail.com	
12	Nana Kobina Dawer	M	S.T.M.A	Chief fisherman	0545283978		
13	Nana Kofi Bentil	M	Nzema East	Chief Fisherman	0243634081		
14	Mohammed Adam Inass	m	Western	Rep (C/F)	0548717148		
15	COLLINS OWUSU BEMPAH	M	ACCRA	QHSE Coord.	0244531516	collins.owusubempah@ecoatlantic.com	

ECOATLANTIC OFFSHORE EXPLORATORY DRILLING PROJECT

STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Stakeholder: **Meeting Location:** **Date:**

#	Full Name	Sex	~~Institution~~ DISTRICT	Position	Phone Number	Email	Signature
16	Nana Opakoh	M	Tomoro	Chief fisherman	0554475117		
17	Nana Kwamena Asiedu	M	Tomoro	Chief fisherman	0592484843		
18	Nana Eguir	M	S.D.A.	Ex-member	0247676350		
19	Nana Kodwo Mbeah III	M	S.D.A	Chief Fisherman	0551524122		
20	Nana Ebu Kwofie	M	Axim	Chief Fisherman	0242255178		
21	Richard Entsie	M	Abuesi	Chief Fishermanlk	0545898146		
22	Mike Abaka-Edu	M	Nzema East AXIM	Executive Member	0244880174	mikeabakaedu@gmail.com	
23	Edward Afful	M	AHANTA WEST	Executive Mem	0246888925		
24	John Macarthy	M	Ellembelle	Chief fisherman	0205024539		
25	Alfred Ayah	M	Petroleum Commission	Manager, ICRO	0244517468	alfred.ayah@petrocom.gov.gh	
26	Philip Asamoah Tabi	M	Petroleum Commission	Community Relations Assistant	0246729503	philip.tabi@petrocom.gov.gh	
27	NANA KWESI ACKON	M	S.T.M.A	CHIEF FISHERMAN	0553135573		
28	JOHN ADJE MENSAH	M	S.T.M.A	CHIEF FISHERMAN	0243464122		
29	Kenneth Agbi	M	ESL	Principal Consultant	0246146600	kyagbi@eslghana.com	
30	Joseph Bruce-Crabbe	M	ESL	Env. Consultant	0240822020	jbruce353esl@gmail.com	

ECOATLANTIC OFFSHORE EXPLORATORY DRILLING PROJECT

STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Stakeholder: **Meeting Location:** **Date:**

#	Full Name	Sex	Institution	Position	Phone Number	Email	Signature
31	Hama JF ESamsay	M	GNCFC	V/chairman	0544185195		[signature]
32	Patience Aku Agyei	F	ESL Consulting	Env. Consultant			
33	Amanda	F	ESL Consulting	Env. Consultant			
34	Obed Adjei	M	ESL Consulting	Env. Consultant	0243943889		[signature]
35							
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38							
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45							

PHOTOGRAPHS

PHOTOGRAPHS TAKEN DURING AND AFTER THE MEETING

Photographs of ESL Team Member (an Environmental Consultant) delivering the presentation on the Eco Atlantic Offshore Exploratory Drilling Project

Photograph of a representative from Eco Atlantic Ghana Limited speaking with District Chief Fishermen during the Stakeholder Engagement Meeting on 25th July 2023.

Photographs of Stakeholder Engagement Meeting with District Chief Fishermen on 25th July 2023





Photographs of District Chief Fishermen Airing their Views and Concerns about the Eco Atlantic Offshore Exploratory Drilling Project.

Photograph of the Western Regional Director of the Petroleum Commission, Takoradi, speaking with District Chief Fishermen during the Stakeholder Engagement Meeting on 25th July 2023.

LETTERS OF NOTIFICATION AND REMINDERS

ESL Consulting
(environment & resource development)
P. O. BOX LG 239 LEGON-GHANA
14 Ago Ali Street (Off Trinity Avenue), Mempeasem, East Legon, Accra, Ghana. Digital Address: GA-451-6032 Tel: +233 (0) 30 255 4732, Mob: +233 (0) 244 771 707. Web: www.esl-ghana.com

14 July 2023

Attn.: The Executive Director.
Environmental Protection Agency,
Ministries
Accra.

Received By:.....
Position:.....
Sign:.....
Date:.....
Contact No.:.....

Dear Sir,

RE: ECO ATLANTIC PEA STUDY – A LETTER OF REMINDER AND NOTICE OF PROJECT RESUMPTION.

ESL brings you warm greetings.

Eco-Atlantic Ghana Limited is the operator of the Deep Water - West Cape Three Points (DW/WCTP) block, and are currently planning exploratory drilling operations between December 2023 and January, 2024. As part of the process, a Preliminary Environmental Report (PER) needs to be presented to and accepted by EPA (Ghana) for the acquisition of the drilling permit. An important element requires consultations with key stakeholders mainly the fishing communities that might be affected by the drilling activity as well as the other key regulators of the industry, notably the Petroleum Commission (PC), the Ghana National Petroleum Corporation (GNPC), the Ghana Ports and Harbours Authority (GPHA), and the Ghana Maritime Authority (GMA). To this end, ESL Consulting Limited, a local company with vast experience in environmental and social impacts assessment in the Ghanaian oil and gas industry, was engaged by Eco-Atlantic to lead the consultations in 2018.

We are writing to respectfully remind you about our consultation that we held with you in 2018 regarding this drilling project within the DW/WCTP. As you may recall, we discussed the potential benefits and challenges of the project, as well as the environmental and social impacts. We also agreed on some action points and deliverables; and took note of your concerns and viewpoints in respect of the undertaking.

Unfortunately, due to some management challenges and the Covid pandemic, the project was put on hold for more than two years. However, we are happy to inform you that Eco Atlantic is now ready to resume the project and start the drilling operations as soon as possible.

We, by this letter, wish to notify the Agency of the planned re-engagements scheduled to take place on the 25th July 2023 in Takoradi.

We would appreciate it if you could provide us with any updates or changes that may have occurred in respect of your operational or regulatory activities since our last consultation.

Please if you require us for a follow-up meeting, we are pleased to do so. Alternatively, you can reach us at **+24 233 394 3889 (Obed Adjei, oadjei@esl-ghana.com)** or **+233 24 614 6600 (Ken Agbi, kyagbi@esl-ghana.com)** if you have any questions or concerns. We look forward to hearing from you soon and continuing our collaboration on this important project. Enclosed is a brief background information document on the project.

Yours sincerely,

Ayaa K. Armah
CEO

0501301164 - Diana

ESL Consulting
(environment & resource development)
P. O. BOX LG 239 LEGON-GHANA
14 Ago Ali Street (Off Trinity Avenue), Mempeasem, East Legon, Accra, Ghana. Digital Address: GA-451-6032 Tel: +233 (0) 30 255 4732, Mob: +233 (0) 244 771 707. Web: www.esl-ghana.com

Petroleum Commission Ghana
RECEIVED
18/07/23

17th July, 2023

Attn.: The Chief Executive Officer.
Petroleum Commission,
Accra.

Cc.: The Director, Petroleum Commission, Takoradi.

Received By: Naa A. Armah
Position: NSP
Sign:
Date: 18/07/23
Contact No.: 0302550933

Dear Sir,

RE: NOTICE OF STAKEHOLDER ENGAGEMENT WITH KEY INDUSTRY REGULATORS AND THE COASTAL FISHING COMMUNITIES IN THE WESTERN REGION – ECO ATLANTIC PEA STUDY

Eco-Atlantic Ghana Limited is the operator of the Deep Water - West Cape Three Points (DW/WCTP) block, and are currently planning exploratory drilling operations between December 2023 and January, 2024.

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ESL Consulting Limited, a local company with vast experience in environmental and social impacts assessment in the Ghanaian oil and gas industry, has been engaged by Eco-Atlantic to lead the consultations.

Consultations to this effect had been held earlier in 2018; however, activities were discontinued owing to management challenges. The purpose of this engagement is to highlight minor alterations to the programme.

We, by this letter, wish to notify the Commission of the planned engagements scheduled to take place on 25th July 2023 in Takoradi.

Kenneth Agbi is the lead consultant for ESL on the project, and can be contacted on +233 246146600.

Enclosed is a brief background information document on the project and the engagement schedule.

We would be most grateful if you could find time to participate in the consultation process.

Yours sincerely,

Ayaa K. Armah
CEO

ESL Consulting
(environment & resource development) P. O. BOX LG 239 LEGON-GHANA
14 Ago All Street (Off Trinity Avenue), Mempeasem, East Legon, Accra, Ghana. Digital Address: GA-451-6032 Tel: +233 (0) 30 255 4732, Mob: +233 (0) 244 771 707. Web: www.esl-ghana.com

17th July, 2023

Attn.: The Chief Executive Officer.
Petroleum Commission,
Accra.
Cc.: The Director, Petroleum Commission, Takoradi.

Dear Sir,

RE: NOTICE OF STAKEHOLDER ENGAGEMENT WITH KEY INDUSTRY REGULATORS AND THE COASTAL FISHING COMMUNITIES IN THE WESTERN REGION – ECO ATLANTIC PEA STUDY

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Yours sincerely,

Ayaa K. Armah
CEO

Received By: KEZIAH OBENG
Position: ADMIN
Sign:
Date: 20-07-2023
Contact No: 0302550981

ESL Consulting
(environment & resource development)
P. O. BOX LG 239 LEGON-GHANA
14 Ago Ali Street (Off Trinity Avenue), Mempeasem, East Legon, Accra, Ghana. Digital Address: GA-451-6032 Tel: +233 (0) 30 255 4732, Mob: +233 (0) 244 771 707. Web: www.esl-ghana.com

17th July, 2023

Attn.: The Chief Executive Officer.
Ghana National Petroleum Corporation (GNPC),
Tema.

Received By:.....
Position:.....
Sign:.....
Date:.....
Contact No.:.....

GHANA NATIONAL PETROLEUM CORP.
RECEIVED
18 JUL 2023
CHIEF EXECUTIVE'S SECRETARIAT

Dear Sir,

RE: NOTICE OF STAKEHOLDER ENGAGEMENT WITH KEY INDUSTRY REGULATORS AND THE COASTAL FISHING COMMUNITIES IN THE WESTERN REGION – ECO ATLANTIC PEA STUDY

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Yours sincerely,

Ayaa K. Armah
CEO

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(environment & resource development)
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21 July 2023

GHANA MARITIME AUTHORITY
RECEIVED
Date: 25/07/23

Attn.: The Director General.
Ghana Maritime Authority (GMA),
Accra.

Dear Sir,

RE: ECO ATLANTIC PEA STUDY – NOTICE OF PROJECT RESUMPTION.

ESL brings you warm greetings.

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Consultations with the fishermen in the six coastal Districts were held in 2018 regarding this drilling project within the DW/WCTP. During the consultation sessions, as we may recall, we discussed the potential benefits and challenges of the project, as well as the environmental and social impacts. We also agreed on some action points and deliverables; and took note of stakeholders concerns and viewpoints in respect of the undertaking.

Unfortunately, due to some management challenges and the Covid pandemic, the project was put on hold for more than two years. However, we are happy to inform you that Eco Atlantic is now ready to resume the project and start the drilling operations as soon as possible; and we respectfully, by this letter, write to notify you about the current development.

We would like to hear from you and get your feedback, if any, on the project after reviewing the attached background information. We would also appreciate it if you could provide us with any updates or changes that may have occurred in respect of your operational or regulatory activities since our last consultations.

Please if you require us for a follow-up meeting, we are pleased to do so. Alternatively, you can reach us at **+24 233 394 3889 (Obed Adjei, oadjei@esl-ghana.com)** or **+233 24 614 6600 (Ken Agbi, kyagbi@esl-ghana.com)** if you have any questions or concerns. We look forward to hearing from you soon, and to continuing our collaboration on this important project.

Enclosed is the brief Background Information Document (BID) of the project.

Yours sincerely,

Ayaa K. Armah
CEO

Received By: Daniel Sackey
Position: Front-Desk
Sign:
Date: 25/07/2023
Contact No.: 0302662506

ESL Consulting
(environment & resource development) P. O. BOX LG 2 LEGON-GHANA
14 Ago Ali Street (Off Trinity Avenue), Mempeasem, East Legon, Accra, Ghana. Digital Address: GA-451-6032 Tel: +233 (0) 30 255 4732, Mob: +233 (0) 244 771 707. Web: www.esl-ghana.com

21 July 2023

Attn.: The Director.
Ghana Maritime Authority (GMA),
Takoradi.

Dear Sir,

RE: ECO ATLANTIC PEA STUDY – NOTICE OF PROJECT RESUMPTION.

ESL brings you warm greetings.

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Enclosed is the brief Background Information Document (BID) of the project.

Yours sincerely,

Ayaa K. Armah
CEO

Received By: Dora Duut
Position: Secretary
Sign:
Date: 20-07-23
Contact No 031-20-34160

ESL Consulting
(environment & resource development)
P. O. BOX LG 239 LEGON-GHANA
14 Ago Ali Street (Off Trinity Avenue), Mempeasem, East Legon, Accra, Ghana. Digital Address: GA-451-6032 Tel: +233 (0) 30 255 4732, Mob: +233 (0) 244 771 707. Web: www.esl-ghana.com

21 July 2023

Attn.: The Executive Director.
Fisheries Commission (FC),
Ministries, Accra.

Dear Sir,

RE: ECO ATLANTIC PEA STUDY – NOTICE OF PROJECT RESUMPTION.

ESL brings you warm greetings.

Eco-Atlantic Ghana Limited is the operator of the Deep Water - West Cape Three Points (DW/WCTP) block, and are currently planning exploratory drilling operations between December 2023 and January, 2024. As part of the process, a Preliminary Environmental Report (PER) needs to be presented to and accepted by EPA (Ghana) for the acquisition of the drilling permit. An important element requires consultations with key stakeholders mainly the fishing communities that might be affected by the drilling activity as well as the other key regulators of the industry, notably the Petroleum Commission (PC), the Ghana National Petroleum Corporation (GNPC), the Ghana Ports and Harbours Authority (GPHA), and the Ghana Maritime Authority (GMA). To this end, ESL Consulting Limited, a local company with vast experience in environmental and social impacts assessment in the Ghanaian oil and gas industry, was engaged by Eco-Atlantic to lead the consultations in 2018.

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Enclosed is the brief Background Information Document (BID) of the project.

Yours sincerely,

Ayaa K. Armah
CEO

Received By: Esther
Position: Asst. Adm Manager
Sign:
Date: 25/7/23
Contact No.: 0244022441

ESL Consulting
(environment & resource development) P. O. BOX LG 239 LEGON-GHANA
14 Ago Ali Street (Off Trinity Avenue), Mempeasem, East Legon, Accra, Ghana. Digital Address: GA-451-6032 Tel: +233 (0) 30 255 4732, Mob: +233 (0) 244 771 707. Web: www.esl-ghana.com

21 July 2023

Attn.: The Director.
Fisheries Commission (FC),
Takoradi.

Dear Sir,

RE: ECO ATLANTIC PEA STUDY – NOTICE OF PROJECT RESUMPTION.

ESL brings you warm greetings.

Eco-Atlantic Ghana Limited is the operator of the Deep Water - West Cape Three Points (DW/WCTP) block, and are currently planning exploratory drilling operations between December 2023 and January, 2024. As part of the process, a Preliminary Environmental Report (PER) needs to be presented to and accepted by EPA (Ghana) for the acquisition of the drilling permit. An important element requires consultations with key stakeholders mainly the fishing communities that might be affected by the drilling activity as well as the other key regulators of the industry, notably the Petroleum Commission (PC), the Ghana National Petroleum Corporation (GNPC), the Ghana Ports and Harbours Authority (GPHA), and the Ghana Maritime Authority (GMA). To this end, ESL Consulting Limited, a local company with vast experience in environmental and social impacts assessment in the Ghanaian oil and gas industry, was engaged by Eco-Atlantic to lead the consultations in 2018.

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Enclosed is the brief Background Information Document (BID) of the project.

Yours sincerely,

Ayaa K. Armah
CEO

Received By: Samuel Quaigal
Position: Secretary
Sign:
Date: 20/07/23
Contact No. 0591549145

ESL Consulting
(environment & resource development)
P. O. BOX LG 239 LEGON-GHANA
14 Ago Ali Street (Off Trinity Avenue), Mempeasem, East Legon, Accra, Ghana. Digital Address: GA-451-6032 Tel: +233 (0) 30 255 4732, Mob: +233 (0) 244 771 707. Web: www.esl-ghana.com

21 July 2023

Attn.: The Director General.
Ghana Ports and Harbours Authority (GPHA),
Tema.

Dear Sir,

RE: ECO ATLANTIC PEA STUDY – NOTICE OF PROJECT RESUMPTION.

ESL brings you warm greetings.

Eco-Atlantic Ghana Limited is the operator of the Deep Water - West Cape Three Points (DW/WCTP) block, and are currently planning exploratory drilling operations between December 2023 and January, 2024. As part of the process, a Preliminary Environmental Report (PER) needs to be presented to and accepted by EPA (Ghana) for the acquisition of the drilling permit. An important element requires consultations with key stakeholders mainly the fishing communities that might be affected by the drilling activity as well as the other key regulators of the industry, notably the Petroleum Commission (PC), the Ghana National Petroleum Corporation (GNPC), the Ghana Ports and Harbours Authority (GPHA), and the Ghana Maritime Authority (GMA). To this end, ESL Consulting Limited, a local company with vast experience in environmental and social impacts assessment in the Ghanaian oil and gas industry, was engaged by Eco-Atlantic to lead the consultations in 2018.

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Yours sincerely,

Ayaa K. Armah
CEO

Received By: Onyx Catherine
Position: Clerk
Sign: Catherine
Date: 25/07/2023
Contact No.: 0303219120

ESL Consultancy
(environment & resource development) P. O. BOX LG 239 LEGON-GHANA
14 Ago All Street (Off Trinity Avenue), Mempeasem, East Legon, Accra, Ghana. Digital Address: GA-451-6032 Tel: +233 (0) 30 255 4732, Mob: +233 (0) 244 771 707. Web: www.esl-ghana.com

21 July 2023

Attn.: The Director.
Ghana Ports and Harbours Authority (GPHA),
Takoradi.

Dear Sir,

RE: ECO ATLANTIC PEA STUDY – NOTICE OF PROJECT RESUMPTION.

ESL brings you warm greetings.

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Yours sincerely,

Ayaa K. Armah
CEO

Received By: MICHAEL OFFE
Position: DP'S CLERK
Sign:
Date: 20 – 7 – 2023
Contact No.: 0509400365

ESL Consulting
(environment & resource development)
P. O. BOX LG 239 LEGON-GHANA
14 Ago Ali Street (Off Trinity Avenue), Mempeasem, East Legon, Accra, Ghana. Digital Address: GA-451-6032 Tel: +233 (0) 30 255 4732, Mob: +233 (0) 244 771 707. Web: www.esl-ghana.com

21 July 2023

Attn.: Chief of the Naval Staff.
Ghana Navy (GN),
Accra.

Dear Sir,

RE: ECO ATLANTIC PEA STUDY – NOTICE OF PROJECT RESUMPTION.

ESL brings you warm greetings.

Eco-Atlantic Ghana Limited is the operator of the Deep Water - West Cape Three Points (DW/WCTP) block, and are currently planning exploratory drilling operations between December 2023 and January, 2024. As part of the process, a Preliminary Environmental Report (PER) needs to be presented to and accepted by EPA (Ghana) for the acquisition of the drilling permit. An important element requires consultations with key stakeholders mainly the fishing communities that might be affected by the drilling activity as well as the other key regulators of the industry, notably the Petroleum Commission (PC), the Ghana National Petroleum Corporation (GNPC), the Ghana Ports and Harbours Authority (GPHA), the Ghana Navy (GN), and the Ghana Maritime Authority (GMA). To this end, ESL Consulting Limited, a local company with vast experience in environmental and social impacts assessment in the Ghanaian oil and gas industry, was engaged by Eco-Atlantic to lead the consultations in 2018.

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Yours sincerely,

Ayaa K. Armah
CEO

Received By: CDR Boateng K
Position: CHOK
Sign:
Date: 25 July 2023
Contact No.: 0302777991

ESL Consulting
(environment & resource development) P. O. BOX LG 239 LEGON-GHANA
14 Ago Ali Street (Off Trinity Avenue), Mempeasem, East Legon, Accra, Ghana. Digital Address: GA-451-6032 Tel: +233 (0) 30 255 4732, Mob: +233 (0) 244 771 707. Web: www.esl-ghana.com

21 July 2023

Attn.: The Western Naval Commander.
Ghana Navy (GN),
Takoradi.

Dear Sir,

RE: ECO ATLANTIC PEA STUDY – NOTICE OF PROJECT RESUMPTION.

ESL brings you warm greetings.

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Yours sincerely,

Ayaa K. Armah
CEO

Received By: DAPAAH D.
Position: ABI
Sign:
Date: 20/7/23
Contact No.: 0541917677

Deep Water Cape Three Point Offshore Block West Western Region

Background Information Document

July 2023

Purpose

The purpose of the Background Information Document (BID) is to provide information about the proposed exploratory drilling at the DeepWater Cape Three Point Offshore Block West oil field in Deep Water Tano Cape Three Points by Eco Atlantic Ghana Ltd., and to introduce the Preliminary Environmental Assessment (PEA) study that is being conducted.

Background

Eco Atlantic Ghana Limited (EGL) is an indigenous independent energy company engaged in the exploration and production of crude oil and natural gas. EGL is committed to meeting the highest standards of corporate citizenship through protection of the health and safety of employees, safeguarding the environment and creating a long-lasting positive impact on the communities in which it conducts business.

EGL has been the Operator of the Deepwater Cape Three Points (DWCTPW) licence block, offshore the Western Region of Ghana since 2014.

Eco Atlantic Ghana Limited is preparing to drill One (1) vertical exploration well in the license area.

The proposed exploration well is part of the licence commitment on the DWCTPW Block. The concession block of 950 km^2 is located about 70km off the coast in water depths varying between 500m to over 2,300m (Figure 1). The first well drilling campaign is planned to commence in the third quarter of 2023 and is expected to last approximately 45 days (including drilling, mobilisation and demobilisation).

The commitment well is required in the contract between the Petroleum Commission and EGL, consistent with Ghana's objective to develop its hydrocarbon resources.

Overview of the Proposed Drilling

The first wells known as the 'Dawadawa-1x' is an exploration well, and is planned to be drilled between September and December 2023. Following a successful drilling, analysis will be carried out, and it is possible that up to two further wells will be drilled in the license area to explore new targets and/or assess the viability of the Fan prospect in producing oil in commercial quantities.

The following three wells have been drilled on the acreage.

- Ankobra-1 (September 2008); - Drilled by Hess with the Transocean Deepwater Discoverer rig
- AYD -1 Well (April 2010); Drilled by ENI with the Transocean Deepwater Pathfinder rig.
- Pecan South-1X Well (Feb 2019); Drilled by Aker Energy with the Maersk Viking rig.

10 wells have been drilled by Hess (now operated by Pecan Energies) in the Deep Water Tano Cape Three Points (DWTCPT) that is located immediately to the east of the EGL Block DWCTPW Block:

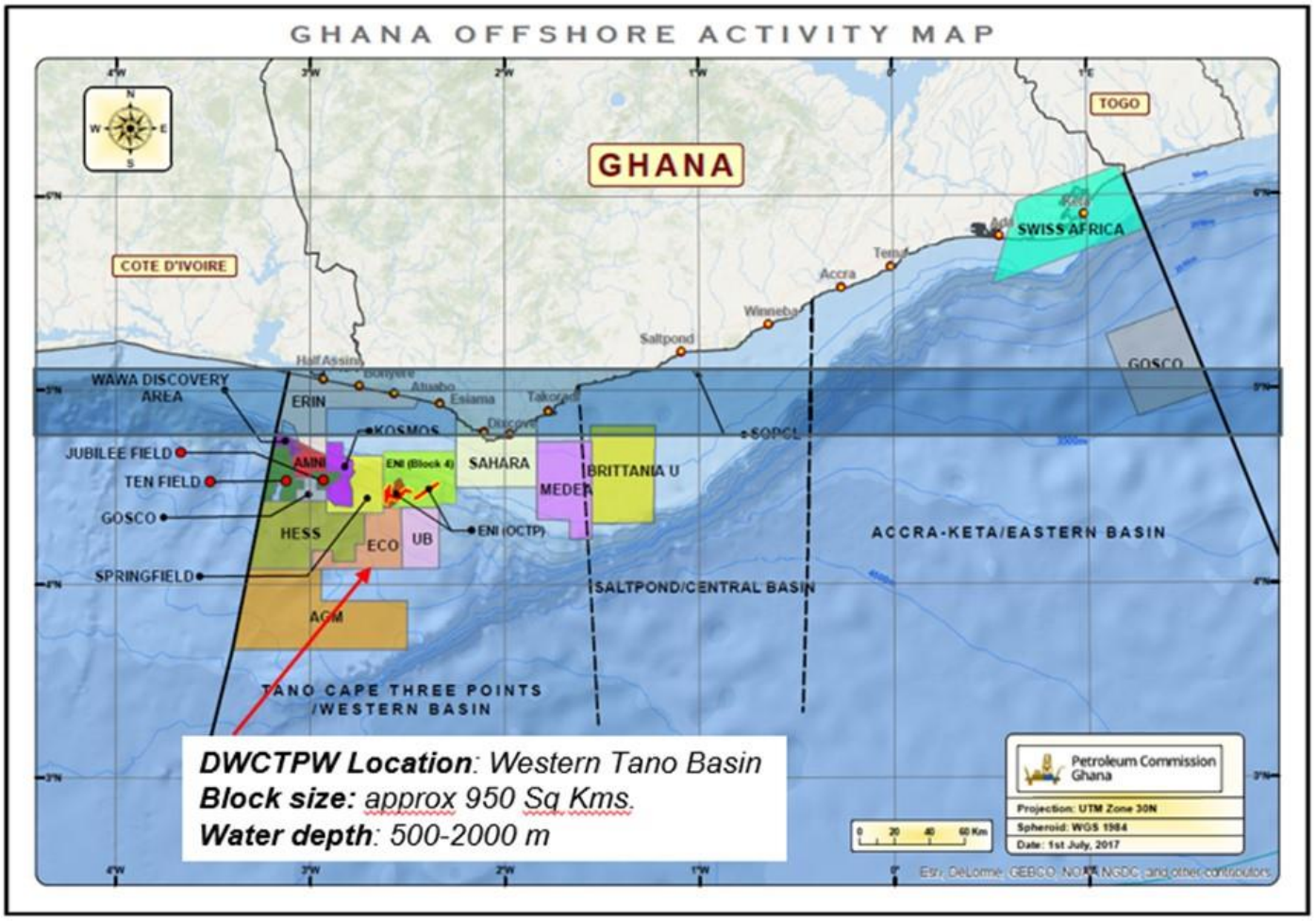
- Paradise-1
- Hickory North-1
- Beech-1
- Almond-1 and 2
- Pecan-1, 2 & 3
- Pecan South-1X
- Cob-1
- PN1

Preliminary Environmental Assessment (PEA) Study

The Environmental Protection Agency (EPA) Act, 1994 (Act 490) mandates the EPA of Ghana to ensure compliance with laid down Environmental Assessment (EA) regulations governing projects and other development activities. The Environmental Assessment Regulations, 1999 (LI 1652) list oil and gas exploration drilling as a Schedule 1 'undertaking' requiring registration by filling Form PO1 (initial assessment) for EPA's screening decision. Following review by EPA of the duly submitted Form PO1 a Preliminary Environmental Report (PER) was required for the exploratory (and potential appraisal) well drilling project. Accordingly, EGL commissioned this Preliminary Environmental Report (PER) study as the basis for consideration for an Environmental Permit to conduct its campaign.

The PER is intended to identify and assess, as well as prevent or minimise potential adverse environmental and social impacts, while enhancing the beneficial impacts of the project. The PER is therefore expected to ensure a socially acceptable, environmentally sound and sustainable offshore drilling operation, with minimal or no adverse impact on fishing and fishing livelihoods and the marine environment in general.

Figure 1: Project Location Map



Source: Petroleum Commission Ghana, 2017. DWT/CTP.

Figure 2: Example Drilling Ship

Potential Impacts

The development will be located in deep water approximately 70 km off the coast of the Western Region of Ghana. The activities planned for the drilling has the potential to impact the environment. Based on a preliminary assessment of the proposed activities, potential impacts and risks include the following:

Physical and Biological

- Gaseous emissions to air from power generation and hydrocarbon production activities on the drilling rig have the potential to effect local air quality and contribute to global climate change.
- Discharges into the marine environment from drilling activities has the potential to impact water column and seabed biological communities.
- The physical presence of drilling rig has the potential to impact water column and seabed biological communities.

Social

- The installation of drilling facilities, presence of drill ship and support vessels and drilling activities proper, may interfere with other marine activities, e.g., fishing and shipping.
- Establishment of a 500m exclusion zone (for purposes of safety) around the drill ship during drilling would mean that an area of about 0.79km2 would be excluded to commercial fishing and shipping.

Cumulative

- Other oil and gas activities are already occurring in the offshore area near where the development will be located.

Accidents

- There are risks associated with accidents and unplanned events. Vessel collisions, oil spills, pipeline rupture or well blowouts, although unlikely, could have a significant impact on the biophysical and social environment, potentially on a regional scale.

Other potential impacts will be identified as the PEA Study progresses.

Figure 3: Rig-Specification _ Noble-Venturer

Maersk Venturer — Rig Summary

General

Rig Type:	Drillship
Rig Design:	Ship shaped, Samsung 96K
Builder:	SHI, Korea
Year Built / Upgraded:	2014
Classification:	ABS
Flag:	Singapore
MODU Code:	2009

Ratings & Dimensions

Water Depth:	12,000 ft
Drilling Depth:	40,000 ft
Length:	748 ft
Breadth:	137.8 ft
Depth:	62.3 ft
Draft (Operating/ Transit):	39.4 ft / 27.9 ft
Moonpool:	84 ft x 41 ft
Variable Deck Load:	44,092 kips
Hook Load:	2,500 kips on main hoist; 1,500 kips on auxiliary hoist
Setback Capacity:	2,645 kips
Racking Capacity:	5 7/8" – 6 5/8" DP 375 at 133 ft, 5" DP 90 at 133ft, 3 ½" DP 54 at 133ft 16" csg 24 at 126ft, 7"-14" csg 64
Quarters Capacity:	230

Capacities

Fuel:	39,060 bbls
Drill Water:	15,158 bbls
Liquid Mud:	15,975 bbls
Brine Storage:	4,887 bbls
Base Oil Storage:	6,277 bbls
Bulk Storage:	31,924 cu ft
Sack Storage:	5,000 sacks

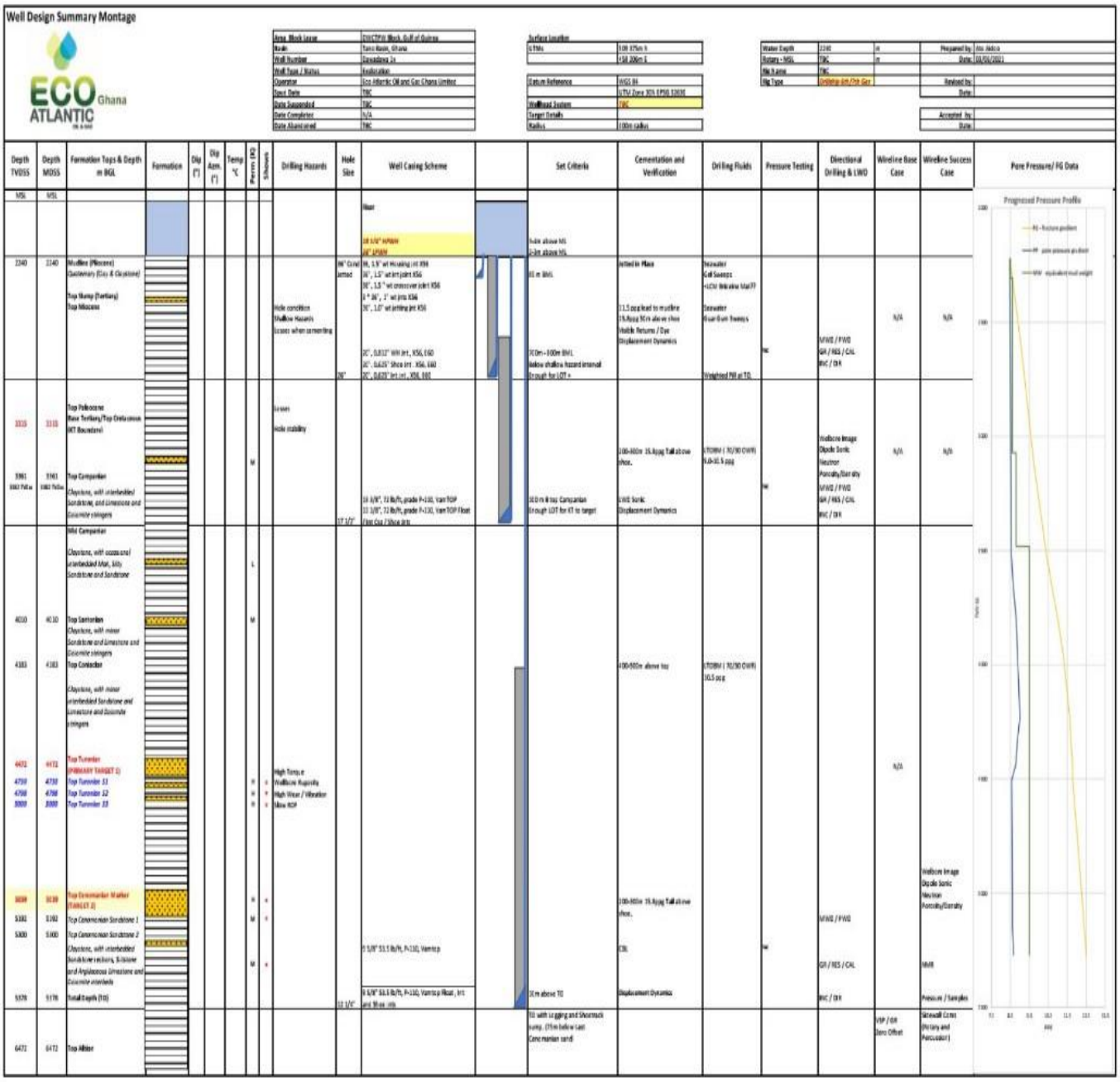
Equipment

Derrick:	NOV; 210 ft x 80 ft x 60 ft; 1,250 st main & 1000 st aux
Drawworks:	AHD-1250; 9,000 hp main / AHD-1000-6,900 hp aux
Top Drive:	NOV TDX-1250; 105,000 ft-lbs max continuous torque
Rotary:	NOV Model RST-755; 75-1/2 in Main, NOV Model RST-605; 60-1/2 in Aux
Iron Roughneck:	NOV ARN 200; 140,000 / 200,000 ft-lbs. m/u / b/o torque
Motion Compensator:	Function is incorporated in AHD
Riser Tensioner / Stroke:	(16) NOV DWRT-225-50; 225 kips/ea; Wire line travel of 50ft
Riser Details:	GE Vetco/MR-6H SE; 90 ft length;
BOP:	GE Hydril; 6 ram; 18-3/4 in x 15k psi
LMRP:	(2) Hydril GX 18-10, BTM FLG 18-3/4 in x 10 psi annulars
Control System:	GE Hydril MUX System
Pipe Handling:	NOV (2) HydraRacker-model HR-IV-ER w/ 30 kips lifting capacity
Solids Control System:	(6) NOV-Brandt VMS-300 Shakers, Mi Swaco/CD-1400 Vertical Degasser
Diverter:	*GE Vetco Gray-CSO; 75-1/2 in x 500 psi*
Tree Storage / Handling:	NOV; (1) 230T Xmas Tree Carrier, located at aft end of Moonpool (1) 2x75T Xmas Tree overhead crane to move Xmas trees well center w/ capacity
Cranes:	(4) NOV - OC3932KM01/02/03/04 85T
Mud Pumps:	(5) National 14-P-220; 2,200 HP
Engines:	(6) Doosan/MAN 16V32/40 w/7,248Kw per engine, W/6 generator rating of 7,000Kw per generator
Station Keeping:	Kongsberg DP3 K-Pos DP32 (Main) & DP12 (Backup)
Thrusters:	Wartsila Propulsion Netherlands B.V (6) 5,500kw-DP3 Thruster

These specifications are intended for informational purposes only. Noble makes no warranties about the accuracy or completeness of any information contained herein.

NOBLE

Figure 4: Dawadawa 1x Well Schematic Montage



Invitation to Comment

You are invited to participate in the PEA process and to share issues and concerns you may have about the proposed activity. Your comments are important to informing the PEA process; and it is important that your support or concerns are noted so that they can be assessed in the PER.

Please provide your contact details below:

Name: _____

Organisation: _____

Position: _____

Address: _____

Telephone: _____

Mobile: _____

Email: _____

To register your comments, please use the form attached or send an email to the following:

ESL Consulting Limited
Contact:
Mr. AK Armah
Tel: +233-302-554732
Mob: +233-244-771707
Email: akarmah@yahoo.com
Address: ESL Consulting Ltd, PO Box LG 239 Legon, Ghana

Contact:
Eco Atlantic Oil & Gas Ghana Limited
Contact: Collins Owusu Bempah
Tel: + 233-20 898 7429;
WhatsApp: +233 24 453 1516
Email: collins.owusubempah@ecoatlanticgh.com
Address: 20 Church Crescent St, Accra

Stakeholder Comments

Please answer the questions below. Feel free to provide any comments you would like to raise. Please use additional sheets if required.

1. What are the primary concerns and / or benefits faced by you/your community/your organization with regards to this activity?

_____

_____

_____

_____

_____

2. In your opinion, what are the positive and negative aspects of the proposed Activity?

_____

_____

_____

_____

_____

3. Do you have information regarding the environment, community or health status which you think is relevant? (If so, please include here)

_____

_____

_____

_____

_____

Thank you for your participation

Eco Atlantic

Deep Water Cape Three Point Offshore Block West Drilling Campaign

Stakeholder Engagement for Preliminary Environmental Assessment (PEA) Study

Agenda

- ❑ Welcome note
- ❑ Purpose of gathering
- ❑ Introduction of Participants
  - ○Eco Atlantic personnel
  - ○PC and GNPC Personnel
  - ○EIA Consultant – ESL
  - ○All other participants – self intro
- ❑ Content presentations
  - ○Background
  - ○Overview of Proposed Drilling
  - ○Preliminary Environmental Assessment
- ❑ Discussions
- ❑ Questionnaire
- ❑ End of session remarks

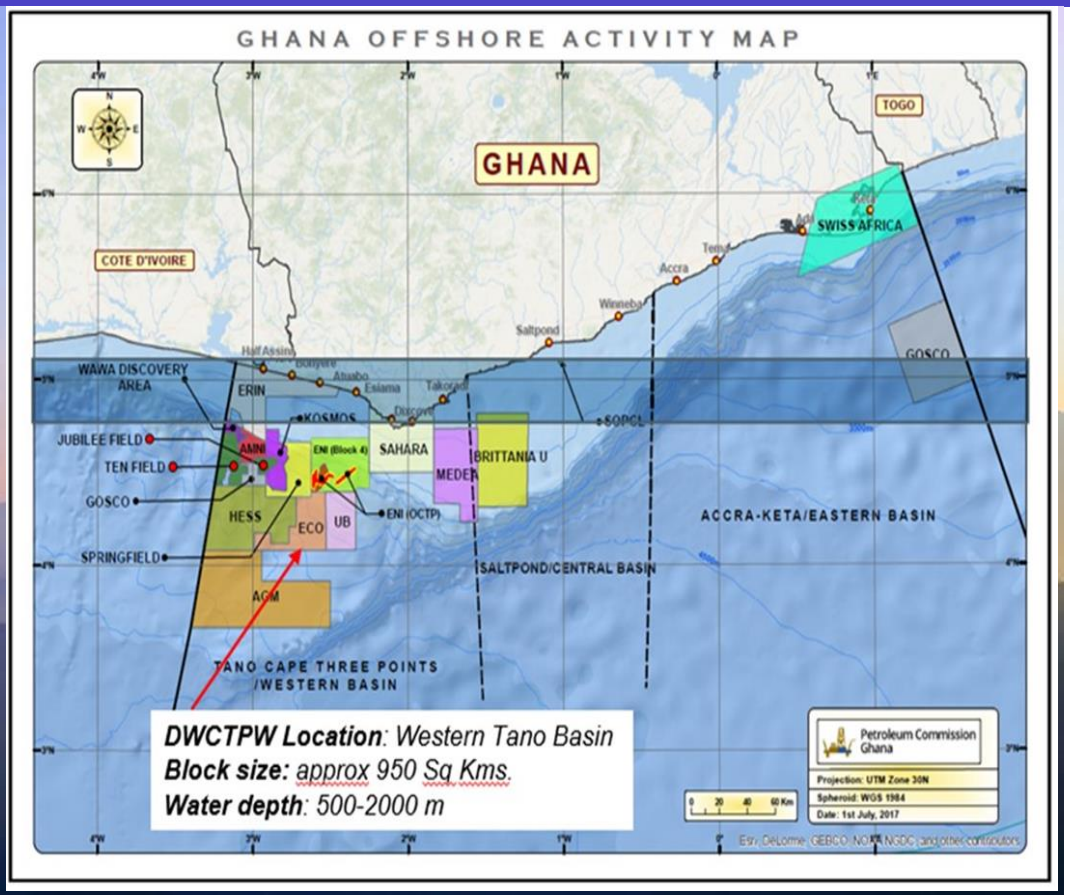
WELCOME NOTE & PURPOSE & Participating Groups Introduction

- To provide information about the proposed exploratory drilling at the Deep Water Cape Three Point Offshore Block West in the Deep Water Tano Cape Three Points oil Field.
- To introduce the ongoing Preliminary Environmental Assessment (PEA) Study; and a reminder of the 2018 Study.
- To collect and note stakeholders' relevant views and concerns; and have them addressed during the PEA study.

Background

- Eco Atlantic Ghana Limited (EGL) is an indigenous independent energy company engaged in the exploration and production of crude oil and natural gas.
- EGL has been the Operator of the Deepwater Cape Three Points (DWCTPW) licence block, offshore the Western Region of Ghana since 2014.
- EGL is committed to:
  - meeting the highest standards of corporate citizenship through protection of the health and safety of employees, as well as safeguarding the environment
  - creating a long-lasting positive impact on the communities in which it conducts business.

Background-cont'd



Source: Petroleum Commission Ghana, 2017. DWT/CTP.

- What EGL intends to do:
  - Eco Atlantic Ghana Limited is preparing to drill One (1) vertical exploration well in the license area.
  - The proposed exploration well is part of the licence commitment on the DWCTPW Block.
  - The commitment well is required in the contract between the Petroleum Commission and EGL, consistent with Ghana's objective to develop its hydrocarbon resources.
- The concession block of 950 km^2 is located about 70km off the coast in water depths varying between 500m to over 2,300m (Figure 1).
- Timing
  - The first well drilling campaign is planned to commence in the third quarter of 2023 and is expected to last approximately 45 days (including drilling, mobilisation and demobilisation).

Overview of the drilling

- The first well known as the ‘Dawadawa-1x’ is an exploration well, and is planned to be drilled between September and December 2023.

- Following a successful drilling, analysis will be carried out, and it is possible that up to two further wells will be drilled in the license area to explore new targets and/or assess the viability of the Fan prospect in producing oil in commercial quantities.

- The following three wells have been drilled on the acreage.
  - Ankobra-1 (September 2008); - Drilled by Hess with the Transocean Deepwater Discoverer rig
  - AYD -1 Well (April 2010); Drilled by ENI with the Transocean Deepwater Pathfinder rig.
  - Pecan South-1X Well (Feb 2019); Drilled by Aker Energy with the Maersk Viking rig.
  - 10 wells have been drilled by Hess (now operated by Pecan Energies) in the Deep Water Tano Cape Three Points (DWTCPT) that is located immediately to the east of the EGL Block DWCTPW Block:
    - Paradise-1
    - Hickory North-1
    - Beech-1
    - Almond-1 and 2
    - Pecan-1, 2 & 3
    - Pecan South-1X
    - Cob-1
    - PN1

Preliminary Environmental Assessment (PEA) Study

WHY THE PEA STUDY

- Legal Requirement by EPA
  - The Environmental Protection Agency (EPA) Act, 1994 (Act 490) mandates the EPA of Ghana to ensure compliance with laid down Environmental Assessment (EA) regulations governing projects and other development activities.
  - The Environmental Assessment Regulations, 1999 (LI 1652) list oil and gas exploration drilling as a Schedule 1 'undertaking'
  - Preliminary Environmental Report (PER), the statement of the PEA study, is the basis for consideration for an Environmental Permit to conduct the campaign.

- PEA PROCESS, OUTCOME and PURPOSE OF THE PER

Process entails:

- Registration (by Filling a PO1 Form) → Screening → PEA study → Submission of the PEA report (Preliminary Environmental Report - PER):

- The PER is intended to identify and assess, as well as prevent or minimise potential adverse environmental and social impacts, while enhancing the beneficial impacts of the project.
- The PER is therefore expected to ensure:
  - a socially acceptable, environmentally sound and sustainable offshore drilling operation,
  - minimal or no adverse impact on fishing and fishing livelihoods
  - minimal or no adverse impact on the marine environment in general.

Potential Impacts

- The development will be located in deep water approximately 70 km off the coast of the Western Region of Ghana.
- The activities planned for the drilling has the potential to impact the environment.
- Based on a preliminary assessment of the proposed activities, potential impacts and risks include the following:

Physical and Biological

- Gaseous emissions to air from power generation and hydrocarbon production activities on the drilling rig have the potential to effect local air quality and contribute to global climate change.
- Discharges into the marine environment from drilling activities has the potential to impact water column and seabed biological communities.
- The physical presence of drilling rig has the potential to impact water column and seabed biological communities.

✓ ***Design and operation Drilling Rig focus on energy efficiency to reduce Greenhouse Gases***

✓ ***All discharges to water will be treated to meet or be below required discharge limits according to local regulations and international standards;***

✓ ***Drilling and production process will use as environmentally friendly chemicals as possible***

Social

- The installation of drilling facilities, presence of drill ship and support vessels and drilling activities proper, may interfere with other marine activities, e.g., fishing and shipping.
- Establishment of a 500m exclusion zone (for purposes of safety) around the drill ship during drilling would mean that an area of about 0.79km2 would be excluded to commercial fishing and shipping.

✓ **Drilling is temporal and lasts only for about a month.**

Cumulative

- Other oil and gas activities are already occurring in the offshore area near where the development will be located.

Accidents

- There are risks associated with accidents and unplanned events. Vessel collisions, oil spills, pipeline rupture or well blowouts, although unlikely, could have a significant impact on the biophysical and social environment, potentially on a regional scale.

✓ ***The application of best industry practice will reduce likelihood of an event.***

✓ ***Oil spill response plans and equipment, collection and containment systems offshore and onshore, oil dispersion systems offshore, will be available to mitigate oil spill.***

- Other potential impacts will be identified as the PEA Study progresses.

Invitation To Comment

- Issues and concerns you may have about the proposed development
- Your comments are important to the PEA process
- Your support or concerns will be noted so they can be assessed in the PEA.

THANK YOU !!!

ESL Consulting Limited

Ken Agbi.
(kyagbi@esl-ghana.com)

www.esl-ghana.com

Thank you

Rig-Specification _ Noble-Venturer & *Dawadawa 1x Well Schematic Montage*

Maersk Venturer — Rig Summary

General

Rig Type:	Drillship
Rig Design:	Ship shaped, Samsung 96K
Builder:	SHI, Korea
Year Built / Upgraded:	2014
Classification:	ABS
Flag:	Singapore
MODU Code:	2009

Ratings & Dimensions

Water Depth:	12,000 ft
Drilling Depth:	40,000 ft
Length:	748 ft
Breadth:	137.8 ft
Depth:	62.3 ft
Draft (Operating/ Transit):	39.4 ft / 27.9 ft
Moonpool:	84 ft x 41 ft
Variable Deck Load:	44,092 kips
Hook Load:	2,500 kips on main hoist; 1,500 kips on auxiliary hoist
Setback Capacity:	2,645 kips
Racking Capacity:	S 7/8" – 6 5/8" DP 375 at 133 ft, 5" DP 90 at 133ft, 3 ½" DP 54 at 133ft 16" csg 24 at 126ft, 7"-14" csg 64
Quarters Capacity:	230

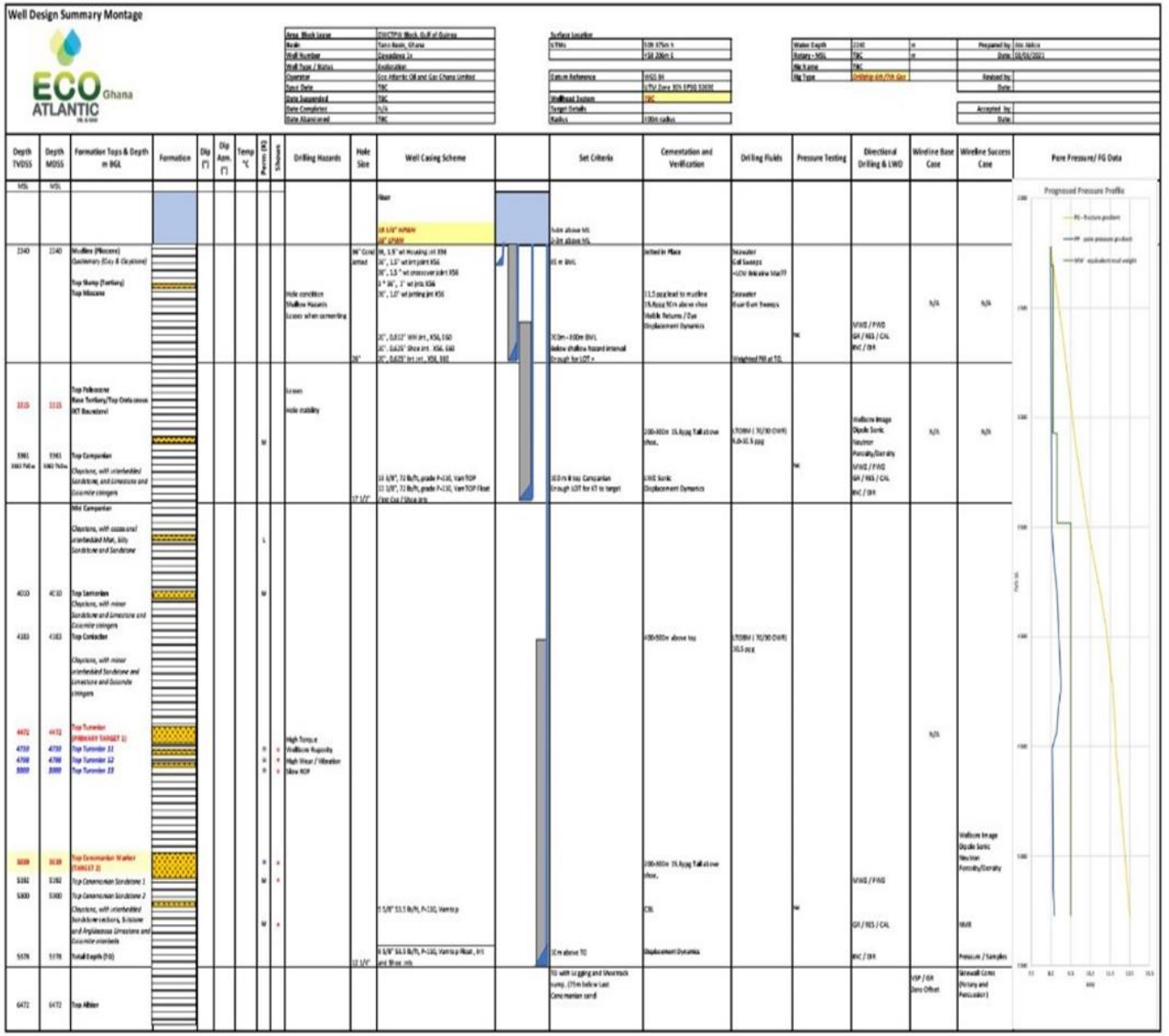
Capacities

Fuel:	39,060 bbls
Drill Water:	15,158 bbls
Liquid Mud:	15,975 bbls
Brine Storage:	4,887 bbls
Base Oil Storage:	6,277 bbls
Bulk Storage:	31,924 cu ft
Sack Storage:	5,000 sacks

Equipment

Derrick:	NOV; 210 ft x 80 ft x 60 ft; 1,250 st main & 1000 st aux
Drawworks:	AHD-1250; 9,000 hp main / AHD-1000-6,900 hp aux
Top Drive:	NOV TDX-1250; 105,000 ft-lbs max continuous torque
Rotary:	NOV Model RST-755; 75-1/2 in Main, NOV Model RST-605; 60-1/2 in Aux
Iron Roughneck:	NOV ARN 200; 140,000 / 200,000 ft-lbs. m/u / b/o torque
Motion Compensator:	Function is incorporated in AHD
Riser Tensioner / Stroke:	(16) NOV DWRT-225-50; 225 kips/ea; Wire line travel of 50ft
Riser Details:	GE Vetco/MR-6H SE; 90 ft length;
BOP:	GE Hydril; 6 ram; 18-3/4 in x 15k psi
LMRP:	(2) Hydril GX 18-10, BTM FLG 18-3/4 in x 10 psi annulars
Control System:	GE Hydril MUX System
Pipe Handling:	NOV (2) Hydra Racker-model HR-IV-ER w/ 30 kips lifting capacity
Solids Control System:	(6) NOV-Brandt VMS-300 Shakers, Mi Swaco/CD-1400 Vertical Degasser
Diverter:	*GE Vetco Gray-CSO; 75-1/2 in x 500 psi*
Tree Storage / Handling:	NOV; (1) 230T Xmas Tree Carrier, located at aft end of Moonpool (1) 2x75T Xmas Tree overhead crane to move Xmas trees well center w/ capacity
Cranes:	(4) NOV - OC3932KM01/02/03/04 85T
Mud Pumps:	(5) National 14-P-220; 2,200 HP
Engines:	(6) Doosan/MAN 16V32/40 w/7,248Kw per engine, W/6 generator rating of 7,000Kw per generator
Station Keeping:	Kongsberg DP3 K-Pos DP32 (Main) & DP12 (Backup)
Thrusters:	Wartsila Propulsion Netherlands B.V (6) 5,500kw-DP3 Thruster

These specifications are intended for informational purposes only. Noble makes no warranties about the accuracy or completeness of any information contained herein.



Some Photographs from the Previous Meetings

GROUP PICTURE WITH CHIEF FISHERMEN AND SOME FISHERMEN AT STMA, ESSIKADO CHIEFS PALACE, ON THE 23 RD OCTOBER, 2018

GROUP PICTURE WITH CHIEF FISHERMEN AND SOME FISHERMEN AT AHANTA WEST DISTRICT, DIXCOVE FISHERMEN SHED, ON THE 31ST OCTOBER, 2018

Some Photographs from the Previous Meetings – cont'd

GROUP PICTURE WITH CHIEF FISHERMEN AND SOME FISHERMEN AT STMA, ESSIKADO CHIEFS PALACE, ON THE 23 RD OCTOBER, 2018

GROUP PICTURE WITH CHIEF FISHERMEN AND SOME FISHERMEN AT NZEMA EAST DISTRICT, NZEMA EAST DISTRICT ASSEMBLY, ON THE 31 ST OCTOBER, 2018

Some Photographs from the Previous Meetings – cont'd

GROUP PICTURE WITH CHIEF FISHERMEN AND SOME FISHERMEN AT ELLEMBELLE DISTRICT, ESSIAMA CHIEFS PALACE, ON THE 30 TH OCTOBER, 2018

GROUP PICTURE WITH CHIEF FISHERMEN AND SOME FISHERMEN AT JOMORO DISTRICT, HALF ASSINI FISHERMEN SHED, ON THE 30 TH OCTOBER, 2018

Some Attendance Sheet from the Previous Meetings

ECO ATLANTIC Ghana Limited

TRANSPORTATION ALLOWANCE

District.....SHAMA.....23-10-2018.....

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
10	Nana Effirim II	Shama	Shama		0248449155		
11	Nana Kojo Konduah	"	Abuesi		0243681060		
12	Addo-Blankson Richardson	"	"		0274903439		
13	Seidu Sam	"	"		0249367494		
14	Fredrick Otteo	"	"		0249665218		
15	Kofi Reckson	"	Shama		0244409417		
16	Nana Esyin	"	"				
17	Nana Mohammed Otenuu	"	Abodze		0578096060		
18	Abudu Kojo Ngeeme	"	"		0243533893		

Some Attendance Sheet from the Previous Meetings – cont'd

ECO ATLANTIC Ghana Limited

TRANSPORTATION ALLOWANCE

District..... STMA 23-10-2018

No.	Name	District	Town	Distance Travelled	Phone Number	Amount Received GHS	Signature
1	NANA KWEKU OYE ADOM	STMA	ESSIKADO		02411529 05		
2	JOHN ASSEI-MENSAH	STMA	ESSIKADO		0243446122		
3	NANA KWESI ACKON	STMA	NGYERESIA		0553135573		
4	EKOW SUKO NYIMPA	STMA	NGYRESIA		0275431734		
5	KWESI NKETSIA	STMA	NGYRESIA		0248398974		
6	EMMANUEL ANSAH	STMA	SEKONDI		0274419532		
7	EVANS NII TACKIE ANSAH	STMA	SEKONDI		0243861912		
8	ERIC TETTEH ASHONG	STMA	SEKONDI		0547878553		
9							