

Client:
West African Power Pool (WAPP)

Ghana



GRIDCo
Backbone to Power Delivery



**400/330kV WAPP GHANA - CÔTE D'IVOIRE
INTERCONNECTION REINFORCEMENT PROJECT**
**Feasibility Study & Line Route and
Environmental and Social Studies**



**FINAL ENVIRONMENTAL AND SOCIAL
IMPACT ASSESSMENT (ESIA)**
Ghana

January 2026

**400/330 KV CÔTE D'IVOIRE – GHANA INTERCONNECTION
REINFORCEMENT PROJECT**

**ENVIRONMENTAL AND SOCIAL IMPACT
ASSESSMENT**

January, 2026

EXECUTIVE SUMMARY

INTRODUCTION

In January 2006, the West African Power Pool (WAPP) was established by the Economic Community of West African States (ECOWAS) with the goal of creating a regional electricity market in West Africa. The objective is to develop critical infrastructure to ensure that all ECOWAS member states have access to affordable energy supplies. The current project focuses on the reinforcement of the 330 kV Côte d'Ivoire–Ghana interconnection, a key component of the WAPP Coastal Transmission Backbone (CTB), which aims to connect Akoupé-Zeudji in Côte d'Ivoire to Ikeja West in Nigeria, passing through several countries, including Ghana. The Ghana Grid Company (GRIDCo), responsible for the transmission of electricity in Ghana, is the project developer. This Environmental and Social Impact Assessment covers the Ghana side of the Reinforcement Project 125 kilometres from Bibianiha near Dunkwa-on-Offin in Ghana to Omanpe Ghana-Côte d'Ivoire border with a Substation at Bibianiha

An Environmental and Social Impact Assessment (ESIA) is a legal requirement in Ghana for development projects like this high-tension transmission line. The ESIA aims to identify potential adverse environmental and social impacts of the project and propose measures to mitigate them. GRIDCo previously obtained an Environmental Permit in 2015 for this project, but the permit has since expired, necessitating an update of the Environmental Impact Statement (EIS). The updated ESIA will ensure compliance with Ghana's environmental regulations, as well as meet the requirements of the World Bank's Environmental and Social Standard (ESS1): Environmental and Social Assessment and Management and other relevant Environmental and Social Standards (ESSs) as the Bank intends to finance the project. Also attached to this ESIA is a Bio-Diversity Assessment Report of the Project Corridor (see Appendix X)

The project is vital to meet the increasing electricity demand in West Africa and to enhance the reliability of the regional power grid. By integrating the national electricity networks of ECOWAS member states, the project will facilitate optimal power exchanges and trading across the region, thereby contributing to the economic development and energy security of the West African sub-region. For Ghana, specifically, the project will help to stabilize and increase the grid's capacity, ensuring a more reliable electricity supply to meet both domestic and regional demands.

POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

Environmental Protection Agency (EPA) as the primary regulatory body in Ghana, responsible for enforcing environmental protection laws and ensuring compliance with Environmental Assessment (EA) protocols. The EPA Act 1994 (Act 490) and the Environmental Assessment Regulations 1999 (LI 1652) are central to the legal framework, mandating the need for Environmental and Social Impact Assessments (ESIAs) for projects like the high-tension transmission line.

The project will be implemented in line with national legislations, including the Constitution of the Republic of Ghana (1992), which protects private property rights and ensures fair compensation in cases of compulsory land acquisition for public welfare. It also meets the requirements of specific laws related to energy, land use and acquisition, labor, social and environmental protection, such as the Energy Commission Act 1997 (Act 541), the Lands Act 2020 (Act 1036), and the Labor Act 2003 (Act 651). It will also meet the requirements of the Environmental and Social Framework- Environmental and Social Standard 1 (ESS1) and other relevant Environmental and Social Standards.

CONSIDERATION OF ALTERNATIVES

The Environmental and Social Impact Assessment (ESIA) report evaluates the various alternatives considered during the planning phase of the high-tension transmission line project. The process by which the project team examined multiple options regarding equipment, route alignment, and overall project viability to ensure the most efficient and environmentally sustainable outcome.

Several alternatives were assessed, including the "No Development Scenario," alternative methods for transmitting power, different transmission line routes, alternative phase conductors, and various tower designs. The "No Development Scenario" was considered but ultimately dismissed due to the significant socio-economic benefits that the project will provide, such as improved energy supply, economic growth, and enhanced quality of life in Ghana and West Africa. Additionally, not proceeding with the project would likely lead to less efficient and more environmentally damaging alternatives, such as increased reliance on diesel generators.

For the mode of transmitting power, the project team evaluated both overhead and underground cabling. While underground cabling offers advantages in terms of reduced environmental impact and security, it was determined that overhead cabling is more cost-effective and easier to maintain, making it the preferred option for this project.

For the route selection, GRIDCo decided to align the new transmission line route with the right-of-way of an earlier project designed in 2014 rather than reroute the project elsewhere to minimize costs, delays, and environmental and social disruptions. Although this choice involves managing legacy issues, notably the non-payment of compensation for impacted farms and other assets during the preparatory phase of the parent project that was not implemented.

Aluminum Conductor Steel Reinforced (ACSR) cables were selected for the transmission line in favour of copper cables, due to their cost efficiency, durability, and suitability for long-distance power transmission. Finally, among various tower designs considered, the horizontal configuration was chosen for its cost-effectiveness, ease of maintenance, and better load distribution, despite requiring more land. This design also minimizes visual impact while ensuring safety and reliability for the transmission line. The other configuration assessed were Triangular and Cat's Head Tower Configurations.

DESCRIPTION OF THE PROJECT

The proposed transmission line project, spanning across Ghana and Côte d'Ivoire, focuses on constructing and operating a high-tension transmission line within Ghana. The transmission line will stretch approximately 125 km, (from Bibianiha near Dunkwa-on-Offin to Omanpe -Ghana Côte d'Ivoire border) crossing five districts within three regions of Ghana. These districts include Upper Denkyira East in the Central Region, Wassa Amenfi Central, Wassa Amenfi West, and Wassa Amenfi East in the Western Region, and Aowin Municipal in the Western North Region. The project also involves the development of the Dunkwa II Substation, strategically located near Dunkwa-on-Offin.

A 40-meter Right-of-Way (RoW) will be acquired for the project, requiring approximately 500 hectares of land. The acquisition will be managed by GRIDCo in collaboration with the Lands Commission, ensuring that affected properties are compensated. The construction phase will involve activities such as geotechnical investigations, tower spotting, assembling and the erection of 320 pylons across the designated regions. The project is expected to employ about 150 people, working in various segments of the transmission line at the same time.

BASELINE ENVIRONMENTAL CONDITIONS

The Upper Denkyira East Municipality, situated in Ghana's Central Region, spans 501.94 square kilometers, accounting for 5.19% of the region's land area. It is bordered by Adansi South, Assin North, Twifo Atti-Morkwa, Wassa Amenfi East, and Upper Denkyira West. The municipality features a varied landscape with a forest-dissected plateau, elevated around 250 meters above sea level, and a network of rivers and tributaries, including the major River Offin.

The climate is semi-equatorial with temperatures ranging from 20°C to 35°C and two rainy seasons. Vegetation consists mainly of semi-deciduous forests, though these have been impacted by cocoa farming and illegal mining. Forest ochrosols in the region are fertile, supporting crops like cocoa and oil palm. Environmental issues include deforestation from illegal activities and waste management challenges, with the landfill nearing capacity.

Water resources are a major concern, with households relying on river water, pipe-borne supplies, boreholes, and wells. Pipe-borne water is the primary source for 40.5% of households, but many also use unprotected wells, posing health risks. Climate change has exacerbated problems such as altered rainfall patterns, drought, and flooding.

Demographically, the municipality has a population of 101,273, with a growth rate of 3.3% annually. It is predominantly rural (55.6%) with a high age dependency ratio of 74.2%. Traditional land tenure is communal, managed by local chiefs. Addressing climate change, environmental degradation, and water management are key to the municipality's sustainable development.

The Wassa Amenfi Central District, established in 2012 with Manso Amenfi as its administrative capital, spans 1,845.9 square kilometers in Ghana's Western Region. Positioned between latitudes 5° 20' N and 6° 70' N and longitudes 2° 09' W and 2° 27' W, the district borders Bibiani Anhwiaso Bekwai Municipality, Upper Denkyira West District, Sefwi Wiawso Municipality, Aowin Municipality, Prestea Huni-Valley Municipality, Wassa Amenfi East Municipality, and Amenfi West Municipality. It has a population of 119,117, comprising 63,212 males and 55,905 females.

The district features undulating terrain with an average elevation of 153 meters and is intersected by significant rivers such as Tano and Ankobra, which support domestic and agricultural needs. The climate is characterized by high annual rainfall between 1,500 mm and 2,200 mm, supporting the district's extensive cocoa, palm, and rubber plantations. The area's rich vegetation includes moist semi-deciduous forests and four forest reserves, which are crucial for biodiversity and economic resources but face threats from illegal mining activities.

Geologically, the district is part of the Asankrangwa-Manso-Nkwanta Gold Belt, containing valuable mineral deposits. Soil types support diverse agriculture, including tree crops and food crops, though illegal mining has led to significant environmental damage. Water resources are variable, with many households relying on rivers and streams, impacting water quality and health.

The population is predominantly young, with 43% under 15 years old and a high dependency ratio of 85. The district's cultural fabric includes the Wassa ethnic group, with traditional practices influenced by Akan heritage. Major festivities include the Yam Festival, celebrating the harvest of water yam. Christianity is the dominant religion, with a minority following Islam and traditional beliefs. The land tenure system is communal, governed by traditional authorities.

The Aowin Municipal Assembly is situated in the mid-western part of Ghana's Western Region, encompassing a total land area of 2,607 square kilometers. Positioned between latitudes 5° 25' N and 6° 14' N and longitudes 2° 30' W and 3° 05' W, the municipality shares borders with Amenfi West Municipal, Juaboso and Sefwi Akontombra Districts, Jomoro Municipal, and the Republic of La Côte d'Ivoire. It has a population of 129,721, with a gender distribution of 68,236 males and 61,485 females.

The region features an undulating landscape, with elevations exceeding 305 meters and major rivers including the Tano and Bia, which are crucial for water supply. The climate is Wet-Semi Equatorial, with an annual average temperature of 26°C and bimodal rainfall ranging between 1,700 mm and 2,100 mm. Vegetation predominantly consists of tropical rainforest, with some semi-deciduous forest in the northeastern part. Soil types such as Acrisols and Ferralsols support agriculture, though illegal mining has led to environmental degradation.

The population is youthful, with significant proportions under 15 years, necessitating increased infrastructure development. The cultural landscape includes traditional practices and festivals, such as the Ellue Yam Festival, reflecting the area's rich heritage.

Land tenure is primarily governed by customary practices, with ongoing efforts to integrate formal land registration systems. The municipality's development plans emphasize addressing climate change impacts, managing natural resources sustainably, and improving living conditions for its residents.

The vegetation/land-use types along the proposed Transmission line route in all the districts is mainly, fallow-lands, cash crops, food crop farms such as Cocoa, Rubber, Cassava, plantain etc. and lands degraded by illegal mining (*Galamsey*) activities. Furthermore, the proposed transmission line traverses four major rivers namely Ankobra, Tano, Disue and Boin rivers and one stream in all the districts.

PUBLIC PARTICIPATION/STAKEHOLDER ENGAGEMENTS

Stakeholder engagement for the ESIA report involved consultations with key entities including traditional councils, municipal assemblies, and affected communities in the project area. The consultations, which started in December 2023, aimed to identify an optimal project route, minimize impacts on sensitive sites, and increase community awareness and acceptance of the project. Methodologies included bilingual communication and community meetings, where stakeholders raised concerns related to land acquisition, compensation, and environmental impacts. A grievance redress mechanism was established to address complaints transparently and ensure community feedback is integrated into project planning and execution. The process also includes measures for handling gender-based violence (GBV) and other sensitive issues.

The project activities will include constructing a substation, clearing vegetation to demarcate the project Right-of-Way and Centerline, tower spotting, excavations and establishing of tower foundations, assembling and installation of towers as well as stringing of the transmission lines and insulators in modified and natural landscapes and habitats with adverse impacts on vegetation, wildlife, and rivers that traverse the project Right-of-Way. Civil works will be associated with soil erosion, and waste generation as well as risks to the health and safety of workers and local communities through falls, cuts electrocution and other accidents.

In terms of social risks, land-take (500 hectares) leading to the physical and economic displacement of people will occur. The affected lands include small-scale mining areas, cumulatively covering about 29.9 acres of the demarcated project right-of-way. Other social risks are labor influx into the project areas, including overseas workers, posing community and health risks like the outbreak and/or spread of infectious/communicable diseases, malaria, cholera, HIV/AIDS, unwanted pregnancies, Sexual Exploitation and Abuse (SEA)/Sexual harassment (SH) in project communities. The increased presence of workers and clashes with illegal miners may trigger and/or exacerbate social conflicts that may require the intervention of armed security personnel. Site workers may be survivors or perpetrators of Gender based Violence (GBV) including Sexual Exploitation Abuse (SEA) and Sexual Harassment (SH). Other social risks associated with the construction phase of the project are use minors for activities on site, prevalence of

illegal and discriminatory labor practices, accidents involving site workers, equipment, and residents of the project catchment communities.

During the operational phase of the project potential vandalization of the towers and transmission lines by thieves and illegal miners as well as health and safety, risks notably, electrocution and falls may lead to long term injuries and death. Regular maintenance of the Right-of-Way, essential for the integrity of the transmission line, may adversely affect flora and fauna due to the implementation of necessary vegetation control measures such vegetation clearing and pruning. It may also involve the use of armed security personnel who may use disproportionate force to evict encroachers within the demarcated Right-of-Way and/or commit other human right abuses. Waste generation from routine maintenance, including vegetative matter and electronic waste, is expected to be limited but requires proper management to avoid environmental harm.

Public safety concerns include potential exposure to electromagnetic fields (EMF) and risks from tower collapse and cable disengagement due to vandalism, theft and/or extreme weather events, though research indicates minimal adverse health effects from EMF exposure. Fire hazards from electrical faults and bush fires are also potential risks during the operational phase of the project.

The environmental and social impacts/risks that were identified were duly evaluated to establish their level of significance in relation to the project based on the magnitude (scale, extent, and duration) of the potential impact and sensitivity of the receiving media.

IMPACTS/RISK MITIGATION & ENHANCEMENT MEASURES

Mitigation measures proffered for the construction phase include enforcement of Environmental and Social Clauses inserted into the Works Contract that will be binding on the Contractor and any Sub-Contractor that will be employed on the sub-project. It will institutionalise the use of Personnel Protective Equipment and signing of Code of Conduct by site workers as well as organizing occupational health and safety training and GBV sensitization sessions for site works and the project affected communities. GRIDCo and security personnel who will be used for Right of Way Protection Operations will sign Memorandum of Understanding to establish all the necessary ground rules guiding their assignment as well as Code of Conduct in addition to running background checks on selected security personnel prior to their deployment for field work.

To address land acquisition concerns, GRIDCo will prepare and implement Resettlement Action Plan (RAP) and ensure compensation for affected individuals, adhering to national legal and policy standards as well as the requirement of World Bank ESS5 and 10. There will be Livelihood Restoration Program for affected communities, where illegal mining activities (*galamsey*) have been identified during the preparation of the RAP. Construction phase mitigation measures will also include safeguarding cultural heritage, managing traffic impacts, and controlling waste and noise pollution, with specific protocols for handling materials and minimizing disruptions. Measures to manage air quality will involve limiting land clearance, regular

site watering, and maintaining equipment to reduce dust emissions. These measures aim to minimize negative effects and enhance project benefits across all phases of implementation.

To mitigate soil impact during the high-tension transmission project, GRIDCo will implement erosion control measures such as silt fences, terracing, and vegetation buffers to prevent soil degradation around tower foundations. Site management practices will include limiting land disturbance and using matting to reduce soil compaction, while disturbed areas will be restored with native vegetation for stabilization. Erosion will be minimized by restricting land clearance and avoiding construction on steep slopes, with temporary impacts expected to be managed through prompt re-vegetation. To prevent water pollution, construction will avoid blocking water bodies and herbicides will not be used, while measures for managing wastewater and spillage will be enforced. Occupational safety will be addressed through adherence to international standards, with specific measures to prevent hazards from tower collapses, falling objects, and snakebites, alongside efforts to minimize impacts on flora and fauna.

To manage vegetation within the right-of-way (RoW) of the high-tension transmission project, GRIDCo will use physical or mechanical clearing methods, avoiding chemicals like weedicides to prevent environmental harm. This approach minimizes the impact on surrounding vegetation and avoids potential water pollution and worker safety issues associated with chemical use. During construction, potential risks from illegal mining will be managed by situating towers away from mining sites, and public education on mining dangers will be promoted. Waste management practices will ensure proper disposal and recycling of construction debris, while occupational safety measures will include protective equipment and adherence to safety regulations. Public safety and socio-economic impacts will be addressed through careful project execution and local employment, boosting temporary job opportunities and local economic benefits.

The project's impact on local populations is expected to be minimal, with only about 25% of the construction workforce potentially coming from outside the community if necessary, and these workers will be accommodated in a dedicated work camp. Archaeological and cultural chance finds will be managed through a Chance Find Procedure in compliance with national regulations. Work camps will be strategically located away from water bodies and settlements to mitigate environmental and noise pollution, with strict waste management and sanitation measures. Public safety will be a priority, with anti-theft measures, secure installations, and regular maintenance to prevent accidents and ensure community well-being.

Measures to prevent the incidence of GBV/SEA/SH and ensure accountability include pasting posting in the project communities and organizing GBV/SEA/SH sensitization and training sessions for staff of site workers, security personnel, field workers of GRIDCo and residents of projected affected communities in areas such as GBV/SEA/SH. The use of trained focal persons at the community and health facility level to receive GBV/SEA/SH complaints and other grievances and referring GBV/SEA/SH cases to the Police Station/Domestic Violence Victims Support Unit (DOVVSU) Office/helpline as well as the Social Safeguard

Specialist on the project for the necessary investigations to commence. Case management shall be based on the survivor centred approach.

GRIDCo and security personnel who will be used for Right of Way Protection Operations will sign Memorandum of Understanding to establish all the necessary ground rules guiding their assignment as well as Code of Conduct in addition to running background checks on selected security personnel prior to their deployment for any Right-of-Way protection operations. A security risk assessment and management plan will be prepared prior to the commencement of works and updated throughout the project implementation.

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan (ESMP) outlines a comprehensive approach to managing and monitoring environmental, social, and occupational risk and impacts throughout the project lifecycle. GRIDCo's Corporate Environmental Policy ensures adherence to national and international standards, while a dedicated Environmental and Social Risk Management and Training Programme establishes roles and responsibilities for the Project Environmental and Social Management Team. This team, including specialists in environmental and social aspects, will oversee compliance, liaise with regulatory bodies, and implement monitoring activities.

GRIDCo's Project Implementation Unit (PIU) consisting of skilled professionals, including an Environmental Management Specialist and Social Development Specialist, will ensure effective management and adherence to environmental guidelines. Continuous training and audits will support project staff in maintaining high standards of environmental and social performance. The contract stipulates the contractor's obligations, including labor, equipment, materials, compliance with environmental and social management plans, and overall execution of the project.

The General Health and Safety Procedures for the project will be governed by GRIDCo's "Corporate Safety Rules," Safety Manual, and the Factories, Offices and Shops Act (1970), ensuring compliance with occupational safety and health standards. Key safety measures include proper manual lifting techniques, hearing protection, use of personal protective equipment, and fire prevention systems, with specific guidelines for dealing with hazardous materials and emergencies. Pollution prevention will be managed through strict protocols for waste and spill management, supported by ongoing environmental and social team training. Monitoring of health and safety parameters, including noise, air quality, and waste management, will be conducted according to established guidelines, with corrective actions implemented as necessary. Comprehensive training programs will be provided to staff on environmental and safety issues, complemented by regular community education to enhance safety awareness.

GRIDCo's monitoring and reporting program includes a comprehensive plan for data management, covering storage, handling, and analysis responsibilities, with clear reporting lines to ensure effective oversight of site operations and compensation activities. Monthly reports will be provided to GRIDCo

Management, WAPP, and other stakeholders, while incident/accident reports will be submitted promptly (within 48 hours) to the World Bank or other relevant stakeholders in the event of incidents/accidents. Bi-annual and annual reports will be prepared for the World Bank and EPA, respectively, detailing environmental management and compliance. An emergency response plan will be implemented to address potential incidents, including fire, floods, and chemical spills, with regular drills and training for personnel. The Project Implementation Unit will oversee the reporting process and ensure that all documentation and emergency preparedness measures are maintained effectively.

Additionally, a detailed budget of US\$ 425,000.00 has been estimated for environmental management planning and which includes monitoring, training, and unforeseen expenses, to ensure comprehensive management and response capabilities.

EMERGENCY RESPONSE PROCEDURES

The emergency response procedures for the project address potential incidents including fires, medical emergencies, and oil spills. For small fires, immediate alarm activation, evacuation, and safe extinguishing measures are outlined, while large fires require professional intervention and organized evacuation. Medical or accident-related emergencies involve prompt first aid, transport to medical facilities, and thorough investigation and documentation. Oil and solvent spills necessitate quick containment and clean-up using appropriate materials, with immediate reporting to the Environment, Social, Health, and Safety Officer.

DECOMMISSIONING PLAN

The Decommissioning Plan (DP) outlines GRIDCo's strategy for managing the end-of-life phase of the proposed transmission line, anticipated to operate for over fifty years. The plan ensures decommissioning is conducted systematically, aiming for minimal environmental impact and adherence to best practices. Key objectives include executing rehabilitation in an orderly fashion, achieving agreed post-project land-use outcomes, and avoiding ongoing liabilities. The process involves the removal of all project-related materials within a year of decommissioning, followed by land and water restoration to near-original conditions, and compliance with national regulations and local standards. GRIDCo will engage contractors to manage waste using the principles of reuse, reduction, and recycling, and will notify the EPA and other stakeholders, providing detailed reports and financial assurances as required.

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Appendix XVII: Environmental and Social Management Plan (ESMP)

LIST OF ABBREVIATIONS

ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GRIDCo	Ghana Grid Company
GRA	Grievance Redress mechanism
RoW	Right-of-way
WB	World Bank
ESF	Environmental and Social Framework
ESS	Environmental and Social Standard
EPA	Environmental protection agency
SEP	Stakeholder Engagement Plan
WAAP	West African Power pool
PIU	Project implementation unit
RAP	Resettlement Action Plan
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
GBV	Gender Based Violence
DOVVSU	Domestic Violence and Victims Support Unit (of the Ghana Police Service)
LI	Legislative Instrument

1 INTRODUCTION

1.1 Project Background

In January 2006, a new entity called the West African Power Pool (WAPP) was founded by articles of agreement among members of the Economic Community of West African States (ECOWAS). The WAPP aims to create a regional electricity market in West Africa by prudently developing and implementing critical infrastructure projects that would enable all ECOWAS members to have access to affordable energy supplies.

The Revised ECOWAS Master-plan developed in 2004, identifies the key priority projects that need to be implemented to ensure stable integration of the national electricity networks in the ECOWAS Region and facilitate optimal power exchanges and trading between the Member States. Prominent among the infrastructure sub- programmes to be developed is the WAPP Coastal Transmission Backbone (CTB), which seeks to establish a robust 330 kV transmission link from Akoupé-Zeudji in Côte d'Ivoire to Ikeja West in Nigeria passing through Dunkwa-On-Offin, Aboadze, and Volta in Ghana, Mome Hagou in Togo, and Sakete in Benin. The Benin – Nigeria interconnection project was commissioned in February 2007 and the Ghana – Togo – Benin interconnection project has been implemented. The Ghana Côte D' Ivoire link remains outstanding.

The WAPP Secretariat on behalf of CI-ENERGIES, formerly known as Société de Gestion du Patrimoine du Secteur de l'Electricité (SOGEPE) and Société d'Opération Ivoirienne d'Electricité (SOPIE) of Côte d'Ivoire, and the Ghana Grid Company (GRIDCo) has procured the services of STUDIO PIETRANGELI (SP) an International Consulting firm to update a number of studies and reports on the double circuit 330 kV Côte d'Ivoire–Ghana interconnection reinforcement project, which was originally done by ANTEA GROUP in 2014. For the Ghana section, an Environmental Permit (Permit number CE0019720102) was issued by the EPA in March 2015 under Ghana law. Additionally, an Environmental Management Plan (EMP) was prepared in March 2017. However, with the abandonment of the planned project works, and recent efforts to revive the project under World Bank funding, an update has become necessary. The update involves:

- Update of line route study and production of maps, plan and profile drawings
- Update of Environmental and Social Impact Assessment (ESIA), Environmental and Social Management Plan; and
- Update of the Resettlement Action Plan for the project.

This Environmental and Social Impact Assessment covers the Ghana section of the Ghana -Côte d' Ivoire Reinforcement Project. The Ghana section involves the development of a 125-kilometrehigh tension transmission line from Bibianiha near Dunkwa-On-Offin in Ghana to Omanpe on the Ghana-Côte d'Ivoire

border, with a substation at Bibianiha (see Figure 1 for the route map of the Ghana Section). The Côte d'Ivoire section is being implemented by CI-ENERGIES.

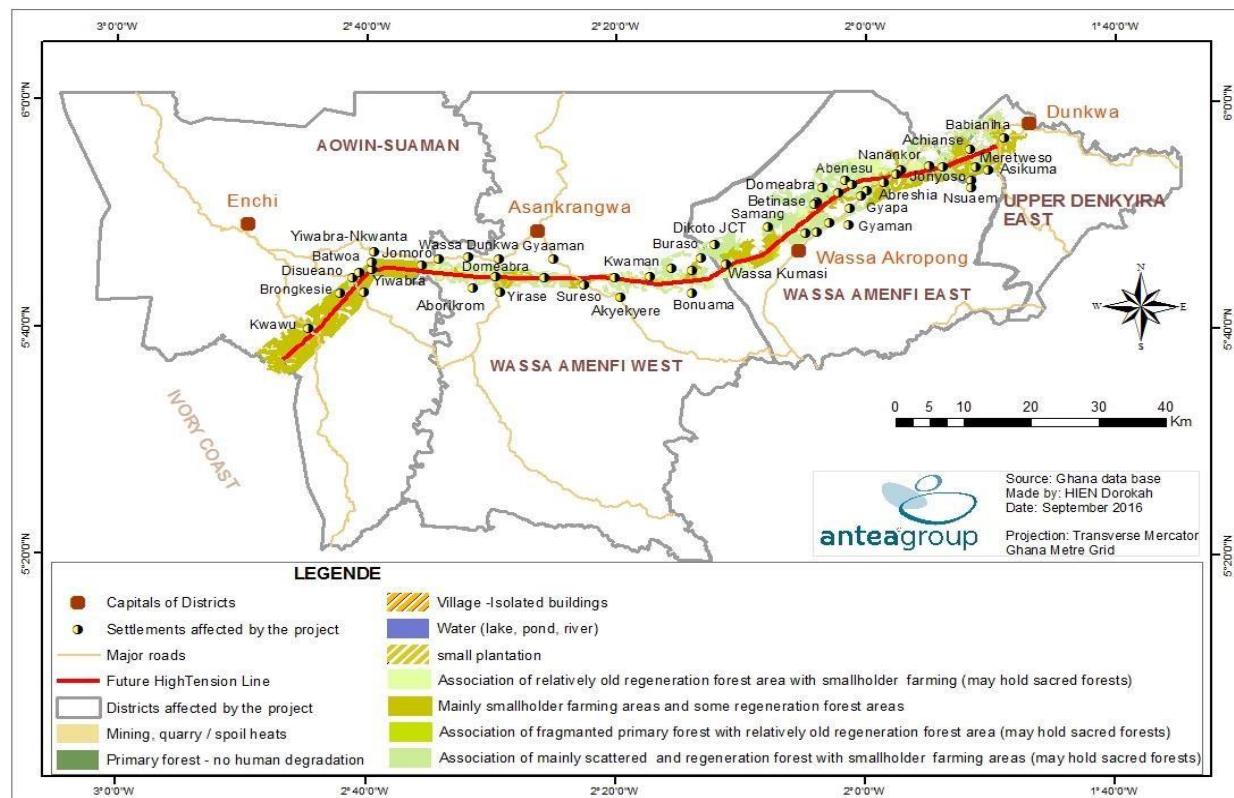


Figure 1; Project map showing Ghana side of the transmission line

The transmission line will operate at 330kV and 400kV voltages, providing high-capacity transmission capabilities and reducing power losses during transmission over long distances. The project spans critical locations on both the Ivorian and Ghanaian sides, providing clear linkage between existing power networks in both countries.

By creating a reliable connection between Côte d'Ivoire's energy reserves and Ghana's, the project will provide both nations with more stable access to electricity, especially in times of peak demand. The interconnection project enables efficient trading of power between Côte d'Ivoire, Ghana, and eventually other neighboring countries, furthering regional integration. The project will extend power to rural areas in both countries, fostering economic development and improving the quality of life for remote communities. Côte d'Ivoire is a net exporter of power in the region, and Ghana can leverage this connection to meet local demand during periods of electricity shortage.

The 330/400kV Ghana-Côte d'Ivoire Interconnection Transmission Line Project is crucial for enhancing the energy supply and stability of both nations, fostering cross-border collaboration, and contributing to the larger vision of an interconnected West African energy market.

1.2 Project Developer

The proponent, Ghana Grid Company GRIDCo was incorporated by the Energy Commission Act, 1997 (Act 541) and the Volta River Development (Amendment) Act, 2005 (Act 692), for the exclusive operation of the National Interconnected Transmission System as an independent Utility to take over the transmission functions of the Volta River Authority (VRA) within the framework of the Ghana Power Sector reforms.

GRIDCo was incorporated on December 15, 2006, as a private limited liability company wholly owned by the Government of Ghana under the Companies Code, 1963 (Act 179) and granted a certificate to commence business on December 18, 2006. The company became operational on August 1, 2008. GRIDCo is mandated to:

- Carry out the business of economic dispatching and transmission of electricity from facilities of wholesale suppliers to bulk customers or distribution companies and utilities in Ghana and West Africa without discrimination.
- Acquire by purchase or otherwise construct, establish, manage, maintain, and otherwise deal with all transmission facilities, works, buildings, and other systems necessary to transmit electric energy.
- Undertake metering and billing of all power transfers in the National Interconnected System.
- Carry out any general commercial activities related to the safe and reliable operation of the transmission system and economic dispatch of electric energy.

The total kilometers of the transmission line as of the end of 2020 was 6600km. The breakdown for the various voltage levels within the network is tabulated in Table 1.

Table 1: The breakdown for the various voltage levels

Voltage Level (kV)	Length of line in kilometers (2018)	Length of line in kilometers (2019)	Change in length (%)
330	565.00	1096.77	94.12
225	92.20	92.20	0.00
161	4,990.67	5,106.71	2.33
69	212.00	212.00	0.00
34.5	92.30	92.30	0.00

The Government of Ghana is the sole shareholder of GRIDCo under the Ministry of Energy. Details on GRIDCo can be accessed on its website www.gridcogh.com.

1.3 Justification of Project

The project's goal is to increase the country's current grid supply to meet West African consumers' urgent demand for power. The project also aims to create a regional electricity market in West Africa by prudently

developing and implementing important infrastructure that will enable all ECOWAS members to have access to affordable energy supplies.

1.4 Purpose of Environmental and Social Impact Assessment

It is a legal requirement in Ghana under the Environmental Protection Agency Act, 1994 (Act 490), and the Environmental Assessment Regulations 1999 (LI 1652) that development projects of this nature should be subjected to Environmental Impact Assessment (EIA). An environmental permit in 2015 was obtained for the construction of this project upon approval of the Environmental Impact Statement (EIS). (Copy of the expired Permit attached as Appendix I. The EPA upon submission of application for renewal of the permit requested GRIDCo to update the EIS for their approval for the construction of the project. (Copy of EPA response to renewal of permit application attached as Appendix II.

In addition, it is the policy of GRIDCo to ensure the welfare of the people likely to be adversely affected by its operations as well as to assist in the sustainable development of the environment within which it operates. The ESIA will enable GRIDCo to:

- a. Obtain the necessary environmental permit for commencement and implementation of the project
- b. Comply with the requirements of WB ESS1 and other relevant ESSs)
- c. Implement the project with minimum adverse effects on the physical, biological, socio-cultural and socio-economic environments.

The study is concerned with the ecological and social aspects of the project within the project area, particularly the possible adverse consequences such as pollution, disturbance of habitat, truncation of land uses, dislocation of people and other forms of social distress, loss of buildings and fields, and dangers to people and animals. The study has addressed indirect as well as direct impacts but emphasizes on mitigation measures.

2 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

The relevant policies, legal and institutional frameworks that must be considered for the successful implementation of the project have been gathered and reviewed as part of this draft Environmental Impact Statement. All relevant national and international policies, laws, regulations, guidelines, and standards that may apply to this proposed high voltage transmission line and its auxiliary structures have been applied as required. Consultations have also been carried out with some of the relevant agencies to ensure compliance.

The broad mandate for environmental protection falls under the EPA, as the lead regulator in Ghana. The adoption of the National Environmental Action Plan led to the enactment of the EPA Act, 490 (1994) which for the first time gave legal support to Environmental Assessment implementation in Ghana, after almost fifteen years of experimentation. The passing of the Ghana ESIA Procedures into the EA Regulations (LI 1652, 1999) further consolidated EA application in Ghana.

All relevant legal, institutional framework and their implications for the successful take-off and implementation of the proposed project were analyzed during the ESIA exercise.

2.1 National Legislations

2.1.1 The Constitution of the Republic of Ghana, 1992

The 1992 Constitution provides the highest level of protection for private property rights. Private property may only be seized in situations where the state has a legitimate need to impede on those rights. No property "shall be compulsorily taken possession of or purchased by the State" unless it is, among other things, "to promote the public welfare," according to Article 20.

The Constitution further stipulates that the affected owners cannot suffer financial hardship when private lands are given up for the benefit of the public. According to this, "The State may only acquire property through compulsory acquisition if a statute is in place that guarantees (a) the rapid payment of just compensation; and (b) the right of any person with an interest in or right over the property to contact the High Court. Additionally, "the State shall resettle the displaced inhabitants on suitable alternative land with due regard for their economic well-being and social and cultural values where a compulsory acquisition or possession of land affected by clause (1) of this article involves the displacement of any inhabitants."

2.1.2 The Environmental Protection Agency Act, 1994 (Act 490)

in place of the previous Environmental Protection Council Decree (NRCD 239), the Government of Ghana enacted the Environmental Protection Agency (EPA) Act 1994 (Act 490). The environmental policy objectives could not be achieved without the Agency's ability to enforce compliance with the Act. Act 490 created the EPA's powers, duties, organizational structure, and financial support. It also authorized the

Agency to guarantee that all investments and endeavors comply with all established Environmental Assessment (EA) protocols in the planning and implementation of development projects, including compliance with regard to those that are already underway. The Ghana EPA Act 490 is essential for ensuring that high-tension transmission projects are planned and executed in an environmentally responsible manner, with due consideration for the potential impacts on both the environment and local communities.

2.1.3 Environmental Assessment Regulations, 1999 (LI 1652)

Enacted in February 1999 in accordance with Section 28 of Act 490, the Environmental Assessment Regulations 1999 (LI 1652) lays down the specifications for environmental permits, environmental impact assessments (ESIAs), environmental management plans (EMPs), environmental certificates, and the preparation of preliminary environmental reports (PERs). To control the nature, quantities, circumstances, or concentrations of substances that may be released into the environment, the Act granted the EPA the authority to request an environmental impact assessment and/or an environmental management plan from various categories of undertakings, enterprises, construction, or development.

In order to ensure effective prevention, minimization, and mitigation of the potential impact of industrial developments existing before and after the coming into force of LI 1652, the Environmental and Social Impact Assessment (ESIA) procedure serves as both a compliance promotion tool and a regulatory tool to be enforced under Section 24 of LI 1652. One of the projects for which an ESIA is required is the construction and operation of a power transmission line.

2.1.4 Fees and Charges (Miscellaneous Provisions) Act, 2022 (Act 1080)

Following evaluation and approval of the relevant environmental assessment report, this Act lays out the parameters for fees that the EPA may levy before issuing environmental licenses and certificates.

2.1.5 Volta River Development (Amendment) Act 2005, (Act 692)

The Amendment to Volta River Development Act, 1961 (Act 46) was passed in 2005 as the result of Ghana's Power Sector Reforms. The power transmission function of VRA was given to Ghana Grid Company Limited (GRIDCo), a transmission utility company, by the Volta River Development Act, 2005 (Act 692). All of the Ghana's electricity transmission and evacuation infrastructure, which VRA had previously overseen together with power generating, is now under the control of GRIDCo.

2.1.6 Energy Commission Act, 1997 (Act 541)

Act 541 created the Energy Commission and outlined its responsibilities for the development, management, regulation, and use of Ghana's energy resources; licenses for the transmission, wholesale supply, distribution, and sale of electricity and natural gas; and the marketing, sale, refining, storage, and bulk distribution of petroleum products, among other related matters.

According to the terms of the Energy Commission's "PUBLIC NOTICE - EC N. 003," GRIDCo must register the project with the Commission and secure a permit prior to starting construction on the project. The EPA must authorize an environmental permit before this permit may be issued. In order to formally establish the framework for licensing electricity production, supply, and distribution as well as sale services in Ghana's power sector as specified by the Energy Commission Act, 1997 (Act 541), the Energy Commission of Ghana developed and issued a "Licensing Manual for Service Providers in the Electricity Supply Industry" in 1996.

2.1.7 Factories, Offices and Shops Act, 1970 (Act 328)

Act 328 upholds the obligations of the employer and advances the health, welfare, and safety of those who work in the nation. Employers must abide by the Act and make sure that all workers (including those of the contractor, the supervising consultant and the utility i.e. GRIDCo have a safe and healthy work environment to protect their own health and well-being.

2.1.8 Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917)

Act 917 conforms with the World Bank Environmental and Social Standard 3 which recognizes that economic activity and urbanization often generate pollution to air, water, land, and consume finite resources that may threaten people, ecosystem services, and the environment at the local, regional, and global levels. The current and projected atmospheric concentration of greenhouse gases (GHG) threatens the welfare of current and future generations. At the same time, more efficient and effective resources use, pollution prevention, and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable. This Act sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life cycle consistent with Good International Industry Practice (GIIP). The proposed project would therefore be executed in compliance with this law.

2.1.9 Public Health Act, 2012 (Act 851)

Act 851, passed in 2012, is aligned with the Environmental and Social Standard on Community Health and Safety (ESS4) of the World Bank, which requires that project developers:

- Anticipate or avoid adverse impacts on the health and safety of project-affected communities during project life-cycle from routine and non-routine circumstances;
- Promote quality, safety, and climate change considerations in infrastructure design and construction, including dams;
- Avoid or minimize community exposure to project-related traffic and road safety risks, diseases, and hazardous materials, and have in place effective measures to address emergency events; and
- Ensure that safeguarding of personnel and property is carried out in a manner that avoids or minimizes risks to the project-affected communities.

The Act, thus, deals with the risks to and effects on the health, safety, and security of the communities affected by the power transmission project, as well as the GRIDCO's obligation to prevent or minimize such risks and impacts, paying special attention to those who are vulnerable such as physically challenged, old women and children.

2.1.10 Labour Act, 2003 (Act 651)

Employers are required by Part XV, Sections 118(1) and (2a-h) of the Act to guarantee that each employee works in a satisfactory, safe, and healthy environment. They are also required to provide the information, instructions, training, and supervision that other employees need in order to ensure the health and safety of those employees who are performing a specific job at work such as those stringing of the power lines.

2.1.11 Workmen's Compensation Law, 1987 (PNDCL 187)

The 1986 Act establishes guidelines for the payment of compensation to employees for personal injuries sustained while on the job. This includes regulating the employer's liability in these situations, the payment of medical expenses and provision of medical aid, certain occupational diseases, degrees of partial incapacity specified in a schedule, the determination of claims, remedies against the employer and third parties, protection of compensation against attachment or assignment, and the distribution of compensation in the event of the worker's death. When carrying out the project, GRIDCo will adhere completely to this Act. To ensure adherence to the relevant Act, GRIDCo will leverage its established internal policies and procedures specifically designed to comply with regulatory requirements. We will engage with GRIDCo's E&S team to reference their exact internal policies, such as their Environmental and Social Management System (ESMS), which aligns with national environmental regulations, including Act 490 (1994) and LI 1652 (1999). Additionally, GRIDCo's compliance framework includes regular internal audits, staff training programs, and continuous monitoring protocols, all of which are aimed at ensuring full compliance with the Act during the high-tension transmission project. These references will be documented to provide clear evidence of GRIDCo's commitment to adhering to legal and environmental standards.

2.1.12 Persons with Disability Act, 2006 (Act 715)

The Disability Act 715 was passed in 2006. The Act covers thematic areas such as rights, accessibility, employment, education, transportation, and health care for Persons with Disabilities (PWDs); the establishment and functions of a National Council on Persons with Disability, and some miscellaneous provisions. The passage of the Act was considered a noteworthy milestone in Ghana's human rights discourse as it gave the hope that it will improve the life of PWDs to enable them to be part of mainstream society. The proposed project will be executed in full compliance with the Act. Based on this we have taken the following steps in the stakeholder engagement.

Stakeholder Engagements, Identification and compensation: We have designed our stakeholder engagement process to be fully inclusive, ensuring that PWDs are effectively involved. This includes:

- **Accessible Meeting Venues:** All stakeholder meetings will be held in locations that are accessible to PWDs, with necessary accommodations such as ramps, sign language interpreters, and other assistive devices.
- **Tailored Communication:** Information will be provided in accessible formats, including braille, large print, and audio versions, to ensure that all PWDs can participate fully in the engagement process
- **Identifying Affected PWDs:** We will conduct thorough surveys and consultations to identify PWDs whose livelihoods may be impacted by the project. Special attention will be given to ensure that no one is overlooked, particularly those in remote or hard-to-reach areas.

Compensation and Support: Affected PWDs will be provided with fair compensation for any loss of livelihood, along with additional support tailored to their specific needs. This may include vocational training, financial assistance, and other forms of livelihood restoration to ensure they are not disadvantaged by the project.

2.1.13 Children's Act, 1998 (Act 560)

The Act aims to reform and consolidate the law relating to children. The act provides for the rights of the child, maintenance and adoption, regulates child labor and apprenticeship, and provides for ancillary matters concerning children generally and related matters. The act is divided into four parts as follows: Part I covers the rights of the child and parental duty, including the right to name and nationality, the right to grow up with parents, and the right to education and well-being. Part II covers quasi-judicial and judicial child adjudication, including child panels and family tribunals. Part III covers parentage, custody, access, and maintenance, including the duty to maintain a child, custody, and access. Part IV covers fosterage and adoption, including foster-care placement and adoption application. Consequently, the proposed project will be carried out in accordance with the Act. This Act is relevant to high-tension transmission line projects as it provides a legal framework to protect children's health, safety, and welfare, ensuring that their rights are not compromised by the project.

2.1.14 Local Governance Act, 2016 (Act 936)

The Act establishes a National Development Planning System, defines and regulates District Assembly planning procedures, establishes a Local Government Service, creates and oversees the District Assemblies Common Fund, monitors and oversees internal audit activities within District Assemblies, and addresses related matters. It also provides for local governance by the Constitution. The Local Government Act 2016 (Act 936) is crucial for ensuring that the high-tension transmission project aligns with local governance structures and development plans. The project affects a total of four Metropolitan, Municipal, and District Assemblies (MMDAs), each of which has been actively involved in the initial stages of planning and consultation. Initial engagements with these MMDAs have led to the identification of key local concerns, such as land use conflicts and the need for community-level impact assessments. The assemblies have provided valuable input on routing alternatives to minimize disruption and have expressed support for the project, contingent on continued collaboration. These engagements have laid the groundwork for effective

coordination with local authorities, ensuring that the project proceeds smoothly and benefits from local insights. The proposed project shall be carried out in accordance with all applicable provisions.

2.1.15 National Museums Decree, 1969 (NLCD 387)

The preservation of any archaeological finds is covered by NLCD 387. This statute sets forth the guidelines for the National Museums and Monuments Board's functions. The steps that must be taken in order to find any such artifacts are described in NLCD 387. The National Museum Decree, 1969 (NLCD 387), is relevant to the high-tension transmission project as it mandates the preservation of any cultural and historical artifacts that may be uncovered. Given the linear nature of this project, chance finds—such as ancient artifacts or archaeological remains—are possible during construction, making the provisions of this Decree vital for ensuring these finds are reported, preserved, and protected according to national heritage law.

2.1.16 Volta River Authority (Transmission Line Protection) Regulations, 1967 (LI 542)

The GRIDCO Transmission Lines are secured and public safety is guaranteed by the VRA (Transmission Line Protection) Regulations, (1967) LI 542. The Regulations define the term "transmission line right of way" and restrict or forbid a number of activities within the RoW, such as building construction, farming, mining, and agriculture, which are only permitted with prior approval from GRIDCo.

2.1.17 Volta River Authority (Transmission Line Protection) (Amendment) Regulation, 2004 (LI 1737)

VRA (Transmission Line Protection) (Amendment) Regulation, 2004 (LI 1737) which provides for the right of way distances for 69 kV, 161 kV, 225kV, 330 kV transmission lines. The RoW for 225 kV and 330 kV transmission towers is 40m, whilst that of 69kV and 161 kV is 30 m. This regulation prohibits some activities in the RoW including mining, construction of buildings, and cultivation of some types of crops.

2.1.18 Electricity Transmission (Technical, Operational and Standards of Performance) Rules, 2008 (L.I. 1934)

LI 1934 outlines the standards, guidelines, processes, and regulations that control the creation, management, upkeep, and usage of the high voltage national interconnected transmission system. The design update studies undertaken by SP have fully incorporated the requirements of LI 1934 to ensure compliance with national standards for the high-voltage transmission system. This includes adhering to the specified guidelines and processes for the safe creation, management, and upkeep of the transmission infrastructure. Additionally, the studies are aligned with LI 1934 regulations to optimize system reliability, efficiency, and safety within the national interconnected transmission network. It also defines the national interconnected transmission system. The guidelines are designed to guarantee that the transmission system offers an equitable, transparent, non-discriminatory, open access, safe, dependable, secure, and economically viable means of delivering and transmitting power.

2.1.19 Fire Precaution (Premises) Regulations, 2003 (LI 1724)

In accordance with LI 1724, among other regulations, sufficient steps must be made to eliminate potential fire outbreak causes, and every project or facility must get a fire certificate. GRIDC has confirmed that securing fire certificates for their transmission lines is not required, which has been noted to clarify the project's fire safety compliance considerations.

2.1.20 The Lands Act, 2020 (Act 1036)

Ghana has a diverse land tenure system, which includes customary, leasehold, and freehold systems. The Lands Act addresses issues related to these tenure systems. The Act typically outlines the administrative structures and procedures for land management, including the roles and responsibilities of various agencies involved in land administration.

Registration of land is a crucial aspect covered in this legislation. The Act details the process of land registration, the rights and obligations of landowners, and the importance of having a registered title. Addressing land disputes is a significant part of the Act and it establishes mechanisms for resolving conflicts related to land ownership, boundaries, and other land-related issues. The Act includes provisions related to land use planning and zoning regulations to ensure orderly development and proper utilization of land resources. The Act further incorporates provisions to address environmental concerns and sustainable land use practices, promoting responsible land management. It also specifies the conditions under which the government can acquire or control land for public purposes and the compensation mechanisms for affected landowners. Given the importance of customary land tenure in Ghana, the Lands Act has provisions to protect the rights of customary landowners.

2.1.21 Lands Commission Act, 2008 (Act 767)

Act 767 unifies public service land institutions' activities under the Commission to ensure efficient and successful land management and to address associated issues. As a matter of fact, the 1992 Constitution mandates that no stool land may be developed or disposed of unless the Lands Commission of the region in which the land is located certifies that the development or disposition is compliant with the development plan created or authorized by the local planning authority. The Lands Commission Act, 2008 (Act 767) is relevant to the project as it governs the management, allocation, and registration of land titles. For this high-tension transmission line project, compliance with Act 767 ensures that all land acquisitions and usage are legally approved and documented, preventing potential disputes and facilitating smooth project implementation. The divisions of the Lands Commission are as follows:

- Survey & Mapping Division
- Land Registration Division
- Land Valuation Division
- Land Administration

2.1.22 Land Use and Spatial Planning Act, 2016 (Act 925)

This Act, which was passed in 2016, aims to regulate national, regional, district, and local spatial planning as well as the general aspects of socio-economic development and related matters. It also provides for the sustainable development of land and human settlements through a decentralized planning system and ensures that land is used wisely to improve quality of life, promote health, and ensure safety in human settlements. The proposed project shall rigorously adhere to all applicable provisions of this Act.

2.1.23 Wild Animals Preservation Act, 1961 (Act 43)

Act 43 prohibits the hunting and export of listed species, thereby protecting a number of animal species, with the support of its subsidiary legislations LI 710 and LI 685. The LI 710 allows for the establishment of Wildlife Reserves and the preservation of the local flora and fauna. Schedules of animal species with differing levels of legal protection are also provided under LI 685. Furthermore, they impose limitations on the issuance of Game Licenses and Export Permits for Games and Trophies. The Ghana Wildlife Preservation Act 43 is relevant to a high-tension transmission line project as it provides legal protection for wildlife and their habitats. The Act requires that any development project, including high-tension transmission lines, avoid disrupting or endangering wildlife, particularly in protected areas such as national parks, wildlife reserves, or other ecologically sensitive regions. The project must take measures to minimize habitat destruction, avoid disturbing migration patterns, and protect endangered species, ensuring that the construction and operation of the transmission lines do not negatively impact Ghana's biodiversity and natural ecosystems.

2.1.24 Forestry Commission Act, 1999 (Act 571)

Act 571 reinforces the Forestry Commission's constitutional status and designates it as the only entity responsible for carrying out government policies in the forestry sector. Act 571 of 1999 created the new Forestry Commission, and since then, the Commission has concentrated on enhancing employee accountability, monitoring, and performance. The main relevance of the Ghana Forestry Commission Act 571 to a high-tension transmission line project is its role in ensuring the sustainable management and protection of forest resources. If the transmission line route passes through or near forest reserves, the Act requires that the project obtain necessary approvals from the Forestry Commission and implement measures to minimize deforestation and environmental degradation. This includes reforestation efforts, maintaining ecological balance, and protecting the integrity of forest ecosystems affected by the project.

2.2 Relevant Policies

2.2.1 Gender Policy 2015

The National Gender Policy of Ghana was developed to promote gender equality and women's empowerment in the country. The policy aims to improve the social, legal, civic, political, economic, and socio-cultural conditions of the people of Ghana, particularly women, girls, children, the vulnerable, and

people with disabilities. The policy seeks to re-emphasize the government's commitment to promoting women's human rights and empowerment, as well as to continue working towards the greater development of both men and women. The policy is guided by key principles such as gender mainstreaming, gender equality, equity, and women's empowerment. The policy recognizes the need for effective policies that promote gender equality and equity at all levels and sectors of society. It further provides a comprehensive framework that addresses issues such as women's access to justice, leadership, and accountable governance, gender roles and relations, and economic opportunities for women. This policy ensures that gender considerations are integrated into all phases of a high-tension transmission line project, promoting equality, inclusiveness, and the protection of women's rights and interests.

2.2.2 National Environmental Policy, 1995

In 1995, the National Environmental Policy was put into effect. This policy was developed with a broad vision that was guided by respect for all pertinent environmental and sustainable development principles and issues. With an overarching goal of managing the environment to maintain society as a whole, the Policy strives for sustainable development both now and in the future. The goal of the strategy is to bring Ghanaians together in the pursuit of a common goal: a society in which every citizen has access to enough nutritious food, clean water and air, appropriate housing, and other needs. This will additionally facilitate their ability to lead a satisfying life in spiritual, cultural, and physical balance with their environment through integrated and coordinated environmental management, guaranteeing:

- citizens' quality of life and their living and working environments equal
- access to land and other natural resources
- more efficient use of social, cultural, and natural resources
- public participation and environmental governance

The EPA is the official government organization in charge of integrating, coordinating, and carrying out the policy by making sure that environmental rights of individuals are upheld, environmental sustainability issues are suitably addressed, and government policy priorities and objectives are carried out. As a result, the proposed project will be carried out in accordance with the National Environmental Policy.

2.2.3 National Climate Change Policy 2013

The vision and goals for efficient adaptation, social development, and mitigation are outlined in the National Climate Change Policy (NCCP). The stated objective is to "achieve equitable low-carbon economic growth and sustainable development for Ghana while ensuring a climate-resilient and climate-compatible economy." Although it concedes that economic modernization would result in higher emissions, it contends that the new development route will lower emissions relative to the business as usual (BAU) baseline by reducing energy waste and enhancing public transportation and infrastructure. Low carbon growth and development routes that are resilient to climate change are priorities for the NCCP. It suggests tackling climate change by fusing ancient knowledge with new and developing information. The Climate Change

Policy outlines key strategies to address the impacts of climate change across various sectors, including infrastructure development. Several sections of the policy are directly linked to infrastructure projects, such as the construction of high-tension transmission lines as follows:

1. Building Climate-Resilient Infrastructure: The policy emphasizes the need for infrastructure that can withstand the adverse effects of climate change, such as extreme weather events, rising temperatures, and sea-level rise. For high-tension transmission lines, this means designing and constructing the infrastructure to be resilient to such impacts, ensuring long-term functionality and safety. This might involve using materials and technologies that are more durable under changing climate conditions and considering climate risks in the siting and routing of the transmission lines.

2. Increasing Resilience of Vulnerable Communities to Climate-Related Risks: The policy focuses on protecting communities that are particularly vulnerable to climate change. High-tension transmission line projects must consider the potential impacts on these communities, including how the infrastructure might exacerbate vulnerabilities or disrupt local adaptation strategies. Measures should be taken to ensure that the project does not increase the risk of flooding, heatwaves, or other climate-related hazards for nearby communities, and instead, enhances their resilience.

3. Increasing Carbon Sinks: The policy supports actions that enhance carbon sequestration through the preservation and expansion of forests, wetlands, and other natural carbon sinks. When constructing high-tension transmission lines, the project should minimize deforestation and land degradation, and where possible, include reforestation or afforestation efforts to compensate for any loss of vegetation. This aligns with the goal of maintaining or increasing carbon sinks as part of Ghana's climate change mitigation strategy.

4. Improving Management and Resilience of Terrestrial, Aquatic, and Marine Ecosystems: The policy emphasizes the protection and sustainable management of ecosystems, which are vital for biodiversity and climate resilience. This High-tension transmission line project should be planned and executed in a way that avoids or minimizes damage to terrestrial, aquatic, and marine ecosystems. This includes careful consideration of the route to avoid sensitive habitats, implementing measures to restore any affected ecosystems, and ensuring that the project does not contribute to ecosystem degradation.

The Climate Change Policy guides the integration of climate resilience into infrastructure projects like high-tension transmission lines, ensuring that they are designed to be sustainable, protect vulnerable communities, enhance carbon sinks, and preserve ecosystems.

2.2.4 GRIDCo Corporate Environmental Policy

The GRIDCo Corporate Environmental Policy Statement commits the organization to upholding national and international environmental protection regulations while also ensuring continuous improvement of environmental performance to minimize the environmental impacts of all its operations.

2.3 World Bank's Environmental and Social Standards (ESS1-10)

The relevant Environmental and Social Standards of the World Bank will be strictly by the principles of sustainable development and environmental integrity in the implementation of the proposed project. In 2018, the World Bank adopted a new set of environmental and social policies called the Environmental and Social Framework (ESF). As of October 1, 2018, the ESF applies to all new World Bank investment project financing. With existing projects continuing to apply the Safeguard Policies, the two systems will run in parallel for an estimated seven years.

The Project follows the ten Environmental and Social Standards (ESSs) under the Environmental and Social Framework that establish the standards that the project should meet throughout the project life cycle:

- ESS 1: Assessment and Management of Environmental and Social Risks and Impacts;
- ESS 2: Labor and Working Conditions;
- ESS 3: Resource Efficiency and Pollution Prevention and Management;
- ESS 4: Community Health and Safety;
- ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
- ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- ESS 7: Indigenous Peoples / Traditional Local Communities;
- ESS 8: Cultural Heritage;
- ESS 9: Financial Intermediaries; and
- ESS 10: Stakeholder Engagement and Information Disclosure.

ESS 1: Assessment and Management of Environmental and Social Risks and Impacts

This standard sets out the Borrower's responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through Investment Project Financing (IPF), in order to achieve environmental and social outcomes consistent with the Environmental and Social Standards (ESSs). The essence of ESS 1 is to ensure that projects supported by financial institutions adhere to robust environmental and social standards, thereby promoting sustainable development, safeguarding natural resources, and enhancing the well-being of communities and ecosystems. This standard is relevant for the project.

ESS 2: Labor and Working Conditions

This standard recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions. The ESS 2 aims to create an enabling environment where labor rights are respected, workers are treated with dignity and respect, and workplaces are safe,

inclusive, and supportive. By adhering to these standards, projects can contribute to sustainable development and the well-being of workers and communities. This standard is relevant for the project.

ESS 3: Resource Efficiency and Pollution Prevention and Management

This standard recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. This ESS sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life cycle. The ESS 3 aims to promote sustainable resource use, minimize pollution, and enhance environmental performance within projects, thereby contributing to sustainable development and the protection of natural ecosystems and human health. By integrating resource efficiency and pollution prevention measures, projects can mitigate environmental risks and optimize their long-term sustainability. This Standard is relevant for the project.

ESS 4: Community Health and Safety

This standard addresses the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their circumstances, may be vulnerable. The essence of ESS 4 is to prioritize the health and safety of communities and workers impacted by projects, ensuring that their rights are protected, risks are minimized, and benefits are maximized. By integrating health and safety considerations into project design, implementation, and monitoring, projects can contribute to sustainable development and the well-being of all stakeholders involved. ESS4 is relevant for the project.

ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement

Involuntary resettlement should be avoided. Where involuntary resettlement is unavoidable, it will be minimized and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented. The aims of ESS 5 are to ensure that land acquisition and involuntary resettlement processes are conducted in a manner that respects the rights, dignity, and well-being of affected communities and individuals. By prioritizing the needs and concerns of affected persons and providing adequate compensation, assistance, and support, projects can minimize adverse impacts and contribute to sustainable development and social equity. This standard is relevant for the project

ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

This standard recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development and it recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support. ESS6 also addresses sustainable management of primary production and harvesting of living natural resources

and recognizes the need to consider the livelihood of project-affected parties, including Indigenous Peoples, whose access to, or use of, biodiversity or living natural resources may be affected by a project. The goal of ESS 6 is to support human well-being and ecosystem resilience by encouraging the sustainable stewardship of biodiversity and living natural resources, guaranteeing their preservation for future generations. Projects can help conserve biodiversity, promote sustainable development, and increase climate resilience by incorporating biodiversity considerations into their planning, execution, and monitoring phases. This standard is relevant for the project.

ESS 7: Indigenous Peoples / Traditional Local Communities

This standard ensures that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities. ESS7 is also meant to avoid adverse impacts of projects on Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, or when avoidance is not possible, to minimize, mitigate and/or compensate for such impacts. ESS 7 aims to ensure that projects respect and promote the rights, cultures, and well-being of indigenous peoples and traditional local communities, fostering inclusive and equitable development that recognizes and values their unique contributions to society and the environment. By engaging with communities as partners and respecting their knowledge, values, and aspirations, projects can contribute to sustainable development and social justice. This standard is not relevant for the project.

ESS 8: Cultural Heritage

This standard recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. ESS8 sets out measures designed to protect cultural heritage throughout the project life-cycle. In the framework of development initiatives, ESS 8 seeks to preserve and advance the protection of cultural heritage. Projects can support sustainable development while assisting in the preservation of cultural diversity, heritage, and identity by acknowledging the value of cultural assets, interacting with impacted communities, and putting into practice efficient conservation techniques. This standard is relevant to the project.

ESS 9: Financial Intermediaries

ESS9 recognizes that strong domestic capital and financial markets and access to finance are important for economic development, growth and poverty reduction. FIs are required to monitor and manage the environmental and social risks and impacts of their portfolio and FI subprojects, and monitor portfolio risk, as appropriate to the nature of intermediated financing. The way in which the FI will manage its portfolio will take various forms, depending on a number of considerations, including the capacity of the FI and the nature and scope of the funding to be provided by the FI. ESS 9 focuses on promoting responsible investing by integrating environmental and social considerations into the operations of financial intermediaries. By

adopting robust environmental and social risk management systems, engaging with stakeholders, and adhering to international standards, FIs can contribute to sustainable development and positive social and environmental outcomes. ESS 9 is not relevant for this project.

ESS 10: Stakeholder Engagement and Information Disclosure

This standard recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation. ESS 10 aims to promote transparent, inclusive, and participatory processes that engage stakeholders in decision-making, foster trust and accountability, and contribute to sustainable development outcomes. By respecting stakeholder rights, facilitating access to information, and building meaningful partnerships, projects can enhance their social legitimacy, reduce conflicts, and achieve more effective and equitable results. ESS 10 is relevant for the project.

2.4 Relevant World Bank Group Guidelines, 2007

2.4.1 World Bank Group EHS Guidelines, 2007

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP), as defined in ESS3. The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC and that are generally considered achievable in new facilities at reasonable costs by existing technology. For World Bank-funded projects, application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets with an appropriate timetable for achieving them. The environmental assessment process may recommend alternative (higher or lower) levels or measures, which, if acceptable to IFC/World Bank, become project or site-specific requirements. The World Bank Group EHS Guidelines for Power Transmission and Distribution and General Guidelines are relevant for this sub-project.

2.4.2 World Bank Good Practice Note: Addressing Sexual Exploitation and Abuse and Sexual Harassment (SEA/SH) in Investment Project Financing involving Major Civil Works

The Good Practice Note operationalizes and discusses the scope, prevention, minimization, and mitigation measures for Gender-based Violence risks that are associated with Bank Investment Project Financing. It covers Sexual Exploitation and Abuse (SEA)-exploitation of a vulnerable position differential power or trust for sexual favours and actual or threatened sexual intrusion, Workplace Sexual Harassment (SH) in the form of unwanted sexual advances, requests for sexual favors, and sexual physical contact as well as human trafficking (Sexual slavery, coerced transactional sex, illegal transaction people movement. Also presented in the guidance note are non-SEA issues of physical assault, psychological and physical abuse,

denial of physical services and resources together with intimate partner violence. In responding to project-related GBV/SEA/SH risks, the document proposes adaptable survivor-centered as well as risk and evidence-based approaches that emphasize prevention and risk minimization—especially risks that harm girls and women. It also alludes to the importance of building on local knowledge through stakeholder engagement and continuous monitoring and learning.

Strategies to be implemented by various actors throughout the project cycle to identify GBV/SEA/SH risks on bank-financed projects include risk mapping, assessment, and stakeholder consultation. Mitigation and minimizing measures such as the use of Codes of Conduct, GBV Service Providers, and Environmental and Social Management Plans in addition to capacity assessment are discussed in the document. The guidance note also lays out monitoring and evaluation requirements and stresses the need for sensitization and capacity building for stakeholders.

2.4.3 ESF/Safeguards Interim Note: Covid-19 Considerations in Construction/Civil Works Projects

This interim note emphasizes the importance of careful scenario planning, clear procedures and protocols, management systems, effective communication and coordination, and the need for high levels of responsiveness in a changing environment due to the COVID-19 pandemic. It recommends assessing the current situation of projects, putting in place mitigation measures to avoid or minimize the chances of infection (coronavirus), and planning what to do, if either project workers become infected or the workforce including workers from proximate communities are affected by COVID-19. The recommendation in this interim note covers cleaning and waste disposal, medical services, and general hygiene for the workforce together with the management of site entry and exit points, work practices, and medical supplies for site workers. There are also recommendations to ensure continuity in the supply of materials and project activities amidst disruption in supply chains because of COVID-19. The interim note is useful for both project Consultants and Contractors in spite of the fact that the pandemic has been curbed in Ghana.

2.4.4 International Labour Norms

Ghana's labour laws generally align with international labor norms and standards established by the ILO, there may be variations in specific provisions, implementation mechanisms, and enforcement practices. Continuous efforts to strengthen legal frameworks, enhance enforcement mechanisms, and promote social dialogue are essential to ensure compliance with international labour standards and protect workers' rights.

In case the fundamental labour laws as defined by the International Labour Office (ILO) are not fully covered by national legislation, the proponent of a project financed by an international institution such as the WB needs to conceive and implement ad hoc verifiable procedures in order to guarantee the implementation of international labour norms at least during the Construction and management phases of

the project. The objective is to avoid unacceptable labour conditions and practices and to promote a rational management of social relations.

2.4.5 World Bank Environmental and Social Risk Classification

Under the World Bank ESF, the World Bank classifies projects into four (4) categories, High, Substantial, Moderate, and Low largely based on the scale of the project-level impacts and risks, the country's socio-political conditions as well as the capacity of the borrower to manage the associated environmental and social impacts/risks. Projects classified as category 'High Risk' carry very significant and mostly irreversible environmental and social impacts/risks requiring Environmental and Social Impact Assessment. Projects are also categorized as high risk if, they are to be implemented in countries or regions with a history of social conflict, uncertain or weak regulatory environments and/or in situations where the borrower has a weak capacity to manage the potential environmental and social risks/impacts. High-risk projects also have long-term, irreversible significant, cumulative and/or transboundary impacts/risks that are difficult or sometimes impossible to mitigate.

Substantial Projects are less complex medium-scale projects. Such projects have, few adverse impacts/risks compared to high-risk projects, which are mostly temporary and reversible. Projects rated as substantial may have a transboundary impacts/risk but the impacts/risks can be readily mitigated. Projects in this category are implemented in countries and regions, in which there are concerns about social conflicts but the capacity concerns about borrower's ability to management the potential environmental and social risks can be addressed.

Projects rated as 'low' have environmental and social impacts/risks of low magnitude, which are predictable, temporary, reversible site-specific and easily mitigated, while those rated 'low' have minimal to negligible impacts/risks and may not require any environmental and social assessment.

The Environmental and Social Risk Rating for the project is "High". The project will support construction of high-voltage transmission lines creating new environmental footprint in the modified and natural landscapes and habitats with adverse impacts on vegetation wildlife and rivers due to vegetation clearance for creating ROW, earth works, erection of towers and stringing of transmission lines. Civil works will be associated with impacts and risks such as soil erosion, and waste degeneration as well as risks to the health and safety of workers and local communities such as accidents.

In terms of social risks, land-take (500 hectares) leading to the physical and economic displacement of people will occur. Other social risks are labor influx into the project areas, including oversea workers, posing community and health risks like communicable diseases, STDs, HIV/AIDs, unwanted pregnancies, sexual exploitation, and abuse/sexual harassment in project communities. The increased presence of workers and clashes with illegal miners may trigger and/or exacerbate social conflicts that may require the

intervention of armed security personnel. Lastly, the transboundary nature of the interconnection lines (tying with Côte d'Ivoire) could make issues more challenging.

There is also limited institutional capacity at GRIDCO to undertake environmental, social and health and safety management in accordance with the newly introduced World Bank ESSs even though they have implemented Bank projects under OPs with relative satisfaction.

3 CONSIDERATION OF ALTERNATIVES

This Chapter contains a description of the proposed development. However, during the project planning stage, a number of options had to be taken into account in terms of equipment and the project's viability before the various components of the projected development were chosen.

Numerous feasibility studies have been conducted, which have aided this ESIA study in presenting possibilities in a comparative manner, outlining the distinctions between each possibility, and giving the public and decision-makers a sound foundation on which to choose. A portion of the data used to compare the options will be derived from the alternative's design, and a portion will be based on the consequences that each alternative will have on the environment, society, and economy if it is implemented.

The following alternatives were discussed at the draft ESIA stages:

- No Development Scenario; and
- Project Implementation Option

3.1 The "No development scenario"

Under this scenario, the existing 225 KV transmission line from Prestea to Côte d'Ivoire will continue to be the only transmission line that supplies power from Ghana to Côte d'Ivoire and vice versa. It will undergo route maintenance in the foreseeable future. The line is overloaded and susceptible to faults.

Opting for the No Development Scenario means that there will be no need to acquire additional land as wayleaves for the any new transmission line and the siting of a new substation saving at least 500 hectares of land including farming lands and secondary forests. Closely related to the issue of avoiding land take, the no action scenario minimise physical and economic displacement as there is no anticipated loss of livelihood and damage to assets.

Environmental impacts such as material use, habitat destruction and loss of vegetation is also limited as routine maintenance activities will be largely confined to Right of Way of the existing transmission line and its immediate environs with very minimal civil works such as establishing tower foundations.

Nonetheless, pursuing the no development option implies that there will be no feasible means of evacuating power between these two countries, if the existing 225KV transmission line develops a fault. More importantly, an overloaded circuit presents a significant risk to the entire power transmission system of both Ghana and Côte d'Ivoire with a potential to cause blackouts and load shedding in both countries with its attendant loss of foreign exchange, loss of investment and insecurity as well as the shift to smaller diesel stand-alone power systems in the respective countries.

Even though the “No development scenario” seems to have minimal environmental and social risks/impacts, pursuing this option undermines the objective of the West African Power Pool, that is, ‘to develop a power transmission network that interconnects the entire West African Region.’

The “No development” alternative does not, therefore, represent an option that meets the best interests of people in the project corridor, Ghana and West Africa as a whole.

3.2 Project Implementation Option

The project implementation Option seeks to develop an additional interconnection transmission line between Ghana and Côte d’Ivoire. This alternative loop is a 333 KV transmission line from Dunkwa- on - Offin to Omanpe (Ghana-Côte d’Ivoire border) where it will tie into a new 400 KV transmission line on the Côte d’Ivoire side also to be developed under this project by CI Energies. This option resolves the potential operational challenges associated with the current system of transmission as it is an upgrade on the current 225 KV transmission line serving the two countries. In addition, it will ensure more reliable transmission of power between the two countries in furtherance of the WAPP objective.

These notwithstanding, the implementation of this option is associated land take, loss of livelihood for farmers and other land owners within the proposed Right-of-Way and the site for the construction of a new substation, loss of habitats and other environmental and social impacts. These will require the preparation of Environmental and Social Impact Assessment and an accompanying Environmental and Social Management Plan that will be implemented throughout the project cycle to mitigate the potential environmental and social impacts/risks of the project.

The development benefits of the project implementation option including reliable power supply outweighs that of the ‘No Action Scenario’. The beneficial projects impact of the project such as employment generation and increase investments with stable power supply also outweighs the negative environmental and social risks/impacts associated with project implementation, especially, if these impacts/risks are situated in the context of they being largely resolved using the mitigation hierarchy. From the foregone, the Project Implementation Scenario is selected for further analyses.

3.2.1 Mode of Transmitting Power

Under Project Implementation option the underlisted variants were assessed:

- Alternative Means of Evacuating Power
- Alternative Transmission Line Routes;
- Alternative Phase Conductor Material; and
- Alternative Tower Designs
- Options for Power Transmission

Two transmission modes of passing the transmission lines in between towers were considered and assessed. These are the subterranean approach and the overhead cabling approach. In the former, the cables are buried underground. They only appear on the surface at termini. The overhead cabling involves the mounting of towers at specified intervals and stringing the interconnection cables along the towers.

Burying transmission lines in the ground makes it less susceptible to vagaries of the weather, while minimizing energy losses. These notwithstanding, this transmission option is associated with trenching, landscape alteration and adverse impacts on properties and livelihoods under this project. Construction and maintenance costs are also higher compared to the use of overhead cabling (see Table 2).

Table 2: Estimated cost of overhead towers against underground cables

Type	Underground cable	Overhead Towers Compact design	Overhead Towers Lattice steel towers
Cost per km (US\$)	400,000	84,500	85,000 –100,000

Laying the lines through the ground also adversely affects landscapes such as mountains. Barriers such as mountains, rivers and road crossing makes construction more difficult compared to overhead transmission. Accessing the lines for repair works is also difficult and take a longer time for underground cabling. More insulation is also required under this approach.

Transmitting power via overhead cables visually pollutes areas where they run. It may obstruct the movement of birds and other flying objects and it is easily struck by lightning. As the lines and towers are visible, they are also easier targets for terror attacks, theft and vandalism compared to underground cables. Nonetheless, power transmission by overhead cables is preferred to underground cabling under the project on the account of lower construction and maintenance cost, better accessible during routine maintenance and repairs as well as ease of construction and maintenance.

3.2.2 Transmission Line Route

The choice was between selecting a new route and aligning the project with the proposed route under the earlier project in 2014. The decision was taken by GRIDCo to align the route with the RoW of the earlier project as much as practicable rather than a total change in route alignment because of the underlisted reasons:

- i. Survey data was largely available for selected route minimising delays and cost;
- ii. The vegetation cleared formerly has not fully established making accessibility easier

- iii. The existing route avoids most of the degraded mining areas and sites as much as possible;
- iv. The existing (selected) route avoids settlements and built-up areas traversing farmlands and green fields; and
- v. The communities within the corridor are aware of the project (existing RoW) making community acceptability easier, limiting encroachment and resettlement impacts.

This option is, however, associated with legacy issues from the previous project, notably, non-payment of compensation to persons affected during the demarcation of the Centre line and Right of Way previously under the old project. Figure 2 presents the selected route alignment).

Another consideration was that the selected route in 2014 avoided sensitive environmental areas inside the project zone as much as feasible by GRIDCo, in addition to the limitations and requirements associated with the selection of corridors (see Table 3 for the list of environmentally sensitive areas avoided during route selection).

Table 3: Environmental and Social Sensitive Areas Avoided by the 2014 Right-of-Way

Areas Protected by Law	National parks (current or anticipated), Reserves (flora, fauna), Protected forests
Forest Areas and Vegetation:	Forests and forest groves, Plantations (pines, cashew trees, fruit trees), Gallery-forests and coastal vegetation hedges, mangroves, other humid or tropical ecosystems, areas containing threatened species and species of social, economic, cultural, and scientific interest
Faunal Areas:	Bird migration corridors and flock areas, recognized faunal habitats, threatened species
Human habitat:	Populated areas (cities, villages, hamlets, etc.), Land use, anticipated development zones
Cultural Areas:	Sacred forests and woods, Archaeological or historical sites, Panoramic and tourist sites, Shrines/religious sites/cemeteries

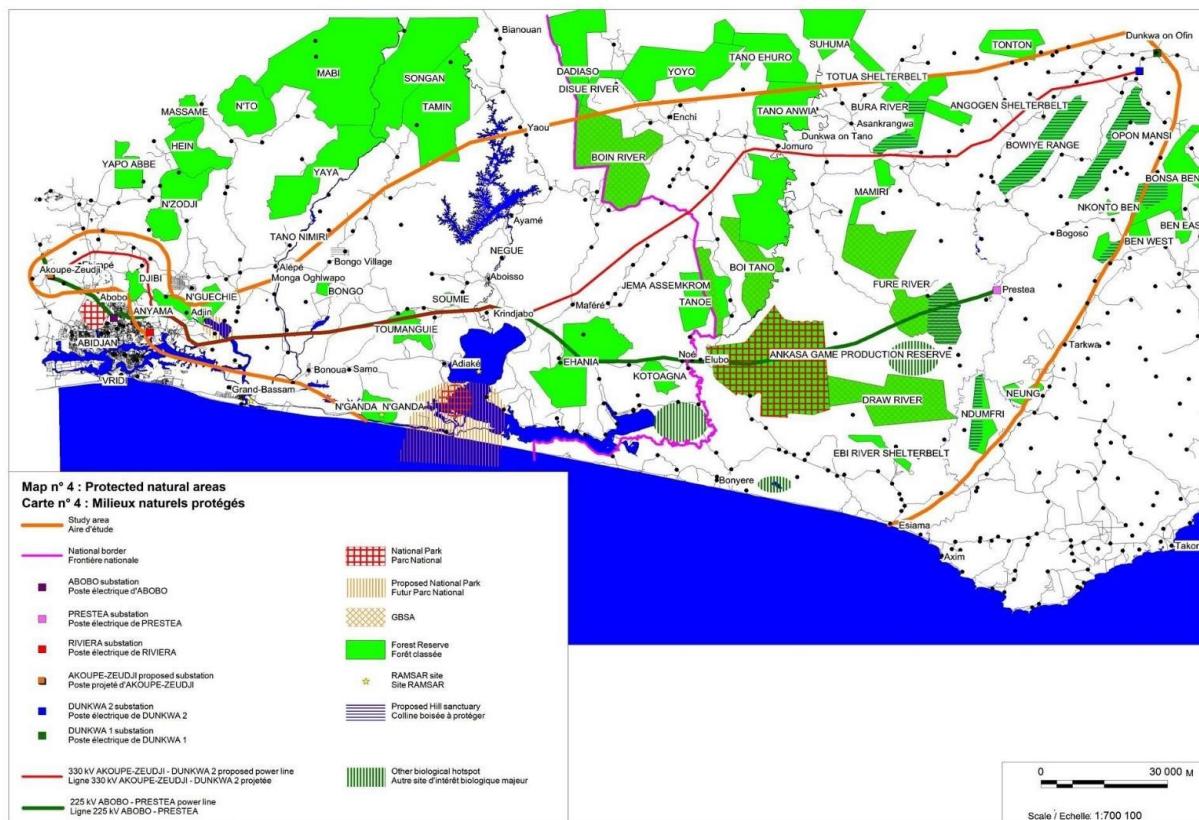


Figure 2: Transmission line route showing Forest reserves, townships, waterbodies and others

3.2.3 Alternative Phase Conductors

Aluminium and Copper insulators were evaluated for this project. For Aluminium Conductors, Aluminium Conductor Steel Reinforced (ACSR) conductors, that is, aluminium conductors with a steel wire core, All Aluminium Alloy Conductors (AAAC) and Aluminium Conductor Alloy Reinforced (ACAR) conductors are the most common types used for high tension and very high-tension overhead lines.

Aluminum conductors are light, more cost-effective, and have a higher strength-to-weight ratio making them ideal for long transmission lines, where weight and cost are significant factors in the selection matrix. However, they have lower electrical conductivity compared to copper and are more prone to corrosion. Copper Conductors, on the other hand, offer superior electrical conductivity, better thermal resistance, and greater durability, but they are heavier, more expensive, and harder to work with in large quantities.

The project chose to use aluminum due to its cost-efficiency and suitability for long-distance transmission, while also considering the specific needs for durability and conductivity in certain sections of the transmission network. The choice of aluminum was also influenced by compatibility with the existing insulators within the Ghana network.

Therefore, in terms of strength, system safety, and security requirements, the proposed network's design criteria would be comparable to, or at least compatible with, those of the current grid. ACSR is the selected option for this project.

3.2.4 Tower Design Alternatives

Several criteria were considered while determining which type of tower design to utilize for the project. These included wind loads, loading stresses, and safety considerations. Others were phase-to-earth wire clearances and clearances to the tower structure (the ground level of the attachment point of the suspension and anchor strings). Three configurations were studied for the suspension towers. These were: Triangular configuration tower with two earth wires, Cat's head configuration tower and Horizontal configuration tower (see Appendix XII for illustrations of the Alternative Tower Designs).

a. Triangular Configuration tower with Two Earth Wires

Triangular Configuration Towers with two earth wires offer good structural stability and are resistant to wind loads. This configuration also provides enhanced protection against lightning strikes, hence, improving system reliability. It requires less space, making it suitable for areas with limited Right-of-Way.

Nonetheless, the compact design can make maintenance more challenging, especially when accessing conductors. It requires more steel for construction, leading to potentially higher costs. The triangular shape causes greater visual intrusion compared to the other two configurations (Appendix XII).

b. Cat's Head Configuration Tower

The Cat's Head Configuration is more suited for difficult terrains such as mountains. The unique shape of these types of towers can make them blend more easily into certain landscapes, reducing visual intrusion. It allows for optimal spacing between conductors, reducing the risk of short circuit. Nonetheless, this tower configuration does not support heavy load compared to the triangular and horizontal configurations limiting its use for high-capacity transmission lines such as 330KV transmission lines. The unconventional shape can complicate construction and increase costs. Finally, accessing conductors during maintenance is more difficult due the tower shape (Appendix XII).

c. Horizontal Configuration Tower

The horizontal arrangement of conductors is straightforward; hence it reduces construction complexities and cost. It also makes conductors easier to access during repair and routine maintenance. The design allows for even distribution of mechanical loads, enhancing structural integrity. This style of towers have the extra benefit of requiring less land for the tower support system and having exceptionally sturdy construction (Appendix XII).

Horizontal Configuration Towers, however, require more land area for installation due to the horizontal spread of conductors, potentially increasing Right-of-Way extent and cost. Conductors may sag more between towers under this configuration, necessitating more frequent maintenance or closer tower

spacing. The horizontal configuration may have height limitations, which could affect performance in areas with tall vegetation or buildings.

GRIDCo opted for the horizontal configuration due to its ease of maintenance and straightforward design, which simplifies construction and reduces costs compared to Triangular and Cat's Head Tower Configuration. The even load distribution and simple structure make it ideal for long transmission lines, where reliability and ease of access are crucial. Despite requiring more land, the benefits of reduced construction complexity and easier maintenance outweighed the limitations of this configuration.

4 DESCRIPTION OF THE PROJECT

4.1 Project Location & Site Setting

The proposed transmission line is intended to span both Ghana and Côte d'Ivoire. This report's analysis is limited to the Ghanaian section of the line. Five districts in three regions will be involved in the construction and operation of the proposed transmission line and the sub-station (Figure 1). These districts are:

- Upper Denkyira East Municipal Assembly (Central Region);
- Wassa Amenfi Central District Assembly (Western Region);
- Wassa Amenfi West Municipal Assembly (Western Region);
- Wassa Amenfi East Municipal Assembly (Western Region) and
- Aowin Municipal Assembly (Western North Region).

The transmission lines will be built inside a 40-meter-Right of Way over a distance of approximately 125 km on the Ghanaian side from the Côte d'Ivoire border (Omanpe) to the upcoming substation at Bibianiha near Dunkwa-on-Offin (see Appendix XI). Figure 3 shows map of the administrative area of the proposed transmission line. The following restrictions on the Ghanaian side limit the geographic area used to choose the least effect corridor.

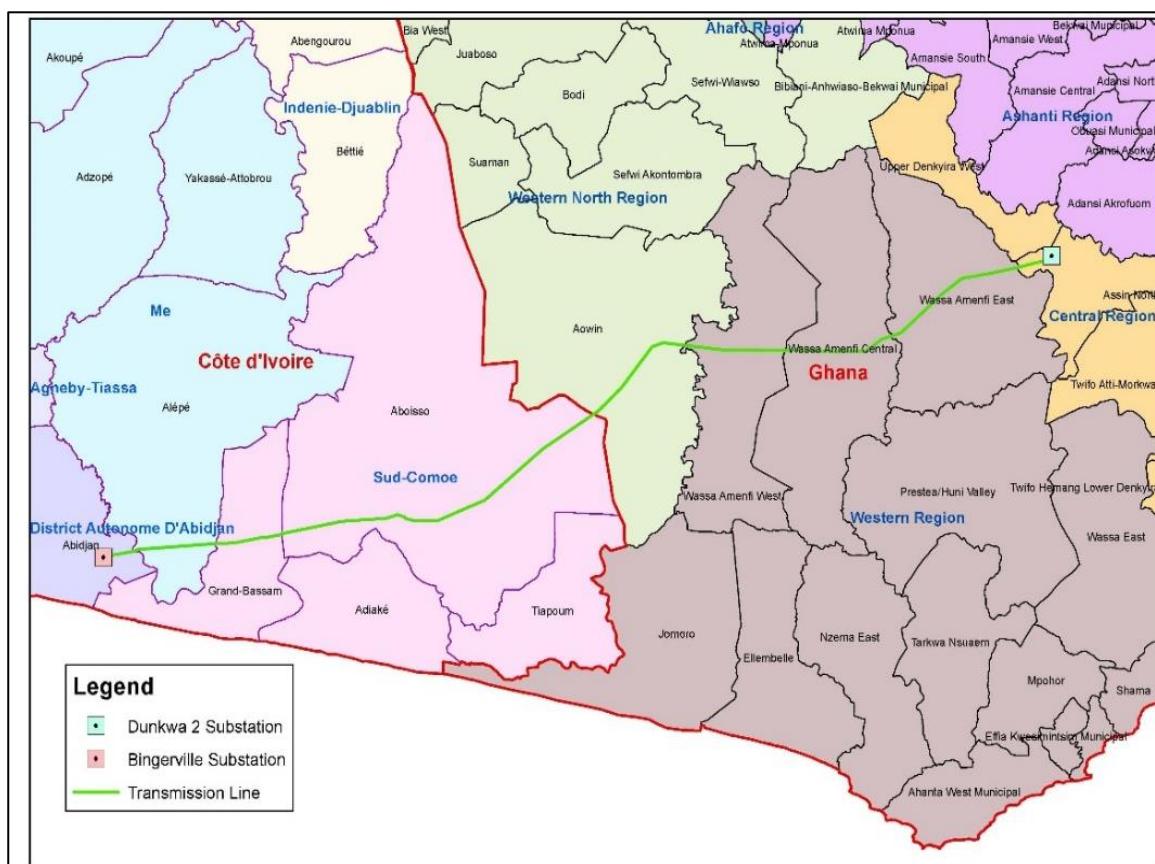


Figure 3: Administrative map of the Côte d'Ivoire-Ghana sections of the Transmission Line

4.2 Accessibility to Substation Site

Dunkwa II Substation, to be located South-West of Dunkwa-on-Offin is the starting point of the project in Ghana. The substation for “400kV/330kV Côte d'Ivoire - Ghana Interconnection Reinforcement Project”, is located 1.6 km southwest of Bibianiha, a village located 3km south-east of the town of Dunkwa-on-Offin. The village has a motorable untarred road which doubles as access to the proposed substation site. Figure 3 shows the proposed road to the substation at bibianiha. Figure 4 shows the existing lines near proposed Dunkwa II substation site, as it will be located in proximity of the two 161kV power lines (Prestea-Obuasi and Bogosa-Dunkwa I) and of the line route of the 330kV power line between Aboadze and Kumasi. Figure 6 shows the location of the project within the high-tension electricity network of SE Côte d'Ivoire and SW Ghana. Figure 7 shows some aerial photographs of the project corridor showing landscapes interspersed with significant galamsey activities.



Figure 4: Area photograph of the proposed sub station at Bibianiha



Figure 5 Access to the proposed Dunkwa II Substation

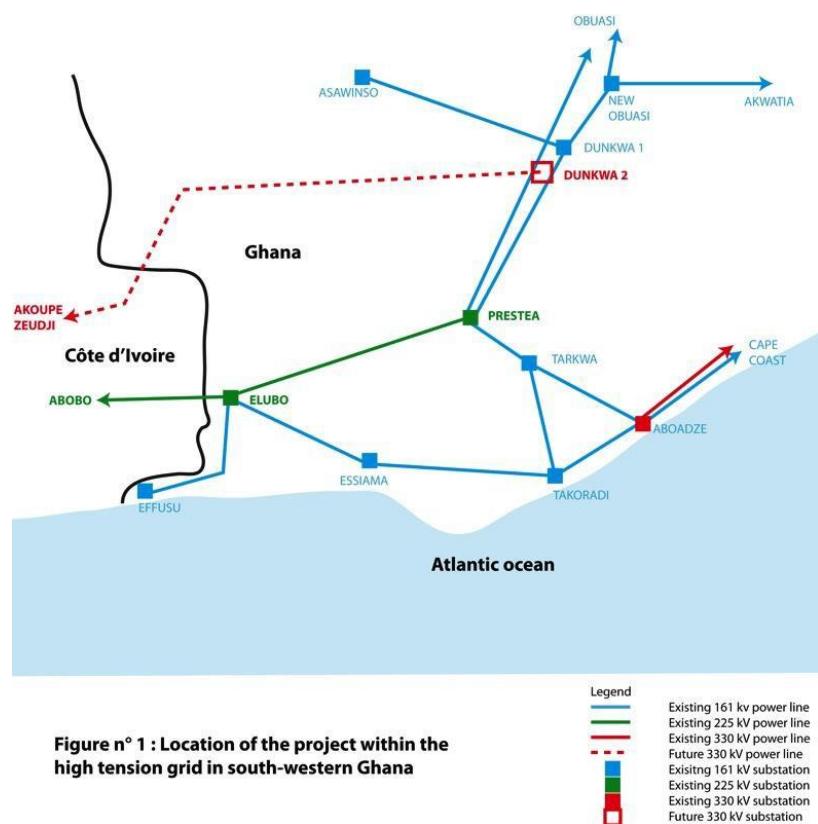


Figure n° 1 : Location of the project within the high tension grid in south-western Ghana

Figure 6: Project location within the high tension electricity network in SW Ghana



Figure 7: Some aerial photographs of the project corridor showing landscapes interspersed with significant galamsey activities

4.3 Overview of Project Development

The activities to be undertaken during this phase of the proposed project field surveys, consultations with the authorities and communities affected, feasibility survey, editing of the Scoping Report, Line Route Study, Feasibility Report, ESIA and two associated documents: ESMP and RAP. Other activities are as follows:

4.3.1 Right of Way Acquisition

A 40m corridor is to be acquired for the construction of the project. The entire stretch of the RoW falls within Upper Denkyira East Municipal (Central Region); Wassa Amenfi Central District (Western Region); Wassa Amenfi West Municipal (Western Region); Wassa Amenfi East Municipal (Western Region) and Aowin Municipal (Western North Region).

Thus, the total land take for the project is expected to be approximately 500 hectares and the acquisition would be done through the state power of eminent domain. GRIDCo, in collaboration with, Lands Commission will ensure that all properties (land, structures, and crops) within the 40m corridor are valued for fair and adequate compensations at replacement to be paid to as Project Affected Persons (PAPs)- those whose livelihoods and assets such as land, farms and structures are impacted by the project activities.

4.3.2 Access Tracks

Access tracks of approximately 3.5 m to 5 m wide, i.e., sufficient width for construction and subsequent maintenance traffic will be created and maintained within the RoW under the towers and from nearby road networks.

4.3.3 Dunkwa II Substation

Dunkwa II Substation, to be located at Bibianiha, South-West of Dunkwa-on-Ofin is the departing point of the project line in Ghana. The substation located 1.6 km southwest of the Centre of Bibianiha, a village located 3 km from the town of Dunkwa. There are existing lines near the proposed location of the Dunkwa II substation, as it will be located in proximity of the two 161kV power lines (Prestea-Obuasi and Bogoso-Dunkwa I) and of the line route of the 330kV power line between Aboadze and Kumasi.

4.4 Pre-Constructional Phase

The project's field surveys, discussions with relevant authorities and communities, update of feasibility study, Line Route Study, ESIA, and two related documents, ESMP and RAP, are among the tasks to be completed during this stage of the proposed project.

4.4.1 Line Route Survey

Desktop studies were first carried out using Google Earth maps and Ghana topographical maps to update and identify the possible transmission line corridors from the proposed Dunkwa II Substation to the Ivorian-Ghanaian border, Omanpe near Kwawu in the Aowin Municipality of the Western North Region. This was followed by a reconnaissance survey along the proposed routes to assess the suitability for selection of an optimal one. The site visits also assisted in identifying features on the ground within a 100m-500m radius of the optimal route which could not otherwise be identified by the Google maps or topographical maps using drones. The avoidance of the Ankasa National Park, about 50km away from the selected route), three forest reserves (Jema-Asemkrom, Boin-Tano and Draw River (forest reserve) one globally significant biodiversity areas (how many were avoided), villages (32), property destruction, and areas of socio-cultural relevance are a few of the reasons that went into choosing the optimal route for the transmission line.

4.4.2 Consultations

A number of traditional authorities in the affected communities, opinion leaders, Municipal and District Assemblies, District Forest Reserve offices, Mineral Commission offices, and regulatory agencies were consulted during the ESIA study. Some of these consultations are detailed in Chapters 4,5 and Appendices VI, VII

4.4.3 Preparation of Environmental Impact Assessment for World Bank Approval and Environmental Permit

ESIA preparation is mandatory to allow for the commencement of the physical construction for such a project. Various activities have been undertaken regarding the acquisition of the Environmental Permit for the project including the registration of the project, approval of Scoping Report and preparation of this draft ESIA for review and approval. An Environmental Permit will subsequently be issued upon payment of processing and permit fees in line with Fees and Charges (Miscellaneous Provisions) Act, 2022 (Act 108). The Permit would outline various conditions that must be adhered to in project implementation. It must be noted that it is an offense under Regulation 29 of the Environmental Assessment Regulations LI 1652 of 1999 to start a project without an Environmental Permit. The World Bank will also review and approve the ESIA prior to the commencement of works.

4.4.4 Updating the Resettlement Action Plan (RAP)

The Ghana–Côte d'Ivoire Interconnection Reinforcement Project is expected to result in land acquisition and economic displacement, primarily due to the establishment of the 40 m Right-of-Way and construction of transmission towers and associated infrastructure. These impacts include loss of land, crops, trees, and temporary disturbance to livelihoods.

This section of the ESIA provides only a high-level summary of resettlement-related impacts, in accordance with World Bank Environmental and Social Standard 1 (ESS1). All detailed resettlement aspects, including identification of Project Affected Persons (PAPs), asset inventories, valuation, compensation entitlements, livelihood restoration measures, and implementation arrangements, are fully addressed in the standalone Resettlement Action Plan (RAP) prepared in accordance with World Bank ESS5.

4.4.5 Valuation, Compensation & Land Acquisition

The land acquisition for the right of way (RoW) of the project involves enumeration, referencing of properties within the 40m corridor, valuation of those properties, and compensation payment to the affected owners. These activities will be carried out by Certified Valuers in the Lands Management Section of GRIDCo Engineering Department with the support of the traditional and the local administrative authorities. The valuations of the affected properties (buildings, lands, and crops) contained in the RAP are deemed fair, adequate and as replacement costs for the affected properties. Again, the preparation of the RAP would be guided by the GRIDCo Land Acquisition and Resettlement Framework Policy and the Lands Act of 2020 (Act 1063).

4.4.6 Acquisition of The Right-Of-Way (ROW)

The proponent will then proceed to acquire the Right-of-Way in accordance with all laws, rules, operational directives, and guidelines upon the EPA issuing an environmental permit.

Article 20 of Ghana's 1992 Constitution stipulates that all parties impacted by state acquisitions must get just and sufficient compensation. RAP will therefore be prepared in line with principles of World bank ESS5 to acquire the RoW for the construction of the project.

This will be done through referencing of all properties, land, crops and buildings, by an independent consultant, Studio Pietrangeli (SP), in collaboration with the Lands Commission to be monitored by the Land Management Department of GRIDCo.

4.4.7 Sourcing of Funds and Procurement

Another activity that will depend to a large extent on the issuance of an environmental permit will be the securing the funding for such a major development. World Bank is the funding agency for this project.

All procurement of goods and services will be done in compliance with national laws and World Bank procurement requirements. Most of the materials and other components of the transmission line will be manufactured and procured internationally, as they are not available for purchase in Ghana. It is expected that project contractors would source these from worldwide level suppliers. Catalogs, certificates, references list, etc. are to be provided to GRIDCo for concurrence. The equipment should have the minimum but necessary configuration to achieve the project's objectives. The procurement of the equipment will take into consideration past importation records of such equipment, the operation, and

maintenance capability of GRIDCo, and other relevant matters. The manufacturer's authorizations are to be provided showing that the Contractor has been duly authorized by the main manufacturers for this project to supply and install that item in Ghana.

4.4.8 Impacts on Biodiversity

The Ghana–Côte d'Ivoire Interconnection Reinforcement Project is expected to generate direct, indirect, and cumulative impacts on biodiversity during both the construction and operational phases. Vegetation clearing within the Right-of-Way (RoW), construction of tower foundations, development of access tracks, and long-term maintenance activities will result in habitat loss, habitat degradation, and habitat fragmentation along the transmission corridor.

Construction activities will cause disturbance and temporary displacement of terrestrial fauna due to increased noise, human presence, and machinery movement. In addition, the transmission line poses risks to avifauna through collision and electrocution, particularly during the operational phase. The alteration of habitat structure and disruption of ecological corridors may also affect wildlife movement and ecosystem connectivity.

Over the long term, cumulative impacts may arise from repeated vegetation management and increased access to previously undisturbed areas, potentially leading to localized reductions in species abundance and changes in ecosystem functions.

4.5 Construction Phase

- i. The following construction activities will be undertaken:
- ii. Geotechnical Investigations
- iii. Tower spotting
- iv. Construction of access and tower corridor tracts
- v. Clearing of right-of-way
- vi. Clearing and excavation of tower base and foundation
- vii. Clearing of tower track
- viii. Storage and transportation of equipment and materials
- ix. Erection of towers and stringing of transmission lines

4.5.1 Geotechnical Investigations

A detailed geotechnical investigation will be carried out for the towers for the proposed transmission line. The work will comprise drilling boreholes and performing a Standard Penetration Test to satisfactory depths. The field and laboratory tests will then be carried out to provide the subsoil profile and the soil physical and chemical properties required for calculations of the foundation soil bearing capacity and help in foundation design.

4.5.2 Tower Spotting

This involves choosing each location where the towers (or pylons) will be installed. It is important to note that tower spotting occurs along the whole transmission line.

Land surveying and soil study are related activities to tower spotting. These operations require clearing some vegetation and access to the line path, which could result in impacts on farms. The best foundation and design for any tower will be determined via topographical studies and tower spotting. At this point, the final tower site may be somewhat modified to accommodate the transmission line corridor's vertical profile and avoid any buildings that might have been built after baseline data was gathered for the proposed RoW. These changes will only be made in directions of a few meters.

4.5.3 Construction of Access and Tower Corridor Tracts

A maintenance track of 4 m width shall be constructed along the entire length of the wayleave. Wherever possible, existing access tracks shall be used to gain access to the proposed line route. Where there are no such tracks available, new access tracks will be constructed from the closest public road to the RoW. The access track as well as the maintenance track in the RoW, which will be constructed during the construction phase, will be retained for the operational phase. The tracks will be used for the transportation of labour and material to the line route as well as for the installation of towers and conductors.

The tracks will be cleared of tree stumps, shrubs and other vegetation likely to obstruct the transport of construction machinery, equipment and maintenance staff to the tower corridor. Cut trees will be neatly stacked to one side of the proposed tracks for the use of, or sale by, the communities close to the site of clearance.

4.5.4 Clearing of Right-Of-Way

The construction and operation of the proposed line will require a Right-of-Way of 20 m width on each side of the centre line of the transmission line. This 40 m wide wayleave, which will run the total length of the transmission line, shall be cleared of vegetation to a height of about 1.25 m above ground level, except in areas crossing forest galleries along rivers of great ecological interest in particularly for rare species which could be adversely affected by habitat fragmentation of the forest cover. In this case the vegetation will be kept and maintained up to a height of 8m by use of raised pylons overhanging the forest gallery.

Trees considered being potentially capable of threatening the proposed transmission line beyond the 40 m width will be cut down or pruned as appropriate. These are trees whose branches might grow large enough to obstruct the transmission lines or which could topple over and cause harm to the line. Mechanical methods will be employed for all vegetation clearance (chain saw, forestry wood chipper). There will be no usage of herbicides to manage the vegetation.

4.5.5 Clearing and Excavation of Tower Base and Foundation

The proposed tower base areas will also be totally cleared and all roots removed. With a total of about 320 pylons to be constructed in Ghana, a total tower base area of about 15 000 m² will be cleared and all roots removed for the purpose of the construction of the transmission line (Figure 8). The area to be cleared for a single tower will be made up of the dimensions of the tower base (for ex. 7m x 7m depending on tower design) with an additional buffer of 2m on the periphery of the base (in total 9m x 9m).



Figure 8 Tower-base and foundation

Tower foundations will vary according to the prevailing geology. A majority of them will however have footings of the pad and chimney type, which will be excavated mechanically. By this method, a concrete pad will be constructed at the bottom of the excavation, and each foot of the tower erected within its own 'chimney' of steel reinforced concrete. After about two days, the formwork will be removed and the excavation will then be backfilled to original ground level and consolidated.

The ground surfaces of the tower sites will be so graded as to gently provide drainage away from the tower legs and to avoid the collection of water (leading to the creation of stagnant pools) at the tower bases. Where necessary, (particularly on hillsides), terracing, cribbing or riprap may be used to provide protection for tower foundations.

In areas prone to flooding (swampy areas) a raft foundation for the transmission line towers may be used. The raft foundation is similar in concept to the pad and chimney foundation except all four feet of each tower will be set on a single raft of concrete.

4.5.6 Tower Assembly & Installation

Once foundations have achieved their designed strength, the towers will be assembled and erected. These works will be undertaken within the RoW to avoid any additional vegetation clearance. For such self-supporting towers, the construction materials will be delivered to the site, and the full assembly conducted at the tower locations. Construction time at each site will be short at approximately 3 days for the self-

supporting towers. Once a full section of towers has been assembled, the lines will be strung. This involves attaching pulleys to each isolator, threading a rope through these, and then pulling the conductor through, under tension, to ensure that no contact is made with the ground. Any damage to the conductor during this process (particularly any contact with the ground) will impair the line function. (Figure 9)



Figure 9 Tower Assembly and Installation

4.5.7 Storage and Transportation of Equipment and Materials

Almost all the materials to be used in the construction of the transmission line will be imported. Such components include tower steel and its components in broken down form, conductors, insulators, transformers, switchgear, etc. Materials that will be procured locally will include aggregates i.e. sand and stone, cement and other miscellaneous supplies and services. The imported components will be delivered by ship to either the Tema or Takoradi ports. After clearance from the ports, the materials shall be stored at the Contractor's storage site. It must be noted that the materials for the towers will not be bulky and unwieldy. They will therefore not require any specialized vehicles.

During construction, the materials will be trucked to the site via public roads and access tracks. Vehicle movements will be minimal since the site offices will be put close to the proposed line route.

The locations of the site offices cannot be specified now but their construction will not involve extensive vegetation clearance. In addition, the site/workers' camp will be constructed:

- at least 0.5 km from natural water courses and marshlands
- at least 1 km from settlements and on relatively level ground.

The location of the work camps will not impact negatively on cultural properties, and on forest reserves. It will also be located as to avoid the destruction of crops and buildings.

4.5.8 Commissioning

Final commissioning involves the testing of the towers to ensure that all steelwork joints are correctly made and are tight. The connection of the electrical plant will be checked, and once approved power connections are established. Commissioning of the line will take approximately one week.

4.5.9 Post Construction Demobilization

Upon completion of the construction phase and commissioning, the Project Contractor shall be responsible for all demobilization activities (involving systematic tasks such as equipment removal, material disposal, and document organization) per the requirements of the contract agreement documents.

4.5.10 Erection of Towers and Stringing of Transmission Lines

After transporting the steelwork and its components to the construction yards the transmission towers will be erected. Typically for a 330 kV and other high voltage transmission line, the average span between towers will be about 400m giving a total number of towers for this project in Ghana of about 320 pylons. The towers will have concrete footings with foundation depths of 3m or more depending on the nature of soils at the selected tower spots. Once the towers are erected, the conductors and shield wires will be strung and appropriately 'tensioned' to provide the minimum clearance (8 m) between ground level and the lowest conductor.

River Crossings and Key Details

The proposed transmission line is expected to cross several overhead electricity distribution lines, rivers, and streams. On the Ghana side, the major rivers that the transmission line will cross are:

- Boin River (Border): Serving as part of the frontier, this river spans a key crossing point between Ghana and neighboring regions.
- Disue River: Known for its moderate flow during most of the year, but with a history of swelling significantly during rainy seasons.
- Tano River: One of Ghana's longest rivers, flowing from the Bono region to the south-western coast, with a high-water level during peak rainy seasons.
- Ahuro River: A tributary known to flood occasionally in low-lying areas during heavy rains.
- Mamire River: A smaller watercourse, but prone to seasonal flooding and erosion along its banks.
- Yaya River: This river experiences mild seasonal variations but can reach higher flood levels during particularly heavy downpours.
- Merechu River: Known for its varying flow rate, which intensifies during heavy rains and poses a risk of flooding in nearby communities.

In crossing these water bodies, the transmission line design incorporates safety features to mitigate potential impacts from these rivers' fluctuations, particularly during the rainy season.

River's Highest Water Level and Statistics

The river height clearances were determined based on hydrological data from local meteorological and environmental agencies. Historical water level data during peak rainy seasons over the past decade were analyzed to define the highest water levels for each river. For example, the Tano River's highest water level during the rainy season has been recorded at approximately 400m meters. The project team has used this information to ensure adequate safety margins and has applied a minimum clearance of 8 meters between the lowest conductor and the highest possible water level.

Guard structures will be employed where the line crosses overhead electrical distribution lines, communication lines, and roads. These structures are essential for ensuring that the power line does not create hazards or disturbances to existing infrastructure.

Transmission Tower Heights and Clearances

Based on the line survey and river crossing data, the average river crossing span is approximately 300 meters, ranging between 200 and 400 meters. Given the need for an 8-meter clearance, along with the rivers' highest water levels and a safety margin of 10 meters (ranging between 5 and 15 meters), the conductor attachment height at the towers will be approximately 33 meters, with total tower heights reaching around 50 meters.

Once the towers have been erected and the lines strung, comprehensive testing and measurements will be conducted to verify that the transmission line performs as expected. Special attention will be paid to the clearances between the lines and the ground to ensure compliance with safety standards. The lines will also be tensioned according to the project specifications.

Soil and Environmental Considerations

After the construction of the transmission line, the soil conditions along the right-of-way will be assessed for potential issues, such as soil compaction or erosion. Bare soil areas will be left to naturally re-colonize with native vegetation, helping to stabilize the soil and mitigate erosion risks.

Consideration of Extreme Weather Events, Including Flooding

One critical addition to the project planning is the need to consider extreme weather events, including flooding. As climate change accelerates, the frequency and intensity of such events are likely to increase. To address these risks, the project team will incorporate designs that account for extreme flooding events in vulnerable areas, particularly around river crossings. Flood-resistant infrastructure, additional drainage

measures, and adaptable designs will be put in place to ensure the safety and longevity of the transmission line.

The line will be fitted with an optic fibre cable/ Optic Ground Wire (OPGW), which will be used for system protection, control and communication purposes. (Figure 10)

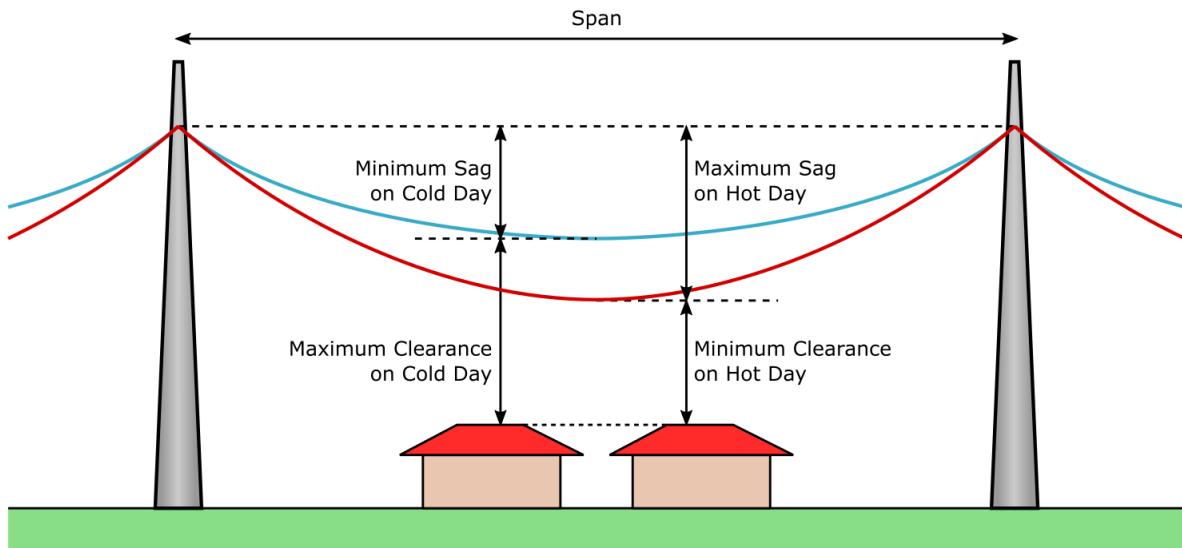


Figure 10; Erection of Towers and Stringing of Transmission Lines

4.5.11 Substations Construction

A location layout plan has been developed for the Substation construction. The substation shall be constructed at the terminal point of the line at Bibianiha near Dunkwa-on-Offin and shall be dubbed Dunkwa II Substation. Construction shall involve the casting of all the necessary concrete foundations required to support the new equipment. Once these have achieved a suitable strength, the electrical equipment will be delivered and mounted. This involves the use of heavy lifting equipment to position the plant followed by wiring and connection. All oil-filled plants will be charged with suitable oils once this equipment is in place.

Construction Process and Design Scheme

The substation construction will begin with the preparation of the site, followed by the casting of reinforced concrete foundations. These foundations will support the substation's major equipment, including transformers, circuit breakers, switchgear, and control panels. The concrete must be designed to meet load-bearing requirements and withstand both operational stresses and environmental factors, such as soil conditions and potential seismic activity.

Once the concrete foundations have cured and reached the required strength, the electrical equipment will be delivered and installed. This phase involves the use of heavy lifting machinery to position the components, such as transformers, which will then be wired and connected according to the substation design.

Oil-filled equipment, such as transformers, will be charged with suitable insulating oils. Based on industry standards and environmental safety considerations, the use of non-PCB (polychlorinated biphenyl) oils, such as biodegradable ester-based oils or mineral oils with low toxicity, will be prioritized. PCB oils are highly discouraged due to their environmental and health hazards. All oil-handling operations will be conducted with care to prevent leaks and spills, and **oil containment systems** will be installed around transformers to mitigate any accidental discharges.

Safety and Infrastructure Considerations

To ensure the safety of both the substation and the surrounding area, the following features will be included in the design:

1. **Fencing:** The substation will be **fully fenced** to secure the site and prevent unauthorized access. The fencing will be designed to meet security standards, with gates and access control systems for staff and maintenance teams. Signage warning of high-voltage hazards will be prominently displayed.
2. **Workstation and Staffing:** The substation will include a **control room** or **workstation** for monitoring and operating the equipment. This workstation will be equipped with control panels, monitoring devices, and communication systems. The substation will also accommodate staff, including technicians and operators, who will manage the daily operations and maintenance tasks.
3. **Drainage System:** To prevent waterlogging and damage to equipment, a **comprehensive drainage system** will be constructed. This system will be designed to manage rainwater runoff and any other water ingress, particularly during extreme weather events such as heavy rains. Proper grading of the site and the use of storm drains will ensure that water is efficiently directed away from critical equipment.
4. **Lightning Protection:** The substation will be equipped with a **lightning protection system** to safeguard against lightning strikes, which could cause significant damage to the equipment. **Lightning arresters** and **grounding systems** will be installed to channel lightning energy safely into the ground, minimizing the risk of electrical faults or equipment damage.
5. **Fire Prevention and Safety Systems:** Given the presence of oil-filled transformers, fire prevention measures will be integral to the design. The substation will be equipped with **fire suppression systems**, including fire extinguishers, and containment pits to capture and contain any oil spills that could lead to a fire hazard.
6. **Environmental Safeguards:** Measures will be taken to ensure that the construction and

operation of the substation comply with environmental regulations. This includes managing noise levels during construction, controlling dust emissions, and ensuring that all waste, including oil and electrical components, is properly disposed of.

Recommendations for Further Consideration

In addition to the design elements outlined above, it is recommended that the following features be further considered or enhanced:

- **Backup Power Supply:** Installing a backup power generator to ensure continuous operation of critical equipment in case of grid failure.
- **Surge Protection:** Including additional **surge protection devices** for equipment sensitive to voltage spikes and surges, particularly during grid disturbances or switching events.
- **Sustainability:** The possibility of incorporating renewable energy sources such as solar panels to power auxiliary equipment and lighting within the substation.

Testing and Commissioning

Once all equipment is in place, **extensive testing and commissioning** activities will be carried out to ensure the substation operates safely and efficiently. This will involve tests on insulation resistance, transformer integrity, switchgear operation, and system synchronization. The substation will not be brought online until all systems have passed the necessary tests and comply with operational standards.

The Dunkwa II Substation will be constructed with safety, security, and operational efficiency as priorities, integrating modern standards in equipment handling, environmental safeguards, and lightning protection. These design features will ensure the substation's long-term functionality and safety while minimizing environmental impact.

4.6 Operational Phase

The project's operational phase will include maintaining the RoW and all high-tension equipment in addition to commissioning the power line (pylons, conductors, substation and cables).

The operation and maintenance of the transmission line will be based on accepted international standards, such as those of the International Electrotechnical Commission (IEC). GRIDCo has its own specific procedures for the operation and maintenance of its lines as set out in the 'GRIDCo Corporate Safety Rules' and RoW management Policy. This document concerns itself with issues which are considered of paramount importance such as public security and the safety, health and welfare of maintenance crew.

The primary tasks to be completed during the transmission line's operational life cycle are vegetation control in the RoW, routine and emergency maintenance and repairs, and surveillance of the state of the conductors, towers, and RoW. GRIDCo in line with Legislative Instrument (L.I) 542 is mandated to maintain and protect its transmission line RoWs from hazards and encroachments. However, Regulation 1(g) (ii) of

the L.I authorizes GRIDCo to approve and regulate sustainable undertakings within the transmission line RoWs.

It is based on this legal framework that GRIDCo has recently developed a RoW Management Policy, which among other things set out guidelines for some sustainable undertakings to be permitted under the RoW including annual crop farming subject to approval by GRIDCo.

GRIDCo maintains a Transmission Department with headquarters in Tema that is responsible for the operation and maintenance of its transmission network in Ghana. The Company carries out its duties under three broad categories. These are discussed below.

4.6.1 Routine Running Maintenance

This comprises of the Department doing regular maintenance to guarantee the integrity and security of the lines. The following are some of the maintenance tasks completed here:

- Aerial surveillance by helicopter. This is done to ensure that potentially hazardous defects are pre-empted and the integrity of the line is maintained and sustained. This is done on an annual basis.
- Foot patrol. The Line Maintenance Team carries out routine physical examination of the transmission line and its component parts to ensure the safety, security and integrity of the line. Such activities are carried out yearly.
- Security patrol. This is done to check on segments of the line close to populated areas for signs of vandalism, theft of bolts and nuts, tampering, and general security of the lines. It is to ensure an early detection and rapid response to acts of vandalism and to rectify such situations as promptly as possible.
- Tower auditing and repairs. This provides a means of assessing the ageing process of towers. It starts one year after the commissioning of a line section and it follows a one-year cycle. In a cycle of tower auditing, 10% of all suspension towers and all dead-end towers are thoroughly examined. As the line ages, it is subjected to wear and fatigue which may not be noticeable by a distant visual inspection. Detection and tightening of loose bolts on support and hardware can reduce premature wear and indicate the need for replacement of worn components before failure.
- In the course of operation, all identified defects are repaired. Such defects may include the replacement of defective conductors, flashed over insulators, broken dampers, vandalized components, and maintenance of access tracks and RoW.

4.6.2 Major Maintenance

These are scheduled maintenance programmes that are carried out on the transmission line as a result of the ageing of towers, the conductors and various equipment in the substation. The repairs may also arise out of the running maintenance activities. These maintenance schedules are typically required since the lines pass through hazardous places (mining sites, industrial areas and coastal zones prone to salt spray). The following are a few of the tasks completed as part of the significant maintenance program:

- Re-insulation of sections of the transmission line
- Treatment of rust and re-painting of tower components
- Replacement of corroded towers and transmission line components
- Replacement of conventional bolts and nuts with anti-theft fasteners,
- Rehabilitation of access roads and tracks.

4.6.3 Emergency Maintenance

These are activities relating to correction of sustained line faults. These may span a whole spectrum of minor faults (e.g. insulator failure) to such major defects as tower failures. Some of the activities carried out under this programme include the construction of a temporary by-pass line to replace collapsed sections, reconstruction of the collapsed section as well as aerial and ground patrols to locate sustained line faults.

5 BASELINE ENVIRONMENTAL AND SOCIAL CONDITIONS

5.1 Data Collection Methodology

A reconnaissance survey was undertaken in December 2023 to gather the biophysical and socio-cultural data from the project zone of influence. Published district profiles of the Upper Denkyira East Municipal (Central Region), Wassa Amenfi Central District (Western Region), Wassa Amenfi West Municipal (Western Region), Wassa Amenfi East Municipal (Western Region) and Aowin Municipal (Western North Region) Assemblies were the main source of the secondary data for the baseline. The baseline which comprises primary and secondary data collected within the project area covered the following: Location and Size, Topography and Drainage, Climate, Vegetation and Soils, the Natural Environment, Water Resources, Climate Change, and Demographic Characteristics.

5.2 Upper Denkyira East Municipality

5.2.1 Location and Size

The municipality is situated between latitudes 5° 30' and 6° 02' North of the Equator and longitudes 1° W and 2° West of the Greenwich Meridian. It is bordered by Adansi South to the north, Assin North Municipality to the east, Twiffo Atti-Morkwa District to the south, Wassa Amenfi East to the west, and Upper Denkyira West District to the north-west. With 501.94 square kilometers of land, or 5.19 % of the Central Region's total land area, the Upper Denkyira East Municipality is quite small.

5.2.2 Topography and Drainage

The area falls under a forest-dissected plateau, rising to about 250m above sea level. There are pockets of steep sided hills alternating with flat-bottomed valleys. Dunkwa-on-Offin, the Municipal Capital, has a series of high lands circling it. The major river in the area is the River Offin. There are a number of streams which are tributaries to the river. Prominent among them are the Subin Ninta, Aponapon and Tuatian in the South, Afiefi and Subin in the North with the proposed transmission line route crossing Aponapon stream crossing in this district (Appendix IX).

5.2.3 Climate, Vegetation and Soils

Climate

The Municipality falls within the semi-equatorial zone, with its attributes. At 35°C in the hottest months and roughly 20°C in the coolest, the average annual temperature is maintained. A total of 120mm to 200 mm of precipitation occur throughout each of the two rainy regimes. September to mid-November is the second rainy season, while May to June is the first, with June being the heaviest. November through February is the primary dry season.

Vegetation

The Upper Denkyira East Municipality falls within the semi-deciduous forest zone. It consists of three layers which do not differ much from the rain forest. Evergreen trees are those found in the bottom levels and parts of the uppermost layers. This is a result of the area's typical moisture. Most of the secondary woods that remain are as a result of the growing cocoa industry and mining activity in the area, particularly in the northern portion of the Municipality. The forest is home to several valuable timber species, including *Triplochiton scleroxylon* (wawa) and *Khaya ivorensis* (African mahogany). The Benso-Benn Forest Reserve is the district's only significant forest reserve. Just 20% of the 86.03 square kilometers of total forest area is located inside the Upper Denkyira East Municipality. The settlements of Asikuma, Tegyemouso, Denyasi, Atobiase, Esaase, and Fawomanyo exist around the forest. The forest is home to a variety of highly valuable tropical hardwood species, including Edinam (*Entandrophragma angolense*), Mahogany (*Khaya ivorensis*), Odum (*Milicia excelsa*), and Wawa (*Triplochiton scleroxylon*). As a result, lumbering has contributed significantly to the district's economy. But because the forests outside of the reserves are not properly managed, this has caused several environmental issues including activities of Illegal chainsaw operators. In the Municipality, frequent bushfires have also contributed to various types of environmental degradation and the loss of forests. The majority of known species, including monkeys and antelopes, which were primarily located in woods, is currently in danger of being extinct.

The vegetation along the line route is mainly degraded fallow lands, cashcrop farms (palm, cocoa), cashfood crop farms (cassava, plantain), illegal mining (Galamsey). In this area, plant communities are often characterized by degraded forests, open scrublands, and grasslands, with pioneer species like *Chromolaena odorata* and *Andropogon gayanus* becoming dominant.

Soils

Forest ochrosols are the main type of soil present in the region. These soils have colors ranging from orange to brown. Compared to oxisol, the soil is not substantially leached. The soils are often alkaline and have higher levels of soil nutrients as a result of the less rainfall. They are the best soils in the nation in terms of crop productivity. The region is ideal for growing tree crops like oil palm and cocoa. Approximately half of the arable area in the Municipality is covered in cocoa. Other crops that perform well include plantains, cassava, and maize.

5.2.4 The Natural Environment

The Municipality is fighting small-scale miners, commonly referred to as "galamsey," in the fight against environmental deterioration. A significant amount of the Municipality's huge land area, as well as certain forest regions, have been degraded by their operations. A further obstacle to the green economy is the problem of illegal logging by chainsaw operators, both on and off reservations. Animals and other microbes are also becoming extinct as a result of it. The Municipality's Forest Services Division works to preserve and safeguard the forest by maintaining a patrol of forest guards to prevent illicit activities. In the Municipality, steps are also taken to guarantee the reforestation of endangered tree species. One cannot

undervalue the importance of waste management as a component of the green economy. In order to guarantee that waste is evacuated to the landfill, Zoomlion and the Municipality work together. However, because the dump site is full, the neighborhood is at risk of environmental contamination. Figure 11 shows degraded project area by the activities of illegal miners.



Figure 11: Degraded project area by the activities of illegal miners

5.2.5 Water Resources

Water situation has also been a burden on the Municipality since ensuring potable water embraces good health and development. The main sources of water in the Municipality are River (River Offin), Pipe borne water, boreholes, Small Town Water System and Wells. The water is used for household activities, drinking, fishing, "galamsey" activities to mention but a few. The following are the proportion of sources of water usage by household: 40.5% of households use pipe borne water, 34.6% use bore holes, 2.5% use unprotected wells, 0.1% use rainwater, 4.8% use bottled/sachet water, 14.0% use river/stream and 3.5% use others.

It could be deduced that majority of the household depends on pipe borne for drinking and for other domestic purposes due to the presence of Ghana Water Company and Small-Town Water Systems, followed by boreholes in the Municipality. However, some of the households have two or more sources of water for their household and other activities. Information gathered from the community assessment found out that (60) communities need boreholes. Also, about 2.5 representing about 355 of the household use unprotected well and this call for an intervention since the effect of water borne diseases cannot be underestimated.

5.2.6 Climate Change

The long-term modification of global weather patterns particularly, increases in temperature and storm activity, that is thought to be a possible outcome of the greenhouse effect is known as climate change, sometimes called global warming. It is the detectable rises in the mean temperature of the landmasses, seas, and atmosphere of Earth.

The two main aspects of the municipality's changes that have been seen are variations in temperature and rainfall patterns. The emission of greenhouse gases (such as chlorofluorocarbon (CFC) from excessively used cars), deforestation (the loss of woodlots for light industrial and residential uses), illegal mining operations, and construction near waterways or flood-prone areas are some of the causes mentioned as being specific to the Municipality. These are some effects of climate change:

- Dwindling water and forest resources
 - Perennial drying up of water sources due to drought
 - Drying up of wetlands
 - De-vegetation of the land
 - Hardening of soil
 - Destruction of habitat of fauna
- Soil erosion (leading to siltation of drains and water bodies).
- Changing rainfall pattern - adversely affecting agricultural development.
- Extreme Drought (Drying out of rivers and streams as a result of farming along river banks; and dumping of waste into the river beds).
- Flooding as a result of heavy rains leading to the destruction of lives and property in communities such as are Sofokrom, Atachem, Accra Town, Railway/Kyekyewere Station, Presentease, Mbraiam, and Gambia, among others.
- Threat to (extinction of) plants and animal species

The Municipal Assembly has implemented the following mitigation and adaptation strategies for climate change:

- Tree Planting
- Conservation of forests
- Sustainable (Physical) development
- Good landscaping with plants
- Construction of drainage system
- Water Harvesting
- Dredging of silted rivers and streams to allow for free flow of run-off water when it rains
- Strict enforcement of good building standards.

5.2.7 Demographic Characteristics

Population

The Municipality has 101, 273 residents in total. Males make up 49.16 percent and females 50.84 % of the overall population. There is an annual population growth rate of 3.3%. In the Municipality, there are roughly 97 males for every 100 females, or a sex ratio of 96.67. Compared to the national growth rate of 2.7 % annually, the present growth rate of 3.3 % is greater. A population's age and gender are its most fundamental traits, and they have an impact on a variety of demographic and policy issues. Every population has a unique age and sex composition, which represents the quantity and distribution of men and women in each age group. The social and economic circumstances of the population, both now and in the future, may be significantly impacted by this structure. There are differences in the Municipality's age cohorts, nevertheless. For instance, between the ages of 15 and 19, the population begins to decline significantly more in men than in women. A population pyramid can be used to better illustrate the structure of age and sex. The fertility, death, and migration rates all have a significant impact on the pyramid's structure. The fact that a higher percentage of people reside in rural areas must be noted. This is explained by the farming and mining that takes place in the rural areas. Living in rural areas makes up more than half (55.6%) of the population.

Age dependency is used to research the kind of support that is provided to the elderly and/or young. People 65 years of age and under make up a sizable share of the Municipality's population. The percentage of reliance in the Municipality is 74.2%. When compared to the Municipality's dependency ratio, the urban setting registers the greatest percentage, or 77.1%.

Land Tenure System: Land tenure in Denkyira traditional area is typically communal, with land owned by the community and allocated to individuals or families by the chief or traditional authority. Chiefs play a significant role in land distribution and management.

5.3 Wassa Amenfi West Municipal Assembly

5.3.1 Location and Size

The Wassa Amenfi West Municipal Assembly is situated between latitudes 5° 22'N and 5° 60'N and longitudes 2° 18'W and 2° 37'W. It contains more than 198 settlements spread across a total land area of 1448.6 square kilometers. The Prestea Huni Valley Municipality and Wassa Amenfi Central District border the municipality to the east, Sefwi Akontombra District and Sefwi Wiawso Municipality to the north, Jomoro Municipality and Ellembelle District to the south, and Aowin Municipality to the west.

5.3.2 Topography and Drainage

Generally, the landscape is undulating, with an average summit elevation of 153 meters (500ft). Rivers and streams are well-connected. Among them are the rivers Tano, Yire, Kwama, and Samre. During the

dry season, vegetable farmers in particular rely on these rivers for irrigation and domestic water needs. As a result, the district's several enclaves have severe water shortages. Despite this, the municipal area's socioeconomic development greatly benefits from the rivers and other streams. However, the majority of these rivers and streams are contaminated due to illicit mining (Galamsey) activities in the municipal area. Climate, Vegetation and Soils. The line route crosses river Tano in the wassa Amenfi West (Appendix IX).

Climate

The municipality is located in the wettest part of the nation. The north experiences 1500 mm of yearly rainfall, whereas the south receives 1750 mm on average. The two primary rainy seasons are from September to early December and from March to July. In terms of range and severity, there are two dry seasons that distinguish them: December through February and August. Temperatures are generally high ranging from 24°C -29°C (75°F -83°F). Maximum temperatures are in March and coolest month is August. The area is a good location for the development of both cash and food crops due to its climate. But the continuous, intense rains have a detrimental impact on the municipal roads, particularly the unpaved ones, which are mostly impassable during the rainy season.

Vegetation

The vegetation of the municipality is the moist semi-deciduous forest. The vegetation supports agricultural activities. The municipality has three (3) forest reserves covering a total area of 17,536 hectares as follows: Mamire Forest Reserve (4,814 ha), Fure Head Water Forest Reserve (7,192 ha) and Fure River Forest Reserve (5,503 ha) (Figure 12).

The forests contain many timber species like *Entandrophragma cylindricum* (Sapele), *Milicia excelsa* (Odum), *Khaya ivorensis* (African Mahogany), *Triplochiton scleroxylon* (Wawa), *Tieghemella heckelii* (Makore) among etc. Most are exploited to feed the two large expatriate wood processing firms' Samartex and SMS in Samreaboi and Manso Amenfi respectively. Some are exported mostly to European countries. A very small proportion feed the new indigenous wood processing concerns springing up lately. In addition, a few of the forest's plants and trees have significant therapeutic significance. Water bodies like the Tano and Tutua rivers are also protected by the forest. In addition, the district's numerous forests offer a natural habitat and friendly environment for a variety of animal species, including antelopes, monkeys, elephants, birds, squirrels, snails, and a host of other forest animal species that serve as a source of meat for both the local population and those living outside the district. The various animal species serve as tourist attractions and enhance the natural beauty of the area. The Forest Services Division's efforts to stop mining in the reserves have minimised the impact of small-scale and illicit mining (galamsey) activities. Nonetheless, there are a few cases where unauthorized miners work at strange hours while evading detection. In the forest reserves, there are also illicit chainsaw operations that have a detrimental impact

on the ecology. These actions deprive the Traditional Authority, the Assembly, and the Government of much-needed revenue.

The transmission line route does not intersect any designated forest reserves, with the closest reserve located approximately 2 kilometers away. The predominant land use along the route includes extensive cocoa farms, palm plantations, and rubber plantations, reflecting the area's agricultural focus. However, the area is significantly affected by illegal mining activities, commonly referred to as Galamsey, which has led to considerable environmental degradation. The presence of these mining operations has further altered the natural landscape, impacting soil quality and vegetation.



Figure 12: Aerial vegetational view of the project area

Soils

The granites and Birimian rocks (basalt-andesite-rhyodacite lavas, with elevated Mg-Ca-Na contents, and volcanics (Zitzmann et al., 1997) are connected to the geological soil formations found in the municipal area. Additionally, two primary agricultural soil groupings have been recognized. These are the forest ochrosol-oxysols and oxysols. Tree crops like coffee, oil palm, rubber, cola, and cocoa can be grown on the soil. Food crops like plantains, cassava, maize, rice, tomatoes, peppers, and garden eggs are also supported by it.

5.3.3 The Natural Environment

In years back, there existed diversity of life with much better opportunities for economic development and responsiveness to climate adaptation and change. Increase in population and the desire to use all means to exploit resources hidden in the earth without putting in measures to reclaim degraded lands has the

potential to deprive the future generation of safe environment. Activities of lumbering in the forest and reserve areas are gradually destroying the natural habitats of animals and birds. Rivers like Tano, Ankobra have been polluted to the extent that it becomes difficult to even treat for domestic purposes. Water Resources

For human health as well as for usage in home, industrial, agricultural, and mining operations, clean, readily available drinking water is essential. The municipal system offers several options for the supply of potable water. These come from pump-equipped hand-dug wells, automated boreholes, and pipe-borne Small Town Piped Water Systems. There are also rivers, streams, and wells that have been dug. The primary source of drinking water for residential units in the municipal system is a river or stream (27.9%), followed by a bore hole, pump, or tube well (23.4%). A total of 25.5% of the municipal drinking water sources are pipe-borne inside dwelling units (4.1%), pipe-borne outside dwelling units (9.9%), and public tap/standpipe (11.5%). In rural areas, rivers/streams account for 47.3% of households' drinking water supply, while bore-hole, pump, and tube wells account for 24.3%. In urban areas, protected wells account for 26.0% of the total, with bore-hole, pump, and tube wells coming in second and third, respectively (22.3%). Pipe-borne water is utilized more frequently in urban areas than in rural ones (13.9 % of households use all three sources combined). Pipe-borne water is used inside dwelling units (7.6%), outside dwelling units (15.7%), and public taps/standpipes (15.9%). Additionally, households in urban areas utilize sachet water at a rate of 4.1% compared to 0.5% in rural areas.

5.3.4 Climate Change

The municipality's development is aided by concerns about climate change and natural disasters. Planning appropriately to reduce such hazards would be made possible by an examination of the local climate's changing characteristics.

Thousands of people are displaced by flooding. In 2018, 1,678 persons were impacted. Flooding ruined lives, wrecked property, killed animals, damaged roads, bridges, and damaged supplies of gas, power, water, and communication, among other things.

Humans, animals, and fowl are all injured or killed by fires. In addition to causing property damage, fires can destroy priceless items, records, workplaces, homes, schools, and clinics, leaving people without a place to live.

Because of leaching, erosion results in infertile soil. Roads, homes, and other structures are also harmed or destroyed by erosion. Water-borne illnesses like cholera and others are brought on by pollution of water bodies. Because illegal miners have contaminated the majority of the municipality's water sources, it is dangerous to drink the water or use it for agricultural.

Mud-built, weak buildings have degraded in flood-prone areas, making occupancy challenging. Forests and farmlands have been destroyed and degraded as a result of illegal mining. Severe ditches with

subterranean water are another effect of it. It ruins lives once more. Disease outbreaks and air pollution are also caused by the dumping and piling of waste in unapproved locations.

5.3.5 Demographic Characteristics

Population

The population of the municipality is 105,000 comprising of 47,361 (51.4%) males and 44,791 (48.6%) females. Rural dwellers accounts for 58.6% of the population with the remaining 41.4% in urban centres.

The population size and age-sex composition have broad ranging consequences for a number of socio-economic indicators such as the welfare of the people. It must be noted that 41.4% of the total population were in the 0-14 age group. Sex ratio is the number of males per 100 females in a population. The sex ratio of 105.7 is indicative that, relatively, males outnumber females in the municipality.

Age-dependency ratio is a measure of the dependent population made up of those below 15 years and 65 years and older, to the independent population, that is, those in the 15-64 age group. The ratio is used to measure the burden borne by those in the working age group. The 48-age dependency ratio for the municipality is 80.3 implying that the proportion of those who depend on the independent group for their sustenance is high. This may have adverse effect on savings for the age cohort 15-64years thereby putting pressure on the Municipal Assembly and Government to increase social interventions like Livelihood Empowerment Programme (LEAP), School Feeding Programme and the Assistantship to needy but brilliant students among others.

The population density of the municipality has risen from 64 persons per square kilometer to 78 persons per square kilometer, indicating that currently, more pressure is being exerted on available land for farming as well as domestic and industrial purposes. This therefore enjoins the Assembly to ensure effective utilization of land especially in the capital as well as other zonal council centres; acquisition of land banks by the Assembly should also be a priority.

5.3.6 Culture and Tradition

The Wassa Amenfi West Municipal has three divisional areas and chiefs who pay homage to the Paramount Chief (Omanhene) of the Wassa Amenfi Traditional Area at Wassa Akropong. These three divisional areas within the municipality are Asankrangwa, Breman and Moseaso. Below the divisional chiefs are the sub-chiefs (Odikro) for minor settlements. Tradition has it that, the people of the municipality are a mixture of migrants from Akwamu, Ashanti, Assin and Ivory Coast. The cultural practices and characteristics of the people are not different from other Akan settlements. Inheritance is through matrilineal lineage whilst funerals, chieftaincy and marriage rites are purely of Akan origins. Like other Akan groups, there are five (5) notable clans namely: Agona, Abrade, Asona, Bretuo and Ahene. Every third Friday of the month is observed as taboo day and no one is supposed to go to farm at Asankrangwa. This is referred to as Adum.

In certain communities of the municipal area, it is also a taboo to rear or keep goats especially in communities where the Tano River drains. The major festival of the people is the Yam Festival, which is celebrated annually between March and April to herald the harvest of the water yam. The Adipa festival is celebrated to offer thanks and food to the gods for bumper harvest and for protection throughout the year. The Chiefs are the custodians of the land and have leased some to family members, migrant farmers, private organizations/individuals etc.

On ethnicity, the Akans constitute the largest ethnic group (77.5%) of the total population. Other minority ethnic groups are Mole Dagbon (7.0%), Ewe (6.0%), Ga Dangme (4.8%), Guans (1.8%), Grusi (1.1%), Gurma (0.8%), Mande (0.7) and all other ethnic group forms 0.4%.

Religious Affiliation Every citizen in Ghana is enjoined by the 1992 constitution to have freedom of worship and may choose to join any religious group provided the practices of the said group are consistent with the same constitution. The majority (80%) of the people are Christians (Catholic, Protestants, Pentecostal/Charismatic and other Christians) followed by Islam (12%). Only a small proportion of the population are adherents of the traditional religion (1%) or other religions not specified whilst those not affiliated to any religion account for 6%. Although there is religious pluralism, practitioners co-exist peacefully.

Land Tenure System: In Wassa Amenfi traditional area, land tenure is generally based on communal ownership with rights granted by traditional leaders. Land use and inheritance are governed by customary laws, with the chief having substantial authority over land allocation.

5.4 Wassa Amenfi East Municipal Assembly

5.4.1 Location and Size

In August 2004, the Wassa Amenfi District Assembly was dissolved and replaced with the Wassa Amenfi East Municipal Assembly, which was established as a district under Legislative Instrument (L.I) 1788. On March 15, 2018, it was proclaimed and given the official status of a municipality by Legislative Instrument (L.I) 2289.

The Municipality is situated in the region's center. It is 1,558 square kilometers in size and is located between latitudes 5° 30' N and 6° 15' N and longitudes 1° 45' W and 2° 11' W.

Its borders are as follows: Upper Denkyira West District and Upper Deykira East Municipality to the north, Prestea Huni Valley Municipality to the south, Mpohor District to the east, and Amenfi West Municipality to the west.

As per the 2021 population and housing census, the Municipality has a total population of 175,696 people, comprising 95,283 males and 84,413 females.

5.4.2 Topography and Drainage

With an average summit elevation of 155m, the terrain is primarily undulating (500ft). A good network of streams and rivers exists. Among these, the rivers Manse and Ashire are notable and the proposed transmission line crosses them (Appendix IX). During dry seasons, the quantities of these rivers and streams significantly decrease. During dry seasons, most streams entirely dry up, even though they are mostly needed for residential and consumer needs.

5.4.3 Climate, Vegetation and Soils

Climate

The project area is located in the nation's belt of rainfall, which experiences high annual precipitation, contributing to lush vegetation and a diverse ecosystem. The range of the yearly average rainfall is 1400 mm to 1730 mm. Extremes can occasionally reach 2100 mm. There are two primary patterns of rainfall. The first one begins in March and runs through July, while the second one begins in September and runs through the first half of December. Most of the year, there are typically high temperatures between 24°C and 29°C (75° and 83° F). March has the highest temperatures, while August is the coolest month.

Vegetation

Thick vegetation cover is the result of significant rainfall and several types of soil interacting. The Municipality is covered with semi-deciduous forest types. There are four forest reserves in the district, totaling 212.62 square kilometers. These are the forest reserves in Opon-Manse, Bowie, Tonton, and Angoben. Antelopes, monkeys, and elephants can all find a natural home in the forest reserves. Birds and snails use it as a habitat as well. The residents can also obtain high-value medicinal herbs and trees from the reserves. These forests contain species of trees like *Entandrophragma cylindricum* (Sapele), *Milicia excelsa* (Odum), *Khaya ivorensis* (Mahogany), *Triplochiton scleroxylon* (Wawa), and others. There are vast tracts of bamboo in other regions of the forest zone that could be used for socioeconomic development.

The transmission line route does not intersect any designated forest reserves, with the closest reserve located approximately 2 kilometers away. The predominant land use along the route includes extensive cocoa farms, cassava, pepper and garden eggs, reflecting the area's agricultural focus. However, the area is significantly affected by illegal mining activities, commonly referred to as Galamsey, which has led to considerable environmental degradation. The presence of these mining operations has further altered the natural landscape, impacting soil quality and vegetation.

Soils

Three main geological soil formations identified in the district are: Upper Birimian, Lower Birimian and Granites. The granite deposits in the district make most parts of it rich in minerals like gold. Two main

agricultural soil groups identified are forest ochrosol-oxysols found in the northern parts and oxysols in the southern parts. Large enclaves of clay deposits are also available.

5.4.4 The Natural Environment

The project area offers a diverse range of living conditions along with improved prospects for economic growth and adaptability to changing climate conditions. Future generations may be deprived of a safe environment due to population growth and the desire to employ all available means to extract riches hidden beneath the surface of the planet without taking action to recover degraded regions. The natural habitats of animals and birds are being steadily destroyed by activities related to lumbering in the forest and reserve regions. It is now difficult to use rivers for residential purposes due to their extreme pollution.

5.4.5 Water Resources

In the project area, 35.2% of households use river/ stream as main source for drinking water, followed by bore-hole/pump/tube well (23.4%). The main source of drinking water for urban households is pipe-borne outside dwelling (44.8%) while it constitutes a mere 15.4% for households in rural areas. Rivers/ streams constitute 37.9% of main source of drinking water for rural households but it constitutes only 1.6% of source of drinking water for urban households. This means a large proportion of households in the municipality still do not have access to improved source of drinking water.

The source of water, especially that used for drinking, has a significant impact on the prevalence of diseases. For example, a decrease in diarrhea is one of the primary health advantages of a clean drinking water supply. With the exception of 11.5 percent of urban homes who utilize protected wells for other domestic purposes, the source of water for domestic use was comparable to that of drinking water. It is clear that the district's rural areas are more likely to rely on boreholes, pumps, or tube wells.

5.4.6 Climate Change

Natural disasters and climate change issues contribute to the municipality's development. Analyzing the changing features of the local climate would enable suitable planning to minimize such threats.

5.4.7 Demographic Characteristics

Population

Wassa Amenfi East Municipal recorded a population of 83,478 (year?). Persons between the ages 0-4 years (15.2%) have the highest proportion among the age groups. This is closely followed by age groups 5-9 years, 10-14 years with 13.8% and 12.9% respectively. The age group 80-84 years constitutes 0.5% with 85 years and older having the least proportion of 0.4%. Of the Municipality's total population (83,478), there are more males (51.4%) than females (48.6%). Within the age group 0-4, there are slightly more females (15.5%) than males (15.1%). The proportion of females in age groups 80-85 and 85 years and

older is 0.6 percent and 0.5 % respectively. These proportions are higher compared to their male counterparts, which is 0.4% in both age groups.

Sex ratio is the ratio of males to females in a given population, usually expressed as an index of the number of males for every 100 females. Out of the total population of 83,478 in the municipality, there are more males (51.4%) than females (48.6%) and this translates into a sex ratio of 105.7 males to 100 females. The percentage of the district's share of the regional population is 3.5%. In urban areas, sex ratio is 94.4 males to 100 females, whereas in rural areas in the district, sex ratio is 106.6 males to 100 females, showing more males than females in the rural areas as against the urban areas

In addition, out of the total population of 83,478, persons under 15 years have the highest proportion of 42%. This is followed by persons within the age group 30-59 who constitutes 25.6%. Persons 60 years and older constitute the least in the district with 5.5 percent. For the sexes, there are more males under 15 years (42.2%) than females under 15 years (41.7%).

Age Dependency is the ratio of persons in the dependency ages (generally under age 15 and 65 years and older) to those in the working age group (15-64 years) in a population. The age dependency ratio indicates that the district has a high working population of 54.3% of which males and females are about equal proportions of 54.1 percent and 54.0 percent respectively. Child dependency ratio is 77.4 while old age dependency ratio is 6.9. The total dependency ratio of the district is 84.3.

5.4.8 Culture and Tradition

The project area's predominant ethnic group is Wassa. Other minor ethnic groups include the Nzemas, Sefwis, Asantes, and Akyems, though. The existence of migrants seeking work in the district's mining, agricultural, and other economic sectors explain the presence of various ethnic groups. The Wassas share a common cultural background with regard to inheritance, succession, and ancestry. The matrilineal structure of kinship and descent upholds the custom of inheritance.

Like in the rest of the nation, the chieftaincy institution plays a significant role in the municipality's social structure. One of the three historic Wassa districts, the capital city of the Amenfis is Wassa Akropong, which also serves as the home of the paramount chief for the region. The Omanhene serves as the chairman of the Traditional Council in accordance with custom. Under the Omanhene, there are roughly forty-five divisional heads in all.

The Kokrobo Oman Kwantukesie festival, which takes place every year in March and April, is the district's main celebration. One of the smaller holidays observed in the district is the Bermutuo festival, which is marked by a time of stillness and quietness as well as some stool-cleaning rites performed by the traditional authority.

The district's primary and predominate religion is Christianity. The district is home to a variety of Christian denominations, including Methodist, Pentecostal, Charismatic, and Catholic. Islam and traditional religions are the other religious persuasions.

The project area is home to a number of heritage sites. Lake Broso is a naturally occurring lake in the district. The district and the nation stand to gain from the development of this into a complete website. Other tourist attractions in the district include a sacred stone in Asrewadi Forest, sacred tree species at Moseaso and Manseso, an underdeveloped waterfall at Akwadaakro, and a cave at Tawiahkrom. However, these are underdeveloped areas.

Land Tenure System: In Wassa Amenfi traditional area, land tenure is generally based on communal ownership with rights granted by traditional leaders. Land use and inheritance are governed by customary laws, with the chief having substantial authority over land allocation.

5.5 Wassa Amenfi Central District Assembly

5.5.1 Location and Size

The Wassa Amenfi Central District, with its administrative capital Manso Amenfi, was carved from Wassa Amenfi East and forms part of the new districts and municipalities created in the year 2012.

The Wassa Amenfi Central District is located in the middle part of the Western Region and lies between latitudes 5° 20'N and 6° 70'N and longitudes 2° 09'W and 2° 27'W. It has an estimated land size of 1,845.9 square kilometres with 131 communities.

It is bounded to the north by Bibiani Anhwiaso Bekwai Municipality and Upper Denkyira West District and Sefwi Wiawso Municipality; to the north-west by Aowin Municipality; to the south by Prestea Huni-Valley Municipality; to the east by Wassa Amenfi East Municipality and to the west by Amenfi West Municipality. The population of the District according to the 2021 population and housing census (PHC) stands at 119,117 with 63,212 males and 55,905 females.

5.5.2 Topography and Drainage

The topography of the project area is generally undulating with summits averaging 153m. The district is blessed with a good number of rivers and streams, including the Tano and Ankobra rivers. These rivers serve as sources of water for domestic and farming (irrigation) purposes, especially for vegetable farmers during the dry season.

5.5.3 Climate, Vegetation and Soils

Climate

The project area falls within the wettest parts of the country, with average annual rainfall ranging from 1500mm to 2200mm. The district experiences a bimodal rainy season; March to July and September to

early December. Temperatures are generally high ranging from 26°C – 27°C (75°F - 83°F) during the year. August is the coolest month of the year and the maximum temperatures occur in March. The district being one of the richest cocoa growing areas. The climate of the district is suitable for the growing of various crops, particularly both cash and food crops as stated earlier on. Nevertheless, the climate has put the district in an enviable position of being one of the leading producers of cocoa in the country. The good climatic condition provides high water table which is good for the drilling of boreholes and construction of hand-dug wells.

Vegetation

The project area falls within the high rain forest zone and is covered by the moist semi-deciduous forest type. The district has four forest reserves covering a total area of 425.14 kilometre square. Some trees and plants in the forest have high medicinal value. The forest also protects water bodies such as rivers Fure and Samire which also drain the district. The forest cover of the district is made up of closed forest (highly dense vegetation), moderately closed trees with herbs and bush cover, moderately dense herb/ bush with scattered trees and the open forest with sparsely inhabited trees. The various forests in the district also provide the necessary natural habitat and congenial atmosphere for different species of animals such as antelopes, monkeys, birds, squirrels, snails and a host of other forest animal species which provide the source of meat to not only the inhabitants of the district but those outside. The forests contain many economic tree species like *Entandrophragma cylindricum* (Sapele), *Milicia excelsa* (Odum), *Khaya ivorensis* (Mahogany), *Triplochiton scleroxylon* (Wawa), etc. Most are exploited to feed the wood processing firms. Some are exported mostly to European countries. The forest cover in the district also makes it very difficult for agriculture mechanisation. The land along the route is primarily used for agriculture, featuring extensive cocoa farms, palm plantations, and rubber plantations. However, illegal mining activities, known as Galamsey, have heavily impacted the area, resulting in significant environmental degradation.

Soil

The Wassa Amenfi Central District lies geologically within the Ghanaian Shield area which consists of the lower Proterozoic Volcanic and the Flyschoid Meta sediments of the Birimian System. The district falls within the Asankrangwa-Manso-Nkwanta Gold Belt which is associated with Birimian rocks. The rock type contains deposits of bauxite, manganese and iron-ore.

Two major soil groups are identified in the district. These are the Forest Ochrosol-Oxysols and Oxysols. These soils support the cultivation of tree crops such as coffee, oil palm, rubber, cola and cocoa. The soil type also supports the cultivation of food crops such as plantain, cassava, maize, rice, tomatoes, pepper and garden eggs. There is also a large deposit of clay which also supports building construction.

5.5.4 The Natural Environment

The project area offers a diverse range of living conditions along with improved prospects for economic growth and adaptability to changing climate conditions. Future generations may be deprived of a safe environment due to population growth and the desire to employ all available means to extract riches hidden beneath the surface of the planet without taking action to recover degraded regions. The natural habitats of animals and birds are being steadily destroyed by galamsey activities. It is now difficult to use rivers for residential purposes due to their extreme pollution.

5.5.5 Water Resources

In the project area, 35.2% of households use river/ stream as main source for drinking water, followed by bore-hole/pump/tube well (23.4%). The main source of drinking water for urban households is pipe-born outside dwelling (44.8%) whilst it constitutes a mere 15.4% for households in rural areas. Rivers/ streams constitute 37.9% of main source of drinking water for rural households but it constitutes only 1.6% of source of drinking water for urban households. This means a large proportion of households in the municipality still do not have access to improved source of drinking water.

The source of water, especially that used for drinking, has a significant impact on the prevalence of diseases. For example, a decrease in diarrhea is one of the primary health advantages of a clean drinking water supply. With the exception of 11.5 percent of urban homes who utilize protected wells for other domestic purposes, the source of water for domestic use was comparable to that of drinking water. It is clear that the district's rural areas are more likely to rely on boreholes, pumps, or tube wells.

5.5.6 Climate Change

Natural disasters and climate change issues contribute to the municipality's development. Analyzing the changing features of the local climate would enable suitable planning to minimize such threats.

In the municipality, there are extreme weather events. Flooding has caused thousands of people to be evacuated. Flooding, among other things, destroyed lives, destroyed property, killed animals, damaged roads, bridges, and supplies of gas, electricity, water, and communication.

Fires hurt and kill people, animals, and poultry. Fires can destroy irreplaceable objects, documents, offices, houses, schools, and clinics in addition to causing property damage, leaving individuals without a place to live.

5.5.7 Demographic Characteristics

Population

The population of Wassa Amenfi Central is 69,014, representing 2.9 % of the total population of the Western Region (2,376,021). Out of the total population of the district, males constitute 35,866 (52.0%)

and females 33,148 (48.0). The distribution of the population by age also shows the age group 0-4 as recording the highest proportion (15.2%) of the district's population which is followed by the age group 5-9 (14.2%). The district's population is youthful with about 43.0% below 15 years and just 3.3 % are reported to be 65 years and over. This leaves 54.0 % of the district's population in the economically active age group of 15-64 years, resulting in a high dependency ratio of 85. There is not much difference between the sexes in terms of the population by age. Sex ratio is quite high and averages 108.2. Sex ratio is higher than 100 in all ages except for ages 25-29, 30-34, 70-74 and 80 years and over where it is less than 100. This deviates from the national sex ratio of 95.2 and that of the Western Region which is recorded at 100. This could be explained by the male-dominated mining activities in the district which have the tendency to attract more male migrants (particularly the youth) than females to the district.

5.5.8 Culture and Tradition

Wassa is the dominant ethnic group in the district. However, there are other minor ethnic groups such as Nzema, Sefwi, Asante and Akyem. The Wassa are culturally homogeneous with respect to lineage, inheritance and succession. Like other Akan settlements, inheritance is through the matrilineal system. Funerals, chieftaincy and marriage rites are also purely of Akan origins. The language spoken by the people in the district is predominately Twi.

The institution of chieftaincy is an important component of the social organization of the district as in the rest of the country. The Wassa Amenfi Central District has a number of divisional chiefs who pay homage to the Paramount Chief (Omanhene) of the Wassa Amenfi Traditional Area at Wassa Akropong. Under the traditional setup, the Omanhene is the head of the Traditional Council. In all, there are more than forty divisional chiefs under the Omanhene.

The major Festival of the people in the district is the Yam Festival, which is celebrated annually between March and April to herald the harvest of the water yam. It is celebrated to offer thanks to the gods for bumper harvest and for protection throughout the year.

Christianity (82%) is the dominant religion in the district. Churches such as Methodist, Pentecost, Roman Catholic, Presbyterian and other denominations are found in the district. This is followed by Islamic Religion (10.1%) and Traditional Religion (0.8%).

Land Tenure System: In Wassa Amenfi traditional area, land tenure is generally based on communal ownership with rights granted by traditional leaders. Land use and inheritance are governed by customary laws, with the chief having substantial authority over land allocation.

5.6 Aowin Municipal Assembly

5.6.1 Location and Size

The project area is partly located in the mid-western part of the Western Region of Ghana between latitude five degrees twenty-five minutes and six degrees fourteen minutes North ($5^{\circ} 25' N$ and $6^{\circ} 14' N$) and longitude two degrees thirty minutes and three degrees five minutes West ($2^{\circ} 30' W$ and $3^{\circ} 05' W$). It covers a total land area of 2,607 square kilometres.

The project district share border with Aowin Municipal are Amenfi West Municipal to the east, Juaboso and Sefwi Akontombra Districts to the north, Jomoro Municipal to the south and the Republic of La Côte d'Ivoire to the west. The population of the Municipality according to 2021 population and housing census stands at 129,721 with 68,236 males and 61,485 females.

5.6.2 Topography and Drainage

Generally, the project area has undulating surface with more than half of the total area rising above 305 meters above sea level. The highest points are over 366 m above sea level. These highlands are located on the east of Enchi where they have formed a North-North West to South-South West alignment. The major perennial rivers that drain the district are Rivers Tano and Bia. There are a lot of tributary rivers which drain the Municipality. The well-known tributaries include Disue and Boin which drains north and south of the Municipality respectively and the proposed transmission crosses these two rivers (Appendix IX). The major rivers and their tributaries have formed a 'tree-like' network on the district landscape. Rivers and streams constitute an important source of water for domestic use in most communities.

5.6.3 Climate, Vegetation and Soils

Climate

The project area experiences Wet-Semi Equatorial Climatic conditions, with an annual average temperature of $26^{\circ}C$. March and April are the hottest months i.e. before the onset of the early rains. Rainfall pattern in the district is the bimodal type with June and October being the peak seasons. The annual rainfall average ranges between 1700mm and 2100mm. It is observed that the Northern part of the Municipality recorded annual average rainfall which was comparably less than what was in the southern part of the district. This can be attributed to the thick forests located in the southern part of the Municipality. Relative humidity is generally high, ranging between 75% and 80% during the wet season and decreasing to about 70% for the rest of the year.

Vegetation

The vegetation cover of the project is of two types namely the Tropical rainforest and the semi-deciduous forest. The main vegetation cover is the Tropical rainforest which covers almost the entire Municipality. The moist semi-deciduous forest covers only a small portion on the north-eastern part of the Municipality which is very close to Sefwi Akontombra District and Sefwi Wiawso Municipality. The land along the proposed transmission line route is primarily used for agriculture, featuring extensive cocoa farms, palm plantations and rubber plantations. However, illegal mining activities, known as Galamsey has heavily impacted the area, resulting in significant environmental degradation.

Soil

Acrisols and Ferralsols are the predominant soil types in the Municipality with appreciable dotted quantities of Fluvisols. These soil types have developed as a result of the forest vegetation and the climatic condition of the Municipality. The soils are rich in humus and suitable for crop production such as cocoa, oil palm and food staples. It is noted that the Northern and middle belt of the Municipality is covered with Acrisols with dotted spots of Fluvisols whilst the southern part of the Municipality is covered with Ferralsols.

5.6.4 The Natural Environment

Although the project area is endowed with natural resources such as water bodies, rock deposits, forest and gold, the state of these resources are varied. Illegal felling of timber, encroachment of forest through farming activities and pollution of water bodies are some of the challenges confronting the existence of some of the natural resources. Farming and extensive logging for example have contributed to fast depletion of the forest resources in the area. There is evidence that forest reserves in the Municipality have been greatly encroached upon as a result of farming and logging activities. For example, the Tano-Ehuro Forest reserve, which is about 176.10 square km, has been degraded through farming and logging activities.

The forest reserves in the Municipality are among a few relics in the country. Their benefits in terms of providing natural habitats for fauna and flora of rare species, protection of watersheds, creation of micro-climatic conditions and contribution to the prevention of global warming are critical for human existence and therefore have to be protected to serve future generation.

Dumping of refuse along water bodies is also a major negative effect of human activities on this resource which serves as a source of water for household activities, fish farming and dry season farming. River Disue and Boin are said to be polluted by the settlements through which they flow namely Enchi, Achimfo, Boinso etc.

5.6.5 Water Supply and Sanitation

Enchi, the Municipal capital enjoys potable water supply from Small Town Water facility. With this facility under-ground water is pumped through pipe to the homes and factories of the people in the town. One of such projects is located at Old Yakase, a community located about 5km from Enchi. Jema and Dadieso have also been selected to benefit from similar facility with funding from the European Union with match up fund from the beneficiary communities.

Similarly, the Municipal Capital, Enchi, would under the same programme, benefit from the construction of a new facility with an increased capacity to enable it produce sufficient water to meet the ever-growing population. The Assembly through various development interventions such as Village Infrastructure Project, Social Investment Fund, HIPC Relief Benefit and Sefwi Wiawso Catholic Development Assistance has constructed an additional one hundred and ten (110) boreholes, fifty-eight (58) hand-dug wells with pumps throughout the district to increase access to potable water for good health and development. The Assembly has also stepped up efforts at improving sanitation at Enchi by procuring additional refuse containers and a tractor. Provision of household toilets in collaboration with house owners has been undertaken on a pilot stage and would be scaled up to include all major towns to solve the problem of inadequate liquid waste disposal facilities. The Assembly has also provided six (6) Public Toilets in the major towns to cater for travelers and strangers who visit these centres.

5.6.6 Climate Change

The project area's development is aided by concerns about climate change and natural disasters. Planning appropriately to reduce such hazards would be made possible by an examination of the local climate's changing characteristics.

Thousands of people are displaced by flooding. Humans, animals, and fowl are all injured or killed by fires. In addition to causing property damage, fires can destroy priceless items, records, workplaces, homes, schools, and clinics, leaving people without a place to live.

Because of leaching, erosion results in infertile soil. Roads, homes, and other structures are also harmed or destroyed by erosion. Water-borne illnesses like cholera and others are brought on by pollution of water bodies. Because illegal miners have contaminated most the municipality's water sources, it is dangerous to drink the water or use it for agricultural purposes.

5.6.7 Demographic Characteristics

Population

The short -medium term plan (for which period) of the district indicated a total of 117,886 persons in the Municipality, with the male and female proportions given as 61,262 and 56,624 respectively. The report indicated that, the proportion of the population in the various age groups decreases with increasing year, with the age group 0-4 years having the highest proportion of about 15 percent and those above 85 years forming just 0.5 percent.

Similar distribution of the population among the various age groups can be seen among both males and females. As males decrease from 14.7 percent among the 0-4 age group to 0.5 percent, females also decrease from 15.1 percent to 0.5 percent respectively. This distribution conforms to both the Regional and National age composition of Ghana's population.

According to the plan, more males (61,262) were recorded in the Municipality than females (56,624). This phenomenon was reflected among the age groups. However, high proportions of males and females (40.8%) were below 15 years, a situation that needs critical attention such as the provision of basic school and health infrastructure.

Again, a small proportion of the population was above 60 years (4.5%) reflecting a low life expectancy. The plan also clearly spelt out that significant proportion of the population are found between 15 and 59 years where the active labour force is constituted.

The analysis of the age and sex structure of the population is best represented. The Figure generally shows a broad base and a narrow peak indicating that the district has a youthful population, a built-in momentum for further rapid increase and therefore the need to strengthen efforts at managing the population. As the male population show a smooth gradient, that of the female is a little undulating indicating the probability of age misreporting among the females. The age dependency ratio of a population is the ratio of a population in the dependent ages to those in the economically productive ages in a population. Dependent ages are classified to be those under 15 years and 65 years and older while the economically productive ages are those 15 to 64 years. Age dependency shows the economic burden that falls on the working population as such, populations with higher birth rates (with more people below 15 years) tend to have more burdens.

About 77.8 percent of the population depends on 100 people. However, the female dependency (79.3) is higher than that of males (76.4%). Due to the large nature of the population below 15 years, 72.5 children depend on 100 working population while 5.3 elderly depend on the same population. Contrary to the total dependency ratio, there are more elderly male dependents on the working group than females.

5.6.8 Culture and Tradition

The project area is partly made up of two traditional areas namely Aowin Traditional Area with its seat at Enchi and Suaman Traditional area whose headquarters is located at Dadieso. The heads of the Traditional areas are called Paramount Chiefs who rule with the support of other divisional chiefs.

Historical records indicate that the Brusas are among the people who settled in Techiman from Sudan in the 12th-Century.

It is believed that when these settlers including the Brusas realised that their population was increasing rapidly, they moved out from Techiman to Moree on the Coast near Cape Coast. It is said that the Brusas among other settlers found big whales which transported them along the coastline. The other settlers such as the Nzemas settled in the Akobra Basins down to the present day Half Assini. The Brusas being typical farmers, moved north east to the forest zone. Another historical source has it that the Suaman people at the present day Dadieso migrated from neighbouring La Côte d'Ivoire and settled along River Bia.

Oral history tells that the River was so hostile that they lost a lot of people through drowning. They therefore decided to move to a safer place which is their present place of abode.

The Aowin divisional area has a traditional festival called "Ellue" or Yam Festival. The yam festival is celebrated annually. The festival ushers in the new farming season and it is used to thank the gods and pray for another bumper harvest.

Land Tenure System

In the Aowin Municipal traditional area of Ghana, land tenure is primarily governed by customary practices where traditional leaders allocate and manage land based on communal and family systems. Land ownership and use rights are typically derived from community consent and follow traditional inheritance patterns, which can be matrilineal or patrilineal. Efforts are underway to integrate statutory land registration and management systems to formalize and secure land transactions, though challenges persist in harmonizing these with customary practices.

5.7 Biodiversity along the Proposed 400/330 Côte d'Ivoire Ghana Transmission line Route

The biodiversity assessment, conducted as part of the Environmental and Social Impact Assessment (ESIA) for the 400/330 kV Côte d'Ivoire-Ghana Transmission Line reinforcement project (see Appendix X for detailed report), evaluated the potential impacts of the project on flora and fauna along a 125 km route spanning from Babianiha near Dunkwa to Omanpe. The study area covers a 40-meter-wide Right-of-Way (RoW) and includes a range of land uses, such as cocoa farms, oil palm and rubber plantations, food crop farms, fallow lands, and riparian marshes.

Ghana is renowned for its rich birdlife, with 36 Important Bird Areas (IBAs), several of which are located near the project area. The biodiversity assessment recorded 71 bird species along the transmission line route using visual and auditory identification methods during early morning and late afternoon surveys. While most bird species observed are of Least Concern according to the IUCN Red List, the project route does intersect critical bird habitats, particularly in the riparian and marshland areas where migratory bird species are known to frequent.

These notwithstanding, it is essential that the design of the transmission line includes bird beacons to prevent bird collisions, especially in areas near IBAs or where bird activity is high. Bird collisions with transmission lines pose a significant risk to both local and migratory bird populations. Incorporating bird beacons along the line will mitigate these risks and ensure the safety of bird species that traverse the region.

Flora and Endangered Tree Species

The vegetation within the RoW primarily consists of secondary and tertiary growth, largely shaped by human activity in agricultural areas. The survey identified 108 vascular plant species, with notable tree species such as *Milicia excelsa*, *Terminalia ivorensis*, and *Khaya ivorensis* all of which are crucial components of local ecosystems.

The IUCN Red List flagged seven plant species as globally threatened, including *Milicia excelsa* and *Nesogordonia papaverifera* (both classified as vulnerable). However, the assessment confirmed that no endangered tree species are located directly within the RoW or at the proposed substation site. Nevertheless, close monitoring during construction is recommended to ensure that no protected tree species are inadvertently affected.

5.8 Illegal Mining Activities (*Galamsey*) within the Project Right-of-Way

Analyses of aerial images of the project Right-of-Way and its immediate environs and preliminary routing transmission line route suggest that there are approximately 42 informal small scale mining sites scattered across the proposed project Right-of-Way. Cumulatively, these activities occupy 29.9 acres (2.4%) of the project Right-of-Way. It is not very clear from the imagery whether these sites are active and abandoned but anecdotal evidence suggest that a large majority of these are inactive and illegal. They are concentrated around seven (7) communities as detailed in Table 4 (Maps of the *illegal Small Scale (galamsey)* sites in the RoW are attached as Appendix xvi).

Table 4: Communities with Mining Pits/Areas

COMMUNITIES AVERAGE DISTANCES TO GALAMSEY SITES

S/NO:	COMMUNITY	AVERAGE DISTANCE TO THE GALAMSEY SITES
1	Nkonya	1 Km
2	Nananko	1.5 Km
3	Wassa Jakpa	1.6 Km
4	Wassa Dadieso	1.5km
5	Wassa Akropong	2.0 Km
6	Wassa Nsuaem	1.0 Km
7	Yirase	2.8 Km

In Ghana, "*galamsey*" refers to illegal small-scale mining activities. *Galamsey* illegal because it is undertaken without valid mining licenses from the Mineral Commission as stipulated in Minerals and Mining Act, 2006 (Act 703) and/or non-adherence to environmental and safety regulations as required by Environmental Assessment Regulations, 1999 (LI 1652). The illegal miners tend to be itinerants; their length of stay at a particular site is normally short between 2 to 6 months depending on the availability and quantity of gold deposits in the area. The illegal miners use simple tools such as pickaxes, sluice boxes, shovels and, occasionally, water pumps, explosives and washing plants in rudimentary designed mines but a few have mechanized their operations including the use of *Changfang motors*¹, excavators, and bulldozers. The miners either lease or forcefully annex the lands on which they operate.

Landowners were not willing to discuss the nature of lease or rental agreements between them and the illegal miners for fear of being exposed as supporting an illegality. Government decision to enforce the provisions of the Minerals and Mining Act, 2006 recently, has further driven these illegal miners underground making it extremely difficult to reach any of the groups within the vicinity of the Right-of-Way for engagement and comprehensive data collection. While *galamsey* provides income for those who participate in this activity in the project RoW and its environs, it has significantly far-reaching adverse environmental and social impacts/risks such as:

- Environmental damage: The activities of *galamsey* lead to deforestation, soil erosion, and contamination of water bodies with chemicals like mercury and cyanide used in gold extraction.
- Health hazards: The use of toxic chemicals and unsafe mining practices pose risks to the miners' health and the local communities where they operate.
- Impact on agriculture: *Galamsey* displaces farmlands, rendering them unsuitable for agriculture due to the extensive damage done to the soil and water systems.
- Social issues: There is a strong link between *galamsey* and other illegal activities, such as child

¹ large floating contraptions used by *galamsey* operators to wash the core during mining

labor, prostitution, drug addiction, conflicts, Gender Based Violence (GBV), Sexual Exploitation and Abuse (SEA), Sexual Harassment (SH) and unsafe working conditions. The practice also sometimes results in deadly mining accidents.

The prevalence of *galamsey* within the project zone of influence poses significant risks to the project's infrastructure. These mining activities (abandoned or active) often create pits and destabilize the soil structure, which can undermine the foundations of transmission towers. *Galamsey* is a national environmental and social problem in Ghana, outside the scope of this project.

6 PUBLIC PARTICIPATION / STAKEHOLDER ENGAGEMENTS

6.1 Public Consultations

The consultations carried out for the 400/330 kV Côte d'Ivoire-Ghana Transmission Line Project involved key stakeholders including the Wassa Amenfi Traditional Council, Upper Denkyira East, Wassa Amenfi West, Wassa Amenfi East, Aowin Municipal Assemblies, and the Wassa Amenfi Central District Assembly. These engagements included the 14 affected communities to raise awareness about the project and receive inputs, particularly on minimizing impacts on environmentally and socially sensitive areas such as shrines, sacred groves, cemeteries, and forest reserves. The consultations also discussed relevant issues relating the resettlement of project affected persons including eligibility criteria, PAPs entitlements and census cut-off-dates.

The report highlights general community consultations, it does not explicitly mention focus groups for vulnerable or marginalized groups, such as women, youth, or artisanal miners (also referred to as galamsey miners). Effective stakeholder engagement under the World Bank's Environmental and Social Standard 10 (ESS10) requires that all segments of society, including marginalized groups, are engaged in consultations to ensure their specific concerns are addressed. Furthermore, ESS5 mandates engagement with all project-affected persons (PAPs), especially those whose livelihoods may be impacted by the project. This included artisanal miners, as their activities may be affected by the acquisition of land and the establishment of the transmission corridor. In subsequent stakeholders engagement on the project, separate sessions will be held to ensure with vulnerable persons/groups identified in the SEP once it is approved by the Bank. The project will ensure that:

- Youth and women-focused groups are included in the consultation process to capture their perspectives on potential employment, compensation, and social impacts.
- Artisanal miners (galamsey miners), who may lose their livelihoods due to project-related land acquisition, are engaged directly, and their concerns are included in the Resettlement Action Plan (RAP).
- District authorities, who play a role in overseeing local development and land use, are continually engaged, particularly during land acquisition processes and grievance redress mechanisms.

Gender Equity Challenges

Women, especially in rural communities, often face greater barriers in access to compensation, participation in decision-making, and livelihood restoration. Thus, the engagement process in the course of the project implementation will be broadened to ensure that:

- Women are involved in decision-making at every stage of the project, particularly in compensation and livelihood restoration processes.

- Gender-based disparities in access to resources, jobs, and compensation under the project are addressed.
- A gender specialist is involved early in the design and consultation phases to ensure that women's needs and vulnerabilities are prioritized.
- artisanal miners during the RAP process are engaged to mitigate any adverse effects on their livelihoods and ensure proper restoration mechanisms are put in place.

6.2 Methodology

The process of identifying stakeholders began in December 2023 following the preliminary line route selection during which communities within the zone of influence of the project were identified in the Upper Denkyira East, Wassa Amenfi West, Wassa Amenfi East, Aowin Municipal Assembly and Wassa Amenfi Central District as being key stakeholders whose properties (crops, lands, and structures) and livelihoods would be adversely affected by the project implementation. A stakeholder engagement plan (SEP) was then designed for consultations. English and in some cases Twi languages with the help of interpreters mostly assemblymen from the local communities were used during the engagement of the stakeholders.

The Consultant, Studio Pietrangeli (SP) in collaboration with GRIDCo, made appointments with the Wassa Amenfi Traditional Council, Upper Denkyira East, Wassa Amenfi West, Wassa Amenfi East, Aowin Municipal Assembly and Amenfi Central District, and the affected communities. Meetings were held with these stakeholders where the detailed project scope and the rationale were disclosed to them for their concerns and inputs where necessary. The consultations started with the normal traditional greetings and pleasantries. At the end of each consultation especially in the affected communities the names, group photographs, and directions to the nearest villages were solicited from the community that had just been consulted. Pictures and attendance sheets and concerns of the consultations are attached as Appendices III, IV and V respectively. All stakeholders were allowed to ask questions for clarification or suggestions to better shape the decision-making process on the project design and implementation. There was also a high-level meeting involving representatives WAPP, GRIDCo, CI Energies, the Project Consultant and the World Bank Safeguards Team at Elubo to discuss mitigation measures for identified environmental and social risks of the project. This meeting, which took place at Elubo on the Ghana-Côte d'Ivoire border was preceded by routing the transmission line corridor on to observe environmental conditions and understand social context/issues within the project corridor (see Appendix VIII for minutes' of the meeting)

The public consultation on the project was deepened by the publication of a Scoping Notice (Appendix III) in line with the regulation 15 (1) of the LI 1652 in the February 12, 2024, edition of the Daily Graphic.

Based on the stakeholder engagements, key issues of concern were identified, and preliminary responses were given to them (Table 4). However, they were further investigated during the ESIA study. These are as follows:

- Community entry strategies
- Land tenure system and cultural heritage
- Land Acquisition & Compensation for Loss Property
- Grievance Redress Mechanisms
- Employment opportunities for community people
- Public and Occupational Health & Safety
- Environmental impacts

Table 5: Issues -Response matrix

Subject	Key issues raised
Community Entry	GRIDCo should ensure that the Project Contractor is introduced to the opinion leaders of the affected communities before project construction to ensure an effective community entry protocol.
The land tenure system and cultural heritage	<p>The need to consult key stakeholders (chiefs, clans, and Family heads) to understand the land tenure system in the project area before the commencement of the acquisition processes.</p> <p>There must be a close collaboration with the chief and elders of the affected communities to ensure that the line route does not adversely impact the shrines and groves. Where necessary, the traditional leaders will advise on the required pacification rites to be performed in an event of an impact on cultural heritage.</p>
Land Acquisition	<p>The need to consult with the chiefs or families depending on the land tenure system of the communities for the Land acquisition.</p> <p>Property valuation should follow immediately after line survey works to prevent speculative developments</p> <p>Compensation for crops loss and landed properties on the project must reflect current market values.</p> <p>Compensation payment through banks should be properly streamlined in order not to disadvantage PAPs without bank accounts, where necessary such PAPs should be assisted to open a bank account for their compensation payment</p> <p>It was suggested that payment of compensations be through GCB Bank Limited which operates within the district.</p> <p>Inclusion of Community members in the land acquisition process to avoid impersonation.</p> <p>For the 'Abunu' and "Abusa" system, both parties (farmer and landowner) must agree on how they want the compensation in terms of who gets what during the payment because this is more of an agreement between both parties on the use of the land before the land acquisition.</p>

Grievance Redress mechanisms	Use of Assembly members within project-affected communities and GRIDCo's project inspectors as focal persons for Grievance Redress. This mechanism will be available for all stakeholders to seek redress or clarifications on the project.
Employment	GRIDCo should put in place a mechanism for the employment of community members during project implementation. It was explained to stakeholders that employment opportunities on the project especially for skilled labour cannot be guaranteed as the construction of the line requires specialized formal training and expertise. The linear nature of the project will not also require unskilled labour services from the affected communities.
Health & Safety	Risk to Public Safety, Community Health & Security Issues Regulation of farming activities and other landed properties encroachment within Right of Way After Facility Development Continued Engagement During Construction & Operational Phase Effective Project Monitoring & Evaluation Process
Environmental Degradation	Project activities to avoid Environmental Degradation Communities to be assured that there will be no major changes in Land Use After Facility Development

6.3 Grievance Redress Mechanism

To facilitate resolutions that are mutually agreeable by the parties within a reasonable timeframe, GRIDCo will, as required, establish a grievance redress mechanism for the project. This procedure will allow institutions, communities, and individuals affected by project activities to formally communicate their specific concerns and grievances. Anyone may use the grievance procedure without worrying about or fearing reprisals.

6.3.1 Grievance Redress Procedure

A Grievance Mechanism is a system that allows not only grievances, but also queries, suggestions, positive feedback, and concerns of project-affected parties related to the environmental and social performance of a project to be submitted and responded to timeously. Such a mechanism aims to receive and facilitate the resolution of grievances raised by stakeholders in a timeous, transparent and balanced manner.

A GRM will be implemented to ensure that relevant parties are responsive to any concerns and complaints, particularly from affected people and communities; and to ensure that there is a central approach and record of grievances.

There shall be a comprehensive project wide GRM that will provide opportunities for affected parties channel their concerns, questions, and complaints to the various implementation agencies through multiple grievance uptake channels. The GRM will have a trained specialist to address any related issues and complaints. The project GRM aligns with the requirements of World Bank ESS10 and national law.

Essentially, the Grievance Redress Mechanism (GRM) will assist in resolving complaints and grievances in a timely, effective, and efficient manner that satisfies all parties involved. It will ensure transparent and credible process for fair, effective resolution of grievances thereby building trust and cooperation stakeholders. Specifically, the GRM:

- Ensures that appropriate and mutually acceptable redress actions are identified and implemented to the satisfaction of complainants.
- Avoids the need to resort to judicial proceedings as a way of seeking redress.
- Provides affected people with avenues for making a complaint or resolving any dispute that may arise during project implementation.

The GRM will consist of the following tiers, from lowest level, in this order:

1. Focal persons at the community level (Community Liaison Officers) to receive and transmit complaints to GRIDCo - PIU and provide feedback to aggrieved parties within the community.
2. Community-based Grievance Redress Committees (GRCs) to investigate, resolve and provide feedback to the PIU on localized grievances referred to them. It will be composed of representatives each from the traditional authority in the community, women in the community, Community-Based Organization, the police and the PAP, etc.
3. Country-based GRC in Ghana headed by Chief Executive of GRIDCo with the PIU Social Safeguards Specialist as the secretary. These GRCs will investigate and resolve issues beyond the Community-based GRCs. It shall consist of one representative from a national NGO, Lands Commission, Ministry of Gender, Children and Social Protection, Affected District/Municipal Assembly, a lawyer of good standing and representative of the PAP; and
4. A Project Grievance Redress Committee based in WAPP to handle inter-country and cross border conflicts, issues, and complaints.

The existence of this GRM structure does not preclude aggrieved parties from resorting to various in-country judicial system (Courts) to resolve grievances directly or in the event they are not satisfied with the outcomes of the project Grievance Redress Mechanisms.

6.3.2 The Grievance Redress Mechanism Process

The Social Safeguards Specialist at the PIU will lead in managing the GRM processes including disseminating all relevant information about the GRM processes to the various stakeholders from national to the districts and community levels. He/she shall provide systems for anonymous reporting in ways that the identities of complainants will be protected. This will largely create an enabling environment to allow for grievances to be raised by project affected persons without fear of victimisation. A focal person (s) shall be assigned to man the call/documentation center and ensure timely escalation of complaints and grievances to the resolving officers.

Scope of the GRM

The GRM for the Financial Inclusion Project will be available for use by all project stakeholders including those directly and indirectly impacted-positively or negatively. This will offer an opportunity to project affected persons to submit questions, concerns/complaints, comments, suggestions and obtain resolution or feedback.

Implementation Steps of GRM

Grievance Redress Committees shall be established to ensure timely and appropriate resolution of grievances arising because of project activities. The coordination responsibility of the GRM shall rest with the Social Safeguards Specialist and the focal persons of the call/report centres or the Community Liaison Officer. Complaints can be registered through calls, text messages, emails or voice mail, and suggestion boxes etc. at all project sites and communities. Once complaints are received at the call or report centre(s) or the community liaison officers, they will be forwarded to the national PIU for documentation, sorting and classification and onward transmission to the appropriate quarters for resolution. When cases are forwarded to GRCs or the appropriate bodies, persons or pillar leads for resolution. Specifically, the following responsibilities shall be adhered to by the team:

- i. Ensure that committees investigate grievances and propose appropriate measures to avoid or minimize adverse impacts of the interventions
- ii. Ensure that the processes comply with existing safeguard procedures and policies
- iii. Build the capacity of focal persons in effective community engagement, grievance handling, and negotiation and conflict resolution
- iv. Build trust and maintain rapport by providing affected persons and the wider public with adequate information on the project and its GRM procedures
- v. Follow up with GRM committee on the status of investigations and resolution of grievances, as well as communicating outcomes with complainants
- vi. Regularly provide a report on GRM results to the project proponents and the World Bank.

The GRM implementation process will involve the following steps which have been summarized in Table 6.

Table 6 Steps in Project-Specific Grievance Handling Processes

GRM stages	Description of tasks	Responsibility	Timeline
Assign Focal Persons	The Social Safeguards Specialist liaise with stakeholders to identify Focal Persons (Community Liason Officers) to manage the designated grievance call/documentation centers.	Social Safeguards Specialist at the Country - Level PIU	Prior to project implementation
Train assigned focal persons on the design and operation of the GRM	Train Focal Persons on grievance redress processes	Social Safeguards Specialist	Prior to project implementation
Receive, transfer and register complaints	Focal Persons receives and register complaints into the grievances register .	Focal Persons (Community Liasson Officers and Digital Center Focal Persons)	1 working day after receiving complaint
Screen and refer complaints	Once complaints are received Focal Person will undertake preliminary assessment of the eligibility of complaints and acknowledge receipts of complaints to complainant within 2 workings days. The complaint will also be transferred at this stage to the resolving officer or party or grievance committee that will be set up.	Social Safeguards Specialist of the Country – Level PIU	2 working days after receiving complaints

Assess the complaint	Once transferred to the appropriate resolving officer, the focal person will undertake further assessment to establish the eligibility of the complaint, and hence determine its gravity (classified in terms of high, medium, and low severity)	Social Safeguards Specialist of the Country – Level PIU	Ongoing 2 working days
Formulate an initial response	Once the assessment is completed, the concerned entity will formulate a response and communicate with the Social Safeguards Specialist, who would then contact the complainant. The communication should state whether the grievance has been accepted or rejected, providing reasons for the decision, and indicate next steps.	Social Safeguards Specialist of the Country – Level PIU	2 working days
Select a resolution approach	Where the complaint is not of fraud or corruption, working with the Social Safeguards Specialist, the GRM Committee will investigate and resolve complaints and where applicable to a specialised body or an appropriate pillar focal person will assign the complaint for mediation at different levels, engage in direct negotiations and dialogue, facilitate negotiations through a third party, conduct further investigation through the review of documents, etc.	GRM Committee	Ongoing 3 working days after receiving complaints for the Community and National Level GRCs
Settle the issues (or further escalate the issues)	The Social Safeguards Specialist will ensure that the GRM Committees take appropriate measures to remove the cause of	Social Safeguards Specialist Focal Person	

	<p>the grievance and initiate a monitoring process to assess any further impacts of project-related work. Once settled, the social safeguards specialist and focal person record the complaint in the system as 'resolved', and inform the complainant of the outcome of the resolution process. Where not addressed, the complainant is informed about the next steps in the grievance redress process including options open to them, and the outcome recorded accordingly.</p>	GRM Committees	<p>Ongoing</p> <p>5 working days after registering complaint</p>
Monitor and evaluate grievance redress process	<p>The PMU through the Social Safeguards Specialist Focal Persons will monitor the grievance redress process and the implementation of the decisions made. The Social Safeguards Specialist will work with focal persons to ensure that redress is granted to affected persons in a timely and efficient manner. They will also provide regular reports to the Bank, noting the progress of implementation of grievance resolutions, timelines of grievance redress, documentation procedures, etc. The project will capture in the grievance log, e.g. Name of the person submitting the complaint (unless kept confidential), Details of the complaint, Name of person assigned to deal with the</p>	<p>Social Safeguards Specialist Focal Person GRM Committee</p>	<p>On-going (throughout project implementation)</p>

	complaint, Details of proposed resolution, including person(s) who will be responsible for authorizing and implementing any corrective actions, Details of whether the complainant was satisfied with the resolution, etc.		
Feedback to complainant and other interested parties	The GRM System will be updated once the complaint has been resolved so as to close the complaint in the GRM System. The PMU will contact the complainant, to evaluate if the complainant is satisfied with the resolution before the complaint is closed in the GRM system. If the complainant is not satisfied with the outcome of the investigation, a judiciary alternative could apply.	National Level PIU/WAPP PCU	On going

Special attention will be paid to the training of designated staff involved in the management of the grievance. This Grievance Mechanism covers non-employees (i.e. affected people and other relevant stakeholders such as local communities).

6.4 Gender-Based Violence and Sexual Exploitation and Abuse, Sexual Harassment (GBV/SEASH) Grievances

Gender-Based Violence (GBV) survivors can report incidents to various entities including the Community Liason Officers, Domestic Violence and Victim Support Unit (DOVVSU) of the Ghana police Service, the nearest police station, or a health facility. They can also contact Community Liaison Officers for assistance, and it is recommended that at least one female liaison officer be appointed for this purpose. Survivors can also reach out directly via the DOVVSU helpline (055-100-0900) through calls or texts. After reporting, the Community Liaison Officer will forward the case to the Project Implementation Unit (PIU) Social Safeguards Specialist, ensuring confidentiality, who will guide the survivor through the support services and investigation processes.

Upon reporting, survivors will be referred to an accredited health facility for medical attention, if not already done. The case will be then relayed to DOVVSU for investigation with the survivor's consent. If the investigation finds grounds for prosecution, the case will be forwarded to court with the survivor's agreement, and the survivor will receive psychosocial support. The PIU Social Safeguards Specialist will monitor the progress of the case at every stage, ensuring timely medical, legal, and psychological support. All costs related to case management, including medical expenses and legal fees, will be covered by the GRIDCo. Once the court reaches a judgment and the case is resolved, it will be officially closed, with updates provided to both the survivor and PIU.

Gender-Based Violence and Sexual Exploitation and Sexual Harassment (GBV/SE/SH) grievances on the project will be handled in a sensitive, systematic, and comprehensive manner to ensure the safety and well-being of the survivor. The guiding principle will be the confidentiality and the survivor centre approach.

6.4.1 Biodiversity Management Plan

The BMP provides detailed measures to manage, mitigate, and monitor biodiversity impacts throughout the construction and operational phases of the project and ensures compliance with **World Bank ESS6 and national environmental requirements**. The BMP shall be implemented concurrently with project activities and forms an integral part of the overall Environmental and Social Management framework.

7 ASSESSMENT OF ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS

7.1 Introduction

The proposed project is a linear one expected to exert environmental and social risks and impacts that will affect a wide area of influence because of a significant 125km length of the line and the 40m RoW acquisition associated with the project. The different locations of the various sections of the transmission line project may increase the potential adverse impacts of the project. In recognition of this fact and in fulfilment of the requirements of permitting and funding agencies, GRIDCo, in line with the law has incorporated this environmental assessment in its project cycle.

7.2 Methodology

This section of the Environmental Impact Statement deals with the methodology to be used to assess the potential impacts of the project and the results from the application of this methodology to the project, using project information and relevant baseline data. It also outlines the key potential environmental and social impacts that could result from pre-construction, construction, operational and decommissioning phases of the project to enable relevant mitigation and enhancement measures to be proposed to minimize significant risks and impacts. The main factors used in determining whether an impact may occur at each intersection between a project activity and a specific environmental medium included:

- Literature reviews (desk study)
- Field observations
- Consultations with local experts
- Consultations with stakeholders
- Experience from similar projects

The impact assessment methodology used for this project consists of five major steps:

Step 1: Identification and description of project activities and their interaction with environmental media.

Step 2: Comprehensive preliminary identification of potential impacts.

Step 3: Screening or comparative assessment of impact importance, identification of impacts that are likely to be significant (i.e., identification of focus areas for further study) through application of a basic set of impact significance criteria to the preliminary information available about each impact.

Step 4: Detailed assessment of the identified focus area and impact characterization techniques; quantification of impacts to the extent possible and rigorous qualitative characterization of impacts that cannot be quantified and

Step 5: Final assessment of the severity levels of impacts through application of the results of the rigorous quantitative and qualitative characterization of impacts developed in Step 4 to a set of objective impact severity criteria; identification of impacts warranting mitigation.

Consultations in the field coupled with the experience gained by the consultant on similar projects have informed the identification and quantification of the identified impacts. The potential impacts associated with each focus area will be qualitatively and where possible quantitatively described and evaluated under the three (3) major phases of the project cycle: Pre-construction, Construction and Operational phases. An evaluation of the residual impacts after implementation of the mitigation measures shall also be undertaken.

7.3 Results of Impact Identification Process

The proposed project may potentially result in impacts on the environment, socio-economic conditions, and/or health and safety. Each of the specific compartments of the environment listed in the Table 7 could potentially be affected by the impacts resulting from one or more of the project activities that have been discussed.

Table 7: Summary of key impacts

Environmental Component	Project Phase	Identified Impact	Impact Nature	Significance
Vegetation	Construction	Clearing of vegetation within the 40 m Right-of-Way (RoW) leading to loss of plant cover	Negative, Direct	Moderate
Vegetation	Construction	Loss of economically and ecologically important trees	Negative, Direct	Moderate
Wildlife	Construction	Disturbance and displacement of terrestrial fauna due to noise, human presence, and habitat clearing	Negative, Direct	Moderate
Wildlife	Operation	Risk of bird collision and electrocution along transmission lines	Negative, Direct	Moderate to High
Habitats	Construction	Habitat loss, degradation, and fragmentation within the project corridor	Negative, Direct	Moderate
Biodiversity	Construction	Reduction in local species abundance and diversity	Negative, Direct	Moderate

Environmental Component	Project Phase	Identified Impact	Impact Nature	Significance
Biodiversity	Operation	Long-term alteration of habitat structure and ecological connectivity	Negative, Indirect	Moderate
Ecosystems	Construction & Operation	Cumulative impacts on ecosystem services (habitat provision, ecological connectivity)	Negative, Cumulative	Moderate

7.4 Impact/Risk Evaluation

Once the environmental and social impacts/risks have been identified, the next stage is to evaluate them for their level of significance based on a pre-determined criterion. Prior to evaluation the nature impacts/risks

Table 8: Definition for Levels of Impacts/Risks

Term	Definition
Nature of Impacts/Risks	
Neutral	No overall environmental and social impact/risk.
Adverse	Negative environmental and social impact/risk.
Beneficial	Positive environmental and social impact/risk.
Duration of Impacts/Risks	
Short-term	Impact/risk persisting for six months or less
Medium-term	Impact/risk persisting for between six months and five years
Long-term	Impact/risk persisting for longer than five years

Scale of Impacts/Risks

Small	Impact/risk is likely to affect less than 5% of the estimated population of the affected area
Medium	Impact/risk is likely to affect between 5-10% of the estimated population of the affected area
Large	Impact/risk is likely to affect less than 10% of the affected

Sensitivity/ Vulnerability/Importance of Receiving Media or Receptor

High	Receptor/Media is rare, legally protected (national law or international law, treaty or convention) Receptor/Media susceptible to irreversible alteration/damage to its functioning (e.g. mortality, extinction, long term injury or morbidity due to the anticipated the impact/risk)
Medium	Receptor/media susceptible to damage/alteration without comprise to its function and continued existence e.g. injury and short morbidity as a result of the impact or risk
Low	Receptor/media is not susceptible to any damage/alteration due to the impact/risk

*Extent of Impact/Risk

Localised	Impact/Risk is limited to the site and 100m-radius (environs)
Regional	Impact/Risk within the boundaries of Ghana
Global/Transboundary	Impact/risk extends beyond Ghana

Magnitude of the impact is measured (high, medium, low) by considering the following variables: extent, duration, and scale of the impact or risk. Table 7 below indicates how these variables interact to determine the magnitude of impacts/risks for the project.

Table 9: Impact and Risk Evaluation Criteria

Impact Characteristics			Magnitude of impact
Extent	Duration	Scale	

Localised	Long term	Large	High
Localised	Long term	Medium	Moderate
Localised	Long term	Small	Low
Localised	Medium-term	Large	Moderate
Localised	Medium term	Medium	Moderate
Localised	Medium term	Small	Low
Localised	Short term	Large	Moderate
Localised	Short term	Medium	Low
Localised	Short term	Small	Low
Regional	Long term	Large	High
Regional	Long term	Medium	High
Regional	Long term	Small	Moderate
Regional	Medium term	Large	High
Regional	Medium term	Medium	Moderate
Regional	Medium term	Small	Moderate
Regional	Short term	Large	High
Regional	Short term	Medium	Moderate
Regional	Short term	Small	Low
Transboundary	Long term	Large	High
Transboundary	Long term	Medium	High
Transboundary	Long term	Small	Moderate
Transboundary	Medium term	Large	High
Transboundary	Medium term	Medium	High
Transboundary	Medium term	Small	Moderate
Transboundary	Short term	Large	High

Transboundary	Short term	Medium	Moderate
Transboundary	Short term	Small	Low

Based on the combination of magnitude and importance a number of possible outcomes can be obtained in terms of significance of an identified impact/risk (see Table 8). Impacts/risks rated moderately significant or higher will require further treatment.

Table 10: Evaluation Criteria

Magnitude	Sensitivity/ Vulnerability/ Importance		
	Low	Medium	High
Low	Insignificant	Moderately Significant	Moderately Significant
Moderate	Moderately Significant	Moderately Significant	Significant
High	Moderately Significant	Significant	Highly Significant

7.5 Constructional Phase Impacts/Risks

This section evaluates the environmental and social impacts/risks of project activities during construction phase based on the established criteria.

7.5.1 Beneficial/Positive Impacts

7.5.2 Increase in Employment Opportunities

The project is expected to provide temporary employment opportunities for up to 150 Ghanaians and foreigners during the construction phase, particularly in areas such as transportation, electrical work, and civil and mechanical works. Indirectly, food vendors and services providers in the informal sector are likely to experience patronage of their services.

Employment benefits would be moderate benefit in terms of magnitude, especially for local communities, as it offers a source of income and skill development. Employment benefits are rated medium scale, short term (limited to cycles during the construction phase) and transboundary as it will involve both Ghanaians and foreign national. In terms of sensitivity, rated medium. Employment generation during the construction phase is rated a moderately significant beneficial impact.

7.5.3 Boost to Local Economy

The influx of workers will have a positive impact on the local economy through the purchase of local foodstuffs and goods as well as rental accommodation. This increased demand could stimulate local businesses, including those in the catering, construction, and allied industries (e.g., cement and iron rod

production), leading to a multiplier effect on economic activities in the area. The impact of the proposed works on the local economy will have a regional spread but it will be limited to construction phase (Short term) and small scale because supply rigidities such as low capital formation will limit the capacity of local businesspeople to take full advantage of the opportunities that the proposed project will offer in the project districts making it low on magnitude. In terms of sensitive is also expected to be low, making this impact insignificant.

7.5.4 Adverse Impacts/Risks

7.5.5 Permanent Loss of Livelihood and Assets

The proposed project will impact negatively on farms, parcels of lands and some structures. It is expected that a total land area of 500 hectares will directly be affected by the proposed project. Different types of annual and perennial crops including some economic trees like cocoa, palm, rubber will also adversely be affected by the project. Farmers within the Right of Way will permanently lose the livelihood they derive from the land that will be acquired as the Right of Way for the transmission lines and the site for the sub-station. Land and property owners will also lose their structures permanently through compulsory acquisition of the 40-meter-wide Right of Way for the transmission lines and the sub-station. The scale of the acquisition is high, long-term and localized, making the magnitude of the impact high. Without compensation for the project affected persons, the effect of the loss of livelihood and assets (land) on them will be irreversible. Therefore, the sensitivity of this impact is high. As both magnitude and sensitivity of permanent loss of assets and livelihood is high, this impact is rated highly significant.

7.5.6 Incidence of Gender-Based Violence (GBV)/Sexual Exploitation and Abuse (SEA)/ Sexual Harassment (SH)

The influx of construction workers poses a significant risk of GBV, including sexual exploitation, abuse, and harassment. Workers may perpetrate these acts within the local communities, leading to long-lasting psychological trauma, physical injuries, and potential transmission of sexually transmitted diseases like HIV/AIDS (long-term). Given the difficulty in detecting these incidents and the vulnerability of survivors, the occurrence of one event is rated large scale and it regional as survivors or perpetrators will be living in catchment communities in the project districts. This risk is medium in magnitude but highly sensitive due to the severe and lasting impacts on individuals and communities as well as existence of national laws and international protocols prohibiting Gender Based Violence.

7.5.7 Discriminatory Labor Practices and Incidence of Child Labor

There is a risk that workers may be subjected to unfair labor practices, such as being paid below the national minimum wage, working under poor conditions, or being denied their rights to join trade unions. Contractors and sub-contractors may employ minors to take part in aspects of the civil works against the prescriptions of national laws. These risks are highly sensitive due to national and international prohibitions

against exploitative labor practices and child/forced. They are likely to be large-scale as there is the possibility that at least 15 (10% of site workers of the estimated 150) workers can minors. It can also be transboundary as the minors and other project workers may be from neighboring countries such as Côte d'Ivoire. The health and safety risks of child labor and tendency for violent response from aggrieved workers suffering from poor working conditions can have long lasting effects (long-term). Hence the magnitude of these risks is high. With a high sensitivity and magnitude, discriminatory labor practices and incidence of child labor on this project is rated as highly significant.

7.5.8 Human Rights Abuse by Security Personnel

The presence of security personnel to manage potential conflicts with illegal miners and project affected persons during tower spotting, erection of towers and stringing transmission lines and related works may lead to human rights abuses, including unlawful detention, injury, or even death. While the magnitude of this risk is low due to its short term, localized (areas where towers will be sited within the proposed RoW) and small-scale nature (the number of clashes is expected to be few due to awareness about the project and use of the existing RoW as defined in 2014), it is highly sensitive because of the potential for permanent harm (injury) or loss of life during encounters with armed security personnel under conflict situation.

7.5.9 Incidence and Spread of Infectious Diseases

Overcrowding of site workers in small poorly ventilated rooms in substandard houses with poor and inadequate water, sanitation and crating facilities and services will facilitate the outbreak and or spread of infectious and communicable diseases such as cholera, chicken pox and malaria. Poor housekeeping practices on site and personal hygiene among site workers will also exacerbate the situation. Incidence and spread of infectious diseases are highly sensitive as they involve mortality and long-term morbidity. It is limited to construction phase (short term) but regional in extent as these infectious diseases can spread within the project communities and adjoining regions within a short time. It is a medium scale risk on the account of the number of persons that be infected when outbreaks occur (between 5% to 10% of the population of the project communities), even if response measures are initiated. Incidence and spread of infectious/communicable diseases are rated moderate in magnitude. With a moderate rating in terms of magnitude and high in terms of sensitivity, this risk is significant under this project.

7.5.10 Pressure on Social Services and Job Opportunities

The temporary influx of workers could put pressure on social amenities within project communities and also lead to social tensions, particularly if the number of workers exceeds the capacity of local services or if the workers are perceived to be taking jobs away from locals. This could result in conflicts or resentment within the project communities. The magnitude of the adverse impact of labor influx on social services and job opportunities of residents of project communities is small scales as the expectation is that not

more than 500 persons will migrate to the project districts in search job opportunities directly related to this project which will employ about 150 persons. The deterioration of social service as a result of labour influx into the project districts will be short term and regional as the migrants will be from other parts of Ghana and neighboring countries. As it involves conflicts with potential loss of life and can also lead to non-functional social services like water and sanitation services, it is rated moderately sensitive. Hence, this risk is moderately significant.

7.5.11 Destruction of Cultural Heritage Resources

Constructional activities such as surveying, clearing, digging and filling along the transmission line corridor and creation of tracks and access routes may lead to damage to areas of historic, scientific, social and amenity values, and also affect the aesthetics of cultural monuments and archaeological resources. This can occur where design and construction do not take account of such cultural heritage and resources. Damage may also be caused by construction related works such as locations of burrow sites, and unregulated access to cultural heritage sites. In case a high-tension transmission line's right-of-way (RoW) intersects a cemetery, the preferred approach is to re-route the line to avoid the site. If re-routing is not feasible, graves may be exhumed and relocated, following extensive consultation with affected families, religious leaders, and adherence to legal and cultural practices. Compensation and support are provided to the families for the disturbance. In some cases, a buffer zone might be established to protect the cemetery if the graves remain undisturbed. The entire process is handled with sensitivity and respect to minimize cultural and emotional impacts. The initial consultation did not identify any archaeological sites except cemeteries. At this stage, there has not been any identified or known cultural heritage site within the area of impact of the project. However, issues regarding cultural properties and the possibility of cultural and/or archaeological 'chance finds' are considered low on magnitude given the fact no shrines, sacred grooves and community places of worship were not encountered in the Project Right-of-Way during the Cultural Heritage Study (see Appendix XIII for the Detailed Report). The impact is therefore limited to chance finds during the construction of transmission line and substation.

From the forgone, destruction or discovery of chance finds rated is highly sensitive, if the discovered or impacted artifacts or sites have cultural, historical, or archaeological value, requiring legal compliance. Even if the finds are not important, they still necessitate documentation and proper management to avoid legal and/or community issues. Therefore, the impact significance is placed at moderate.

7.5.12 Traffic Disruptions

Potential impacts on traffic and transport during construction will arise as a result of additional traffic movements associated with the transportation of equipment and constructional materials to the project site.

Thus, there can be serious disruptions to local traffic and accidents during the construction period. This may result from the transportation of machinery and materials to the project site and during the stringing of the transmission lines across roads. The situation can be aggravated if carefully planned detours and road closures are not put in place. The sum effect of traffic disruptions may include increased travel time, congestion, social stress and agitations. The impact on traffic disruption is short term as they will occur intermittently over a few hours or a few during the construction, it localized and small scale given the low Average Daily Traffic (ADT) volumes on the feed roads within the project corridor. The traffic conditions can also be easily restored post any disruptions making sensitivity low, hence traffic disruptions under this project is expected to be insignificant.

7.5.13 Generation of Construction Waste

Different forms of solid and liquid waste including excavation spoils, vegetative matter, damaged/defective cables, packaging materials and oil spills from construction equipment will be generated. Liquid waste that may result from spilled oil, chemicals and paints are likely to be generated. Other forms of construction waste will be generated from Right of Way clearing and material waste from the excavation of about 320 pits for tower foundation each covering an area of about 100 square meters and depths of about 4 meters as well as the construction of the new sub-station. These wastes, if not properly disposed-off will litter the project zone cause accidents such as trips and falls and/or restrict movement on site.

These wastes, if not properly disposed-off will litter the project zone and can cause accidents such as trips and falls which can lead to long-term injury, morbidity, and mortality. In terms of magnitude, it is moderate because it is It will largely be limited to within the project's 40-meter Right of Way along the 125-kilometer stretch, the site for the substation and material stores (localized) for not more than one year (short term) and medium scale. The impact significance of poor waste management in the high-tension transmission line project is moderate. The impact of poor construction waste management in this high-tension transmission line project is considered moderately significant.

7.5.14 Intermittent Increase in Noise Levels and Vibrations

The use of heavy equipment such as crane trucks, bulldozers, excavators stringing equipment and hydraulic compressors during site preparation, installation of towers and stringing transmission lines will generate intermittent noise above the ambient levels and also minor vibrations with consequences hearing impairment and weakening the structural integrity of buildings within the project zone. General traffic movements in the project zone will also generate some intermittent noise. The increase in noise levels and companying vibrations from earthworks and equipment use may also displace some fauna species from habitats within the project zone.

The displacement of fauna from their natural environment due to increase in noise and vibration is considered low on sensitivity. The increase in noise levels and vibrations associated with this project will be intermittent and will not lead to significant hearing impairment and anxiety since the selected RoW does not traverse human settlements. In addition, the animals can migrate to other areas outside the project zone within the same eco-system, recover and continue to sustain themselves. The effects of noise and vibrations are expected to be localized within a radius of 500 meters from the source, short term and small scale-largely within the non-residential limits, making it low in terms of magnitude. With a low on both magnitude and sensitivity of impact, intermittent increase in noise levels and vibration are insignificant.

7.5.15 Decrease in Air Quality

Air pollution may adversely affect the health of people engaged directly or indirectly in the project activities. The effects may be due largely to point sources such as particulates from vehicular emissions and constructional equipment powered by gasoline or diesel as well as non-point sources such as silica in dust whipped up from the earth agitated by constructional equipment and construction vehicles plying un-tarred roads. The resultant effects are acute respiratory disorders, lung and heart diseases, the type of ailment depending on the size of particulates as well as the materials adsorbed on them. The project zone exhibits wet and humid conditions with short dry spells suppressing the magnitude of the effects on air pollution. Apart from this, transmission lines do not traverse densely populated human settlements. These notwithstanding, the use of construction equipment and vehicles during earthworks, erection of towers will result in the emission of fugitive dusts, and contaminants adhering to dust particles.

More minor air quality impacts can arise from the excavation of materials during construction, during access track grading and gaseous emissions from plant and vehicles used during the construction process. The impact significant on-air quality during high-tension transmission projects is generally short term, localized and small scale making it low in terms of magnitude, but it is moderate on sensitivity because of the potential health effects associated with exposure to polluted air making decrease in air quality is moderately significant.

7.5.16 Decrease in Water Quality

Construction activities of the nature of the proposed project involve the disturbance and removal of vegetation associated with creation of access tracks and excavation for foundation works for tower siting. When these activities are conducted in or close to waterbodies soil erosion and deposition into waterbodies occurs, increasing sediment loading. Other potential sources of water pollution under this project are cleansing construction and equipment near waterbodies and accidental spillage of hazardous materials such as oils, fuel, paint and adhesive in waterbodies. Water with high sediment loading contaminated with hazardous substances poses a threat to aquatic and human life. Contaminated water causes gastro-intestinal and skin diseases.

Decrease in water quality is short term but has regional implications because the catchments of the waterbodies that traverse the transmission line route extend beyond the project corridor but none of them crosses over to Côte d' Ivoire. Water pollution from project activities is also likely to medium scale compared to the threat posed by illegal mining activities in the project corridor making the overall magnitude of this impact high. Nonetheless, links to mortality, morbidity and threat of causing extinction or significant damage to aquatic life make this impact highly sensitive. From the foregone, the risk of water pollution from this project is significant.

7.5.17 Work related Accidents and Incidents

During the construction phase, accidents are likely to arise from moving machinery in the course of operation, unguarded parts of equipment, human errors, faulty equipment and a disregard for health and safety measures. These are likely to pose risks to the workers during activities such as excavation tower foundation, tower assembly and installation, and stringing of the transmission lines as well as constructing the substation. Other sources of injuries and death to workers through occupational hazards are electrocution, accidental falls from height during stringing of transmission lines, noise, vibration and heat, falling/swinging objects and also lubricants some of which contain solvents with potential to cause skin irritation and allergies, respiratory disorders and acute poisoning. Work-related accidents can occur frequently and affect many site works (large-scale) in the short-term within the construction zone and its immediate environs (localized). It is, therefore, high in terms of magnitude. appropriate mitigation measures. Work related accidents in the form of electrocution, hits, falls and cuts can lead to mortality and long-term injury such as spine and neurological problems, loss of vision and other permanent injuries/damage makes it highly sensitive. With a high sensitivity and magnitude rating, this impact is highly significant.

7.5.18 Accidents outside Work Zones

The transportation of construction materials, heavy plants and equipment through settlements and the presence of unprotected tower base excavations could pose potential safety problems such as falls for the local populace. Road traffic accidents can lead to long term injury, loss of lives and property making it highly sensitive. They are regional in nature because they can occur in project communities and along haulage routes and communities outside the project corridor. These notwithstanding, the number of crashes and other forms of road accidents on this project is likely to be low because of the untarred nature of roads and low traffic volumes (small scale) in the project corridor and short-term during haulage of equipment and material as well as general movement by site workers. These imply that in terms of magnitude it is low but with a high sensitivity, the overall significance level of this accidents is moderate.

7.5.19 Impact on Flora and Fauna

Noise and removal of vegetation during the construction of the sub-station and access roads as well as the demarcation of the centerline and 40m right of way for the transmission line will result in permanent and temporary loss of vegetation in these areas leading to potential faunal displacement as well as habitat loss. Another potential cause of fauna loss is accidentally killing animals in the wild and killing of game for meat by site workers. Birds in flight may also collide with the high-tension lines and tower leading to death or injury.

This impact is rated low in terms of magnitude as limited to the 40-meter band project Right of Way and substation site (localized), long term and small scale on the account the anticipated low frequency of collision, the absence of engender animal species and animal migratory routes within the project corridor as recorded during the Bio-diversity Assessment. However, it is highly sensitive because bird collision and direct attack on animals leads to injury and death, vegetation clearing can also lead to habitat loss and loss of plant species including vulnerable species. This impact is therefore moderately significant (low magnitude, high sensitivity)

7.5.20 Impacts due to Establishment of Work camps

The establishment of work camps and the presence of workers in local communities may result in the following potential adverse impacts:

- Increased Demand for Local Resources: The influx of workers may increase the demand for local resources such as water, food, and housing, putting pressure on community supplies and possibly leading to shortages or price increases.
- Social and Cultural Disruption: A large, temporary workforce can disrupt local communities, potentially leading to social tensions or cultural clashes. Differences in lifestyle and behavior may cause friction between workers and local residents.
- Spread of Communicable Diseases: The presence of external workers, particularly in large numbers, may introduce communicable diseases to the community, including respiratory infections, waterborne diseases, or sexually transmitted infections.
- Strain on Local Infrastructure: An increase in population due to workers renting homes in local areas could place additional strain on local infrastructure, such as roads, healthcare services, and waste management systems.
- Waste and Pollution: Work camps and increased residential demand may lead to improper waste disposal, contributing to environmental pollution. Poor sanitation practices could result in water contamination and general environmental degradation.
- Risk of Gender-Based Violence (GBV): The presence of a predominantly male workforce in proximity to vulnerable communities can increase the risk of gender-based violence, sexual harassment, or exploitation.

7.5.21 Impacts of Illegal Mining ("Galamsey") on Power Infrastructure

The prevalence of illegal mining ("*galamsay*") activities within the Right of Way of the transmission line and its immediate environs will have an adverse impact on the siting and construction of towers as these activities create pits and make the soil unstable. Extra cost will be incurred to redesign and re-enforce tower foundations in these areas or acquire additional land for route re-alignment during tower spotting to avoid such zones of instability. Site workers may accidentally fall in unintended mining pits and get injured, trapped or die.

This impact is highly significant and will require mitigating measures. The magnitude of the impact of presence of active and/or abandoned mining pits/areas within the Right of Way of the power transmission line and its immediate environs is low on account of the '*galamsey*' sites observed within the project RoW and its immediate environs cumulatively occupied less than 3% of the entire project Right of Way (small scale and localized). It is long term because there are no attempts to reclaim and restore the degraded lands after the miners abandon the sites. The sensitivity of this impact is also rated high because of the prohibitive cost of restoration and its potential to cause long term injury or death as through accidents. The abandoned pits and soil degradation may require extra tower foundation-strengthening measures such as excavation and replacement of bad materials at extra cost and time to the project, if towers have to be installed there. Avoiding these zones of instability will also require additional land take and resettlement impacts.

7.6 Operational Phase

The operational phase of the proposed project may be environmentally sound and accident free if strict adherence to the non-encroachment requirement of the right of way is observed. However, there is the potential for adverse impacts during the proposed project's operational phase. These have been discussed below.

7.6.1 Destruction of Flora and Fauna

The safety and integrity of the transmission line requires the regular maintenance of the right of way. This will necessitate the cutting/pruning of trees deemed as potential threats to the transmission line and observing general weed control within the right of way. Vegetation control and management will involve physical or mechanical clearing of vegetative growth which could have adverse effects on flora and habitat of some animals. Apart from the towers standing at about 50 meters connected with cables may obstruct bird movements or cause collision with birds

This low magnitude impact will occur on a small scale and short-term basis as the clearing will be intermittent and mostly involve brushing and pruning tall trees and secondary vegetation within the

demarcated Right-of-Way (localized). The vegetation is likely to re-establish itself after six months of clearing given the wet climatic conditions of the project zone implying that sensitive of the impact is low.

7.6.2 Waste Generation

During the construction phase of the 400/330 KV transmission line and substation, various types of waste will be generated. In addition to the solid waste typically associated with construction activities, such as debris, packaging materials, and excess soil, it is important to also consider:

- **Cable Reels and Electrical Waste:** Large quantities of cable reels, wiring, and electrical components will be used during the installation of transmission lines. These materials will generate waste once unpacked and installed, and proper disposal or recycling strategies must be implemented to handle the byproducts safely and efficiently.
- **Construction Debris:** Waste from demolition or clearing activities, along with materials such as concrete, wood, and scrap metal, will be generated during tower erection and substation construction.

The project must implement a comprehensive waste management plan to ensure that these materials are disposed of appropriately. Recycling options for materials such as cable reels and metals should be prioritized to minimize the environmental impact.

- Erosion control measures such as silt fences, riprap, and vegetation buffers to prevent soil displacement.

7.6.3 Soil Pollution by Leaking Oils

During both the operational phases, there is a risk of soil pollution from:

- Oil leaks from operational vehicles and machinery, which can contaminate the soil if not properly managed.
- Leaking oils from transformers and other oil-filled electrical equipment. Transformers, which use mineral oils or biodegradable ester-based oils for insulation and cooling, pose a risk of leakage, especially during installation or in the event of equipment failure.

Theis impact is moderately significant as it is low in magnitude and moderately sensitive in terms of sensitivity.

7.6.4 Work-related Accidents and Incidents

Test runs, routine maintenance and repairs works on the transmission line and substation as clearing and pruning of vegetation around the towers and under the transmission line, replacement of corroded towers and transmission line components and fixing anti-theft fasteners will expose workers to occupational health and safety risks such as falls, hits, electrocution from high voltage and snake falls, hits from and snakebites. These risks can lead to injuries, long term morbidity and mortality.

7.6.5 Community Health Safety Risks

Potential collapse of towers due to rainstorms and vandalism, electro-magnetic field effects, electrocution and fire outbreaks and burns from falling live conductors due to rust or lightning mechanical failure of an insulator string on the tower or snapping of the conductor are some of the community health and safety risks associated with the operation of power transmission systems.

The magnitude of this impact is low. The association of cancer with exposure to electro-magnetic fields from power transmission lines is inconclusive. Experiences from similar projects indicates that collapsing of towers, fire breaks, burns and electrocution from power transmission systems do not occur frequently (small scale). When they do, they are for a brief period (short-term) and limited to the site and its immediate environments (localized). They, however, lead to injury, death, long-term morbidity and devastation-making them overly (highly) sensitive. The foregone makes community health and safety risks associated with operating a power transmission system of this nature moderately significant.

Electromagnetic field (EMF) effects occurs whenever a voltage is present or whenever a current is flowing and its effect is minimal as detailed in Appendix XI.

7.6.6 Human Rights Abuse by Security Personnel

During Right of Way maintenance/protection operations, security persons from GRIDCo may encounter illegal miners, farmers and residents of catchment communities who are encroaching on the Right of Way of the transmission lines, attempting to vandalize, or tampering with the transmission lines and/or towers. In an attempt to evacuate encroachers and/or apprehending thieves, the security personnel may exert disproportionate force, engage in unlawful detention, violating the human rights of the individuals involved. This may lead to injury and/or death of the persons involved. Security personnel may become perpetrators of Gender Based Violence within communities in the project corridor.

Human rights violation by security personnel within the project zone and communities within project corridor (regional) are not expected to be rampant (small scale) during the operational phase as they will be occasioned by intelligence reports of encroachment within the Right of Way of the transmission line of the substation acquisition, theft and vandalization of the towers and transmission line and snap checks on section of the projects RoW. Nonetheless, they will be long term. Therefore, the magnitude is moderate. In terms of sensitivity, it is rated high because activities of security personnel in project corridor can lead to long-term injury, mortality and gender-based violence. With high sensitivity and moderate magnitude, this risk is considered as a significant risk requiring mitigation actions.

8 IMPACTS/RISK MITIGATION & ENHANCEMENT MEASURES

This section of the report will outline measures to avoid and if not possible, minimize or mitigate the adverse environmental and social impacts/risks identified in the previous chapter.

8.1 Construction Phase

The project's construction phase involves activities that could impact significantly on the physical, biological, and socio-cultural/socio-economic environments within the project's area of environmental influence. The following mitigation measures have been proposed for the significant potential environmental and social impacts/risks during the construction phase of the project:

8.1.1 Measures to Compensate of Physical and Economic Losses

To minimize the adverse effects of the acquisition of the RoW on individuals, families and communities, GRIDCo will prepare and implement a Resettlement Action Plan proportionate to magnitude of the physical and economic displacement. The RAP, which will be in line with the requirements of World Bank ESS5 will be approved by the Bank prior to the commencement of works. The plan will guide the implementation of the resettlement program under this project.

As part of the preparation of the RAP, a property impact assessment will be undertaken within the 40m project RoW and the proposed site for the substation based on cut-off-dates agreed with the Project Affected Persons and duly disclosed to them. The property impact assessment will include a census and socio-economic survey of all Project Affected Persons as well as an inventory of assets that will be impacted by the proposed works. All the properties (crops, land and structure) will be enumerated, referenced, and valued for the purposes of paying compensation for the project-affected persons (PAPs) based on replacement cost. The property impact assessment will be carried out in compliance with GRIDCo's Resettlement Policy Framework to meet the requirements of World Bank Environmental and Social Standard (ESS5) on Land Acquisition, Restrictions on Land use and Involuntary Resettlement. The full replacement cost/value method will be used for the valuation of the affected properties within the 40m corridor. Persons, except illegal miners, who will lose their livelihood as result of the project will be due a livelihood restoration and transition allowance.

8.1.1 Mitigation for Measures for Mining (*Galamsey*) Related Impacts

The selected transmission line route largely avoided small-scale mining (*galamsey*) sites as much as possible. In the limited areas, where avoidance was not possible during the route selection stage, GRIDCO will ensure that, as much as possible, mining and degraded areas are avoided tower spotting. In an extreme case where a mined area cannot be avoided, engineering solutions such as removing and replacing unsuitable materials and/or reinforcing the tower foundations with stronger base structures will be

employed to ensure stability; thus, deep excavation and backfilling with suitable materials within mining degraded areas will be adopted to mitigate the risk of tower collapse due to unstable ground conditions.

More importantly a Community Based Livelihood Restoration Programs (LRPs) in the form of and Awareness Campaigns would be developed as part of the Resettlement Action Plan (RAP) for the project. These campaigns will highlight the dangers that illegal mining activities pose to the construction and operation of high-voltage transmission lines, while also offering a community based alternative livelihood opportunities for the communities affected by the mining activities as of the census-out-off date.

The community-based Alternative Livelihood Scheme will be implemented in place Livelihood Restoration Plan in the seven (7) communities identified during the asset inventory undertaken as part of the preparation of the RAP. It will include components such as land reclamation, Right-of-Way protection and smart agriculture. It will be open to all community members including small-scale miners within the affected communities only. The Alternative Livelihood Scheme will be implemented by GRIDCo as part of RAP implementation.

8.1.2 Mitigation Measures for Labour related Risks

Preference shall be given to local communities in terms of employment for semi-skilled and unskilled labor e.g. artisans. In addition, the underlisted will be undertaken to mitigate labor related risks:

- All workers will be given contracts specifying the type of work they are to undertake and their remuneration package as well as the conditions of service in line with the Labour Act, 2023 and other Ghana labor laws
- Workers will be notified of their rights and processes involved in joining and forming workers' unions on site
- Contractual clauses against child and forced labor as well as discrimination by sex, ethnicity and religion will be inserted in the Contractor's Contract document.
- Environmental and Social Contractual clauses will be inserted in the Contract document prohibiting the Contractor, sub-contractors and their employees from child and forced labor and reporting all such cases to the nearest FSU office binding on the Contractor and Supervising Engineer
- All prospective workers will provide an identity card or other proof of identification meeting the age of employment before they are employed on-site
- A Code of Conduct (see Appendix IVX) will be prepared for and signed by the contractor's employees including those of any sub-contractors informing them of the sanctions for Child and Forced Labor. The Contractor will be required to consider alternative work schedules or shifts to accommodate the hiring of more female workers.
- Site workers will have access to an accessible, participatory time-bound work-based grievance

redress system with a focal point for reporting their grievances and receiving feedback

- The Resettlement Action Plan (RAP) conducted catalogued Project Affected Persons (PAPs) for compensation at a total cost to be defined after completion of the activities. Labour Influx Impacts/Risks.

8.1.3 Preventive and Mitigation Measures for Gender Based Violence

To prevent the incidence of GBV/SE/SH under the project GRIDCo will insert Contractual Clauses on mandatory and regular training for workers on required lawful conduct and legal consequences for failure to comply with laws on non-discrimination and GBV/SEA/SH into the Contract documents of the Contractor and Supervising Consultant. These Environmental and Social Contractual Clauses will have commitments ensuring the Contractor and Supervising Consultant to cooperate with law enforcement agencies (e.g. DOVVSU) investigating cases of gender-based violence including SEA/SH as well as clauses against rape, defilement, and other Gender-Based Violence as well as child and forced labor. Workers on site will sign a Code of Conduct with sanctions on rape defilement and other forms of Gender-Based Violence such as SEA/SH. GRIDCo, will also organize one (1) GBV/SEA/SH sensitization workshop will be undertaken for employees of the Contractor/Supervising Consultant and GRIDCo field staff as well as in each of the project communities every year.

The Contractor will paste prohibition posters on sexual exploitation, abuse and harassment as well as the contact numbers of the nearest DOVVSU office/DOVVSU help line/Community Liaison Officers within the immediate project and at vantage points with the project communities.

The Contractor will provide contact numbers of the nearest DOVVSU office/help line within the immediate project zone and prohibition posters on sexual exploitation, abuse and harassment will be pasted in and around the site.

8.1.4 Mitigation Measures Human Rights Abuses from Security Personnel

GRIDCo will also only deploy professional military and police personnel for Right-of-Way Protection operations as a last resort when a clear case of illegality has been established and consultations and negotiations have broken down or in response to threats of or acts of vandalism.

GRIDCo will assign a Memorandum of Understanding with the security personnel establishing the ground rules and scope of the engagement and clearly affirming that GRIDCo will sign off the operational plan/strategy for each operation before the team is deployed on the field. In addition, GRIDCo will run a background check on all security personnel who will be involved in right of way protection operations and ensure that they are cleared of any criminal and GBV record.

All security personnel will be made to sign a code of Conduct to guide their actions during operations and attend training on community policing, GBV and human rights prior to their commissioning. They will prepare a formal brief for GRIDCo management after every assignment.

A transparent-accessible-time-bound grievance redress mechanism with multiple uptake points will be established in communities within the project corridor by GRIDCo. It will be advertised, and residents will be encouraged to use it report any the even they suffer human rights abuses from the security personnel.

8.1.5 Measures to Ensure Occupational Health and Safety of Site Workers

These mitigation measures will be adopted by the Contractor to ensure to prevent and minimize accidents and incidents on site during the construction phase:

- d. Only well-trained professional technicians and Engineers will assign technical tasks such as working at heights
- e. Site workers will undergo medical screening before they are deployed on-site.
- f. Site workers will receive OHS training at least twice during the construction phase.
- g. Workers will sign and agree to the Code of Conduct (see Appendix XIV) prepared for the sub project
- h. Random checks will be done to prevent substance abuse
- i. -Site workers will be provided with PPEs (e.g. body harness (working at height), hard hats, safety boots, earplugs, reflectors etc.) suitable for the assignment.
- j. -Potable water will be provided for site workers at all times.
- k. -Daily toolbox meetings will be organized for site workers
- l. -An Environmental, Social, Health and Safety Officer will be employed to ensure compliance with occupational, health and safety protocols/rules on site e.g. enforcing the wearing of PPEs, facilitating toolbox meetings and ensuring good housekeeping, among other roles
- m. -Prohibitive, warning and directional signs will be provided on site.
- n. -The Contractor will be made to provide at least fire extinguishers and 2 First Aid Box for each gang
- o. -Contact numbers of the nearest fire station will be pasted at vantage points on-site.
- p. Clear sanctions and rewards for non-compliance and compliance respectively will be provided in the Code of Conduct (see Appendix XIV) to be signed by workers.
- q. -Training of site workers in OHS, fire prevention and combating (including fire drills) as well as good housekeeping practices will be undertaken at least twice

a year during the construction phase

- r. -The Contractor will notify the Supervising Engineer and the relevant authorities including SL-Police, Factories Inspectorate Department, GRIDCo and the Police of any accident/incident within 12 hours of its occurrence and provide a detailed accident/incident report in the subsequent monthly progress report.

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A Construction Environment & Social Management Plan (C-ESMP) shall be prepared and submitted by the contractor. This must be approved by the proponent before construction starts. This will provide guidance for the implementation of environmental, safety & health management in the construction of the transmission line and associated structures like the substation. The C-ESMP will also help the contractor establish, implement and integrate ESHP control, monitoring and mitigating measures for the project.

Education and awareness training are given to every worker upon employment. GRIDCo shall promote the need for safety awareness in all aspect of the work by conducting safety awareness programmes and campaigns, displaying posters and signs and using audio visuals. Weekly and monthly safety meetings are held in all the sections, both for workers of GRIDCo and the contractors.

GRIDCo will ensure that the contractor carries out the work in compliance with the relevant provisions of the Factories, Offices and Shops Act, 1970 (Act 328) and the Contractor Safety Rules to minimize the potential occupational safety and health hazards and prevent or minimize accidents. To further minimize the potential safety and health hazards, GRIDCo will ensure that the contractor employs properly trained and experienced operatives and adheres to all technical specifications relevant to safety measures in the execution of the works. In addition, the contractor will be expected to provide an "All Risk Insurance" cover for the contractor, subcontractors, project management staff and all other employees.

GRIDCo will ensure that the contractor conducts formal induction sessions for all workers on site, including issuing each of its employees and employees of its subcontractors with an induction health and safety booklet. Road safety signs be placed at appropriate places and approaches to prevent accidents. Dangerous construction will zone shall be flagged with caution reflectors.

8.1.6 Measures to Protect Cultural Heritage Resources

The findings of a cultural heritage assessment conducted for the 330kV Côte d'Ivoire-Ghana Transmission Line reinforcement project. Indicated no significant cultural heritage sites, sacred groves, shrines, historical monuments, or community structures were identified within the RoW. The report concludes that the transmission line project poses no major threat to cultural heritage sites but emphasizes the importance of careful monitoring and adherence to mitigation strategies, especially in cases of "chance findings" during construction. The detail of the report is attached as Appendix XIII.

During tower spotting, the Contractor will ensure that culturally sensitive sites such as that may be chanced upon would be avoided wherever possible as sites for tower location. Wherever avoidance is not possible, the Contractor, GRIDCO and Consultant will consult with owner/owners of the cultural heritage resource and secure an official consent with conditions under which such cultural heritage sites and resources will be disturbed bearing in mind health and safety concerns. GRIDCo and the Contractor shall fulfil all agreed conditions.

In the event of a chance find, a Chance Find Procedure prepared in line with ESS8, relevant national laws and international best practices is attached as Appendix XV. Site workers will be sensitized to understand the measures in the Chance Find Procedure, so they can implement it in the event of a chance find.

8.1.7 Measures to Minimize Traffic Disruptions

Equipment and materials will be properly secured in vehicles while being transported to avoid the falling of such items on public roads to create potential hazards or safety problems for the public. Also, trucks and vehicles conveying such materials will display appropriate road safety signals- red flag and flashing amber lights. GRIDCo will ensure that deliveries are only made during daylight hours. Construction vehicles and haulage trucks will drive at speeds not more than 40km/hr.

To minimize traffic conflicts at the junction where the access tracks join public roads GRIDCo will ensure that road signs are erected at appropriate distances on either side of the junction to warn motorists of the potential danger of heavy-duty trucks turning into and off the main road. Obstructing vegetation at the junctions will be cleared to allow drivers to properly view and assess situations before joining main roads.

Also, warning notices like "**NO ENTRY**" or "**NO TRESPASSING ALLOWED**" will be placed at entry to access tracks. In addition, random security patrols will be carried out to ensure that the local people do not unduly endanger their safety.

Furthermore, certain constructional activities like the stringing of transmission lines across public roads will cause temporary traffic disruptions. Traffic wardens will be employed to direct traffic during such times to avoid confusion and prevent accidents. As indicated earlier, the proposed transmission line will encounter various roads, some with asphalted surfacing. It is therefore important to ensure coordination with the road agency and GRIDCo to minimise interference between installation and operation of the transmission lines follow guidelines of the "**Road Reservation Management: Manual for Coordination**" (**June 2001**). Thus, in all cases, where line stringing will cross public roads, the Contractor will duly notify the public and appropriate authorities (Ghana Highway Authority and/or District Assemblies) at least one week prior to the activity with a repeat notify at least 48 hours (about 2 days) ahead.

8.1.8 Mitigation Measures for Waste Generation

Solid wastes in the form of trees, tree stumps and wooden containers will be gathered together and made available to the local communities as fuel wood. Metal waste will be collected and disposed of appropriately and/or recycled. Solid waste in the form of paper, food material, etc. shall be disposed of in dustbins that will be provided at the various sections for each gang and Contract's offices. They will be disposed of at approved landfill sites within the project communities.

Excavated material will be used as fill material for towers footing. Bad material and the excess will be used to fill pits or spread to level sections of the Right-of-Way.

The Contractor will be responsible for managing all waste generated during the construction phase, including tree stumps, cable reels, and other materials. Tree stumps will be distributed to local communities for use. All metal waste, such as damaged cables and scrap, will be collected, recycled, or properly disposed of in compliance with local regulations. The contractor's responsibilities include ensuring proper transportation and handling of waste to prevent environmental damage.

8.1.9 Measures to Minimize the Impact of Noise and Vibration

Noise impacts from construction activities will be temporary, limited only to the construction phase of the project. All equipment and vehicles will be new. GRIDCO will have a contractual arrangement with the contractor, hence their ability to generate undesirable sound will be very low. All the equipment to be used in the construction of the line shall be required to emit very low noise in order to ensure that noise does not have an impact both on workers and the public at large. All such equipment and vehicles will undergo periodic routine maintenance to reduce vibrations and other faults that ultimately lead to the generation of noise. Particular attention will be paid to all noise-reducing devices or mufflers to ensure that they are in good working condition to minimize noise generation.

The unnecessary tooting of horns during transportation of equipment and materials through settlements will be avoided as much as possible. Construction site workers will also be advised to avoid unnecessary noise making. In addition, night-time work, especially near communities, will be avoided as much as possible to prevent undue noise impacts on local communities. Construction crew near noisy machinery and power tools will be provided with earmuffs to protect them from hearing loss damage.

It is expected that the full implementation of the measures outlined above will minimize the potential impact of noise on the workers as well as the local communities.

8.1.10 Mitigation Measures for Air Pollution

To minimize air quality impacts on sensitive facilities during high-tension transmission projects, construction activities should be scheduled to avoid peak hours when these facilities are most active. Implementing dust control measures, such as water spraying and using dust suppressants, helps reduce

particulate matter. Additionally, maintaining equipment in good working condition and utilizing barriers or enclosures can help contain emissions and further protect nearby sensitive areas from air quality degradation.

Wind carrying dust from exposed unprotected land surfaces will be minimized by limiting land clearance to minimum area requirements for the construction activities. For instance, excavation of the tower base areas will be restricted to the required dimensions of 6m x 6m and utmost 9m x 9m. To further reduce dust pollution, regular dousing of the substation site and areas where tower foundations are being constructed will be carried out to reduce the effect of wind pick-up of dust particles. GRIDCo will ensure that all exposed surfaces, access road and working areas, are sprayed with water twice a day as part of regular construction activities. This shall be done, when necessary, with water bowsers. The frequency of spraying will be increased during the dry season. In addition, construction machinery and equipment will be maintained regularly to minimize the release of soot and exhaust fumes. Furthermore, trucks that supply sand, gravel and stone aggregates will have their buckets properly covered with tarpaulin during transit to prevent wind pick-up of dust, spill of materials and the release of dust into the atmosphere.

These measures, when fully implemented, are expected to minimize the potential impact of dust pollution on local communities.

8.1.11 Measures to Control Soil Pollution

Mitigating the impact on soil erosion during a high-tension transmission project involves implementing erosion control measures such as silt fences, terracing, and vegetation buffers to prevent soil loss and degradation. Proper site management practices, including limiting the area of land disturbance and using matting or geotextiles, help minimize soil compaction and maintain soil structure. Restoring disturbed areas with native vegetation post-construction aids in soil stabilization and reduces the risk of further erosion. Careful handling and disposal of construction materials prevent soil contamination from hazardous substances. Overall, these mitigation strategies are essential to preserving soil health and preventing long-term environmental damage.

The substation site will be designed and constructed to have a comprehensive stormwater management system to prevent waterlogging and soil erosion. The contractor will construct a drainage system to redirect water away from critical areas, ensuring the site remains stable, unflooded and environmentally compliant.

8.1.12 Measure to Control Soil Erosion

Activities during the constructional phase will expose the disturbed ground surface, which is at least temporarily unprotected, to the agents of soil erosion such as heat, wind and rain. Erosion of soil from exposed unprotected land surfaces will be minimized by limiting land clearance to the minimum area requirements for the constructional activities. For example, excavation of the tower base areas will be

restricted to the required dimensions of 9.6m x 9.6m. Also, the erection of towers/tower footings on steep slopes will be avoided as much as possible to prevent slip erosion.

GRIDCo will apply erosion control practices such as re-grading, compaction and early re-vegetation in relevant areas of the proposed substation to promote soil conservation.

The substation will be designed and constructed with an integrated drainage system to conform with the topography of the area to avoid flooding the area. Other mitigating measures such as silt fences, terracing, and vegetation buffers to prevent soil loss and degradation. The works will be designed and supervised by a competent professional architectural, electrical and civil engineering firm.

8.1.13 Mitigation Measures for Pollution of Waterbodies

Clearing and grading of access and tower corridor tracks and the excavation of tower base areas will be limited to the minimum area requirements. Other measures proposed in other sections of this report for minimizing erosion and managing excavated materials, wastewater and accidental spillage of oil, fuel and paints are valid for the prevention of pollution of water bodies as well as. GRIDCo will use culverts across water bodies to allow access to avoid blockage of streams, rivers and other water bodies. Under no circumstances shall water bodies be blocked to provide for construction access and the erection of towers. Removal of stream bank vegetation (especially bamboo/mangrove) shall be avoided as much as possible. GRIDCo will not employ herbicides/weedicides for weed control or vegetation clearing hence any potential pollution from this source is eliminated. Additional measures to minimize and mitigate against water pollution that will be implemented by the Contractor are as follows:

- Construction equipment and vehicles will be cleansed at 100 meters away from local streams and waterbodies
- Oils, fuel and other lubricants will be stored at least 100 meters away from water bodies
- Screens, oil/grease traps or inceptors will be installed on drains from material storage areas and work zones where activities that can cause potential oil spillage will be occurring and at outfalls into local waterbodies
- One mobile toilet and two refuse bins will be provided for each gang in working at a section
- Toilet facilities will be kept clean and well-maintained at all times and raw sewerage will not be discharged into waterbodies.

GRIDCo will ensure that the contractor does not establish a camp within 500m of a waterbody to minimize the incidence of water pollution.

The measures outlined above are expected to minimize the possibility of water pollution and its effects on downstream users and aquatic life. Effective management practices, such as installing silt fences, using

containment measures, and adhering to proper waste disposal protocols, are essential to protect water bodies and maintain water quality.

8.1.14 Biodiversity Mitigation Measures

In accordance with World Bank Environmental and Social Standard 6 (ESS6) and international best practice and applies the mitigation hierarchy of avoidance, minimization, restoration, and compensation. Measures defined in the BMP include, but are not limited to:

- Minimization of vegetation clearing strictly within the approved RoW;
- Protection of sensitive habitats and ecological corridors;
- Installation of bird diverters and insulation of energized components to reduce avifauna collision and electrocution risks;
- Restoration of disturbed areas using native species;
- Long-term biodiversity monitoring and adaptive management.

Implementation of the BMP will ensure that biodiversity impacts are effectively mitigated during construction and operation of the project.

8.1.15 Measure to Mitigate Adverse Impact on Flora and Fauna

Care will be taken to minimize the area that will be cleared and the number of trees that will have to be cut. Construction workers will be closely supervised to ensure that only the minimum area requirements, as given earlier, for access trucks, tower corridor track and tower base areas are cleared of vegetation to minimize potential impacts on flora and fauna. Also, surveys conducted, and desk studies carried out during the baseline study have not revealed the presence of any floral and faunal species of conservation concern that will be irreversibly impacted by the proposed project (Appendix X). Felling of trees will also be properly supervised to ensure that only trees that are, of necessity, to be felled are felled. Where possible, pruning of trees will be opted for as against felling of trees. Effective mitigation measures, such as habitat restoration, wildlife protection plans, and careful planning to avoid sensitive areas, are crucial to minimize adverse effects on local ecosystems and biodiversity.

Bird beacons will be installed along sections of the transmission line where bird activity is high. This measure will reduce bird mortality and mitigate adverse impacts on avian species.

8.1.16 Measures to Minimize Loss of Vegetation

The method that will be used for vegetation control to manage vegetative growth within the RoW will be physical or mechanical clearing. Threatening trees outside the RoW will be cut only to a height of not exceeding 1m. Chemicals such as weedicides or herbicides shall not be used to control vegetational growth

within the RoW. This is to eliminate the potential harmful effects of these often-persistent chemicals on the environment. In addition, the physical clearing will enable the management of vegetative growth within the RoW to be done in a more controlled manner limiting the clearing strictly to the tower corridor track. This is expected to have a limited effect on vegetation.

In addition, the non-use of chemicals will eliminate issues of potential pollution of nearby surface water bodies and possible seepage of chemicals into ground water. In addition, all potential risks to workers arising from improper handling of these chemicals will be eliminated.

8.1.17 Work Camp Establishment and Management

The contractor will establish one or two work camps near the transmission line route to house a portion of the workers. Additionally, some workers will rent houses in the nearby project communities, depending on proximity and availability of accommodation. This arrangement ensures that workers are adequately housed while minimizing disruption to local communities.

GRIDCo shall ensure that the contractors do not establish work camps close to any water body to avoid water pollution problems. The camp will also be established at least 500m from the closest settlement to minimize noise impacts on the community. The Contractor will also ensure that employees from the local communities are not accommodated at the camp to minimize congestion. Other mitigation measures include the following:

- Ensuring the camps are well-stocked with essential resources (e.g., water, food, sanitation) to minimize the impact on local supplies.
- Conducting regular consultations with local leaders and communities to foster positive relationships and address any arising concerns.
- Implementation of health screening and awareness programs to prevent the spread of diseases, along with the provision of adequate healthcare in the work camps.
- Setting up of robust waste management systems for both camps and rented accommodations, ensuring proper disposal and minimal environmental impact.
- Establishing clear policies and training to prevent gender-based violence, with mechanisms for reporting and addressing any incidents.

8.1.18 Measures to Reduce Pressure on Social Amenities, Outbreak Spread of Infectious/Communicable Diseases in the Project Affected Communities

To minimize pressure social amenities and spread of communicable and infectious diseases in the project affected communities, the Contractor will rent sandcrete buildings with well-ventilated rooms for site workers. The rented accommodation will have the under-listed facilities:

- Clean, safe, and enclosed toilet facilities
- enclosed bathrooms
- kitchens
- eating areas
- potable water
- electricity
- 2 refuse bins are to be emptied daily and disposed of at the approved landfill site by a private waste collector and disposed of at the approved landfill site
- The Contractor shall not put more than three (3) workers in a standard (12 square meters) room.

8.2 Operational Phase

This section of the report presents the proposed mitigation measures put forward to minimise the significant potential environmental impacts that are expected to be associated with the operational or maintenance phase of the proposed project.

8.2.1 Mitigation Measures for Waste Management

During the operational phase, solid waste in the form of trees, tree stumps and wooden containers from periodic right-of-way of clearing, routine line maintenance and repairs will be gathered together and made available to the local communities as fuel wood. Other solid wastes such as damaged cables, conductors and insulators, rags and paper cartons will be collected and kept at the GRIDCO storeroom and returned to the supplier sites or disposed at the approved landfill after inspection.

Accidental spillage of oil at the substation will be avoided as much as possible. Any spilt materials will be quickly mopped up with rags and/or sawdust. The used sawdust and rags will be disposed of at approved landfill site.

8.2.2 Mitigation Measures for Occupational Health and Safety Risks

GRIDCo will use its own certified and trained engineers and technicians for routine maintenance and repairs of the transmission system. Measures shall be designed and adhered to GRIDCo's occupational health and safety policy/standards to mitigate occupational, health and safety risks during the operational phase of the project. Comprehensive safety protocols, regular training, and stringent adherence to safety standards are crucial to minimize accidents and ensure worker safety. Electromagnetic fields (EMF) are generated whenever voltage is present or current is flowing, both naturally (e.g., lightning) and through man-made sources such as electricity transmission equipment, household wiring, and electrical appliances. Since the advent of public electricity in the 1880s, exposure to EMF has increased, and its ubiquitous nature makes complete avoidance nearly impossible. The debate over EMF's impact on human health, particularly from power lines, has led to conflicting conclusions, with ongoing research needed to understand potential risks.

The Environmental Health Division of the Minnesota Department of Health has compiled global research results to address these concerns. Public safety measures should include monitoring EMF exposure and implementing safety standards to mitigate potential health risks and reduce accidents and incidents associated with EMF-related activities. Health and safety measures outlined in the construction phase will be carried out in the operational phase as well. For specific hazards, the underlisted measures will be implemented:

a. Occupational noise

Construction workers working with or near noisy equipment like pumps and power tools will be provided with earmuffs to protect them against noise-induced hearing loss or damage.

b. Injuries from falling/swinging objects

Protective clothing such as hard hats and safety boots will be provided for all employees at the proposed project site for protection against falling and/or swinging objects. Additionally, exclusion zones will be marked around where objects are being lifted. Lifting objects will also be firmly secured to avoid falling. Tree felling will be done by competent and adequately trained workers. Adequate warning will be given to ensure that safety of workers is not compromised.

c. Accidental falls from height

Due to the hazard of potential accidental falls from heights during routine maintenance and repair works, all workers who will be required to climb and work on the towers will be provided with the necessary safety equipment such as body harnesses, (climbing belts). Fall hazards must be minimized through the use of fall prevention or fall protection. Fall prevention refers to using permanent engineering controls so that hazards associated with working at elevated locations are reduced or eliminated.

d. Snakebites

Construction workers will be protected from the potential hazard of snakebites by providing them with safety boots long enough to cover the leg up to the knee. Workers will be required to wear these boots at all times during working hours

e. Accidents outside work zone

Enhanced road maintenance, improved signage, and better traffic management are necessary to reduce accident rates and improve overall road safety in these districts.

8.2.3 Measures to Ensure Community Health and Safety

GRIDCo will carry out the operation and maintenance of the proposed transmission line based on accepted international standards, such as those of the International Electrotechnical Commission (IEC) as well as

GRIDCo's own 'Corporate Safety Rules. However, some specific potential occupational safety and health hazards expected during the operational phase of the project are deal.

Towers rarely collapse. But when they do the hazardous effects (e.g. falling on people and electrocution) are normally felt within the RoW. Therefore, the public safety will be ensured by restricting public access to the Right-of-Way. In line with existing good practice, all towers will be clearly marked with a red inscription on white background - "**DANGER – 400,000 Volts**" to ward off trespassers and prevent them from exposing themselves to the potential dangers of electrocution.

Routine maintenance and repairs on the transmission lines, towers and substation will minimize corrosion and wear out of parts of the towers and their accessories. GRIDCo already has comprehensive, planned and emergency maintenance programs for the existing transmission lines. The same level of care to the new transmission lines to be constructed shall apply.

In addition, tower members will be secured and improved by anti-theft fasteners to check acts of vandalism and its harmful consequences on the towers. Security patrol will be conducted on sections of the transmission line against acts of vandalism and theft. It is expected that the patrols will ensure early detection of any acts of vandalism and signs of tower corrosion. Prompt and necessary remedial actions will be taken to repair the structures to forestall the possible collapse of towers.

GRIDCO will undertake one community sensitization programs in the communities within the project corridor every year to educate residents on the dangers associated with unauthorized entry into the demarcated Right-of-Way, especially going close to the towers and transmission line.

The transportation of heavy plant and equipment through settlements will be done in a manner not to jeopardize the safety of the local people. Equipment and materials will be properly secured when being transported to prevent them from falling and posing potential danger to people. (It is important to note that it is not the constructed towers that will be transported to tower locations but rather the tower members or parts). Legally mandated speed limits (40km/hr.) on the roads and highways shall be strictly observed.

Also, tower base excavations in or near settlements or farms will be protected or clearly marked to prevent people from inadvertently falling into these excavations. For areas with animal populations, these excavations will be guarded with boards to ensure no animals fall into the pits. Tree felling will be done by qualified and competent workers. Adequate warning will be given to ensure that public safety is not compromised during this activity.

The transmission line poses potential public health and safety hazards if the local populace is not properly educated with regard to the potential hazards, such as collapse of towers, which actually occurs rarely. In addition to the hazards posed to the public due to transportation of equipment and materials, other hazards

such as potential exposure to Electromagnetic field (EMF) effects, potential collapse of towers and electrocution exists. These potential hazards require mitigation to ensure the safety of the public.

Since the hazardous effects (e.g. falling on people and electrocution) of the collapse are normally felt only within the RoW public safety is ensured by restricting public access to the right-of-way. In line with existing practice, the towers have been clearly marked with a red inscription on white background - "**DANGER – 330,000/400,000 Volts**" to warn off trespassers and prevent them from exposing themselves to the potential dangers of electrocution. Further, regular maintenance ensures the minimization of corrosion and wearing out of parts of the towers and their accessories. During the field surveys, the various community groups were briefed in very simple terms on the current state of knowledge about EMF effects to allay their fears. This impact is expected to be insignificant at the operational phase of the project.

8.2.4 Public safety

Tower members will be secured and improved by anti-theft fasteners to check acts of vandalism and its harmful consequences on the towers. Furthermore, anti-climbing guards will be installed to discourage adventurous individuals from endangering their lives and limbs. The shattering of insulators, which could pose potential danger to passers-by, will be minimized using quality insulators as well as the periodic washing of the insulators.

Measures proposed earlier to minimize public safety hazards relating to transportation and potential tower collapse are valid for ensuring public safety. These measures will be fully implemented to enhance public safety.

Threatening trees will be felled or pruned as stated earlier in the report to prevent them from falling onto the transmission lines during stormy weather conditions. This will minimize the potential of the fall of live electrical conductors, which could pose safety hazards to the public. Insulator pins will also be checked regularly for signs of rusting and any defective pins found will be promptly replaced to prevent the live electrical conductors from falling from the towers.

9 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan (ESMP) details active remedial measures and monitoring activities to be continuously carried out to prevent or minimize impacts on the physical, biological, and socio-economic/socio-cultural environments as well as to promote occupational safety and health of employees on the project.

9.1 Environmental Policy

GRIDCo has a Corporate Environmental Policy, which aims at safeguarding the environmental quality and mitigating or offsetting the adverse impacts on the environment of all its activities in conformity with national and international environmental management standard and regulation in a sustainable manner.

9.2 Environmental and Social Management System

In order to maintain control over the implementation of the project and also ensure that mitigation measures and commitments made in the ESIA and accompanying ESMP are acted upon in a comprehensive and acceptable manner, an Environmental and Social Risk Management and Training Programme will be developed in this section. This programme will help to identify personnel, responsibilities and training requirements for the Project Implementation Unit (PIU) to be constituted.

The Project PIU Management Team will be responsible for the following:

- Ensuring project's compliance with all relevant environmental, social, health and safety regulations;
- Liaising with all relevant regulatory bodies and organisations such as the EPA, Factories Inspectorate Department, Energy Commission (Inspectorate Unit), etc;
- Formulation and review of environmental and social policies and practices associated with projects;
- Liaising with relevant GRIDCo Departments on all health, environmental, safety and social matters connected to projects.
- Assist in the education and training of project staff in environmental, social and safety awareness.
- Put forward budgetary estimates for projects' environmental programmes for approval
- Undertaking environmental and social monitoring activities for projects.

9.3 Environmental Management Structure

The Lands and Environment (LEM) Section of the Engineering Department is responsible, among others, for pre-project development as well as the post project implementation of the project. Where necessary, the traditional leaders will advise on the required pacification rites to be performed in an event of cultural heritage impact. It is headed by a manager (Chart 1).

In pursuance of the objective of ensuring compliance with national environmental and social regulations, an Environmental Risk Management Specialist and a Social Development Specialist who are a staff of LEM have been appointed to coordinate the E&S activities of the Project Implementation Unit (PIU) for the proposed project. Membership of the PIU will include a Project Valuation Officer. The Project Environmental Coordinator will report through the Project Engineer.

The PIU will be directly responsible for all environmental and occupational safety and health matters arising from the project. The post-construction or operational phase environmental management will be incorporated into GRIDCo's Corporate Environmental Management Plan and implemented by the LEM, Environmental and Social Safeguards Specialists, Procurement Specialist, Financial Management Specialist, Monitoring and Evaluation (M&E) Officer, Health and Safety Officer, Legal Advisor, Land Acquisition and Resettlement Specialist, Community Liaison Officer, Administrative Support Staff

9.3.1 Qualifications of the Project Implementation Unit

The Project Implementation Unit (PIU) for the proposed project will be composed of key specialists, including a Project Engineer, Office Engineer, Environmental Coordinator, Valuation Officers, and Field Technicians. Each of these roles will be filled by personnel with appropriate expertise to ensure effective project management. The PIU will be led by the Director of Engineering, who will oversee all project activities. To maintain high standards of environmental management, all members of the PIU will receive the necessary training. This structure is designed to ensure that the project is managed efficiently and in compliance with all relevant environmental regulations.

9.3.2 Environmental Management Specialist (EMS)

The Environmental Management Specialist (EMS) for the project will be responsible for all environmental issues in connection with the project. He will report through the Manager, Lands and Environment Management to the Director, Engineering. He will work closely with the other members of the Project Implementation Unit.

The EMS should have experience in environmental and social impact assessment, health, safety and environmental (HSE) management. The EMS is responsible for:

- Monitoring all environmental and social programmes for pre-construction, construction, and operational phases of the project, including those related to bio-physical and socio-economic/cultural components.
- Working closely with project contractors to ensure that all monitoring and mitigation guidelines, recommendations for the project are strictly adhered to. This includes compliance with all health, social and safety guidelines outlined and following strictly the GRIDCo's environmental policy guidelines;

- Working closely and coordinating efforts with the EPA and other enforcement bodies to ensure full compliance with all legal and regulatory requirements;
- Organizing activities to motivate and maintain the interest of the project staff in environmental and social issues and assisting to increase project staff awareness of environmental issues through training programmes and review meetings;
- Coordinating investigations into/of all types of accidents;
- Conducting environmental and social audits in accordance with project monitoring guidelines;
- Serving as liaison between project contractors, GRIDCo and relevant regulatory agencies;
- Developing a work plan for the implementation of the ESMP;
- Establishing and running a reporting system on progress (or otherwise) in implementing mitigation measures (including contractors' obligations), training, etc.;
- Production of reports.

9.3.3 Social Development Specialist (SDS)

The structure we have agreed on between the Bank and GRIDCo includes a Social Development Specialist (SDS) who will work in tandem with the Environmental Management Specialist.

The SDS is responsible for: ensuring that the social dimensions of the project are managed responsibly and equitably, protecting communities and promoting sustainable development outcomes. He/She play a pivotal role in balancing development objectives with social justice and human rights concerns. Key functions of an SDS include:

- i. Conducts assessments to identify potential social risks and impacts of the project on local communities, such as displacement, loss of livelihoods, and changes in community dynamics. The SDS analyzes demographic, economic, and cultural factors to understand the social context in which the project will operate.
- ii. Facilitates meaningful engagement with local communities, government agencies, and other stakeholders throughout the project lifecycle. SDS ensures that stakeholder concerns are incorporated into the project design and that there is ongoing communication to maintain trust and transparency.
- iii. Develops, implements, and manages a grievance redress mechanism to address complaints and concerns from affected individuals or communities promptly and effectively. He/She ensures that grievances are tracked, resolved, and reported back to the communities and project management.
- iv. Oversees resettlement action plans (RAP) and ensure that displaced individuals are fairly compensated and provided with necessary support, such as alternative housing or land, livelihood restoration programs, and legal assistance. They further ensure compliance with international standards such as the World Bank's Environmental and Social Framework (ESF).

v. Develops and implements programs that help communities restore or improve their livelihoods post-project implementation, especially for those who lose land, assets, or employment opportunities.

vi. Ensure that the project complies with social safeguard policies, including laws related to labor, human rights, and indigenous peoples, as well as international standards and guidelines. Monitor the social impacts of the project and the effectiveness of mitigation measures as outlined in the ESMP.

vii. Build the capacity of project staff, contractors, and local communities to understand and address social risks, mitigation measures, and the importance of social safeguards. SDS also provides training on issues like gender equity, cultural sensitivity, and conflict resolution.

viii. Regularly monitors the social aspects of the project to assess the effectiveness of mitigation measures, identify any new social risks, and ensure compliance with the ESMP. They also prepare social performance reports and share updates with relevant stakeholders, ensuring transparency and accountability in the project's social outcomes.

ix. Mediates and resolves conflicts that arise between the project team and affected communities or within the community itself, helping to maintain harmonious relations throughout the project lifecycle.

x. Ensures that the needs and perspectives of vulnerable groups (such as women, children, the elderly, and marginalized populations) are considered in the project. SDS also implements specific programs that promote gender equity and protect the rights of vulnerable individuals.

9.3.4 Gender Specialist (GS)

The structure we have agreed on between the Bank and GRIDCo includes a Gender Specialist who will work in tandem with the Environmental Management Specialist.

The GS is responsible for ensuring that gender considerations are integrated into the environmental and social management processes of a project. The primary responsibility is to ensure that both men and women are equitably involved, considered, and benefit from the project's activities, while mitigating any potential gender-related risks or impacts. The following are the key responsibilities of a GS:

- Analyse how environmental changes affect men, women, and vulnerable groups differently, considering potential gender-specific impacts.
- Highlight gender inequalities, such as increased burden on women due to resource scarcity, and propose strategies to mitigate risks.
- Collaborate with the Environmental Management Specialist to incorporate gender considerations into all stages of the Environmental and Social Management Plan (ESMP).
- Ensure both men and women, particularly marginalized groups, are represented and involved in stakeholder consultations and decision-making processes.
- Create a Gender Action Plan outlining strategies to promote gender equality, ensuring equitable

distribution of project benefits.

- Implement gender-sensitive mitigation measures like safe spaces for women and addressing risks such as gender-based violence (GBV).
- Provide training to staff and communities on gender issues and ensure gender sensitivity is part of the project's culture.
- Track progress on gender equity with gender-sensitive indicators and assess the project's gender-related outcomes in collaboration with the EMS.
- Adhere to national and international gender equality standards, including SDG 5, and meet donor and regulatory requirements.
- Ensure both men and women participate equally in resource management, decision-making, and climate change resilience efforts.

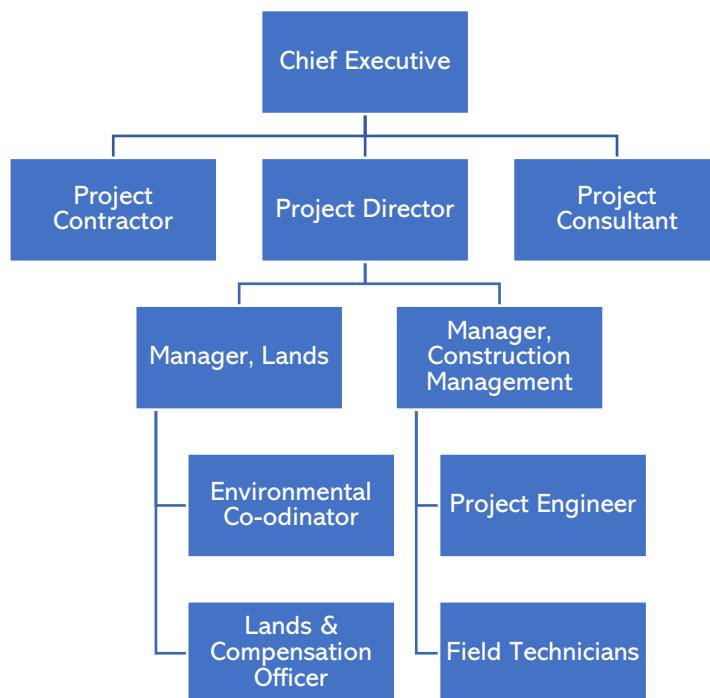


Chart 1: Organisational chart-Project Environmental Management

8.4 General Health and Safety Procedures

Occupational safety and health measures will be guided by GRIDCo's Corporate Safety Rules, the Safety Manual, and the Factories, Offices and Shops Act, 328 (1970), complemented by the occupational safety and health recommendations provided in the Environmental and Social Impact Assessment (ESIA). Relevant issues covered in the Corporate Safety Rules include:

- Manual lifting
- Hearing protection

- Use of personal protective equipment (PPE)
- Housekeeping standards
- Fire prevention measures
- Prevention of falls from heights
- Electrical hazards and safety
- Machinery operation safety
- Welding precautions
- Head and foot protection
- First aid provisions

All the provisions of the Factories, Offices and Shops Act, 328 (1970) will be fully adhered to during project implementation, and mitigation measures outlined in the ESIA will also be implemented to ensure full compliance with health and safety standards.

8.4.1 Fire Prevention System

To mitigate the risk of fire:

- Post "No Smoking" signs will be installed at sensitive locations such as fuel storage areas.
- Adequate fire extinguishers will made available on-site.
- Store flammable materials, like oil-soaked rags, in appropriate containers for safe disposal.
- Limit the handling of flammable materials to qualified personnel.
- Install emergency fire alarm systems in key areas.
- Conduct fire prevention training for selected project employees to ensure they are equipped with the necessary knowledge and skills.

8.4.2 Monitoring

Environmental and social monitoring will adhere to the recommendations provided in the ESIA, covering key parameters such as:

- Implementation of the Resettlement Action Plan (RAP), including compensation payments.
- Effectiveness of the Grievance Redress Mechanism (GRM) e.g. status reports on case
- Incidence of Gender-Based Violence (GBV) and Sexual Exploitation and Abuse (SEA).
- Occupational health and safety compliance, including PPE usage.
- Public safety measures.
- Incidence of Child labour
- House keeping
- Number and types of accidents/incidents and near misses
- Water, noise and air quality monitoring.
- Management of solid and liquid wastes.

The monitoring will enable GRIDCo to take corrective action where necessary, and the E&S and Gender Team will receive training on parameters, sampling methods, and monitoring frequency. Monitoring will be undertaken daily and reported monthly as part of monthly progress reporting. Reporting to the Bank will be undertaken every quarter.

8.5 Training and Development

To ensure effective implementation of all environmental management programs, a comprehensive training program will be provided for the project's **Environmental Management Team** and key contractor personnel. The training will focus on environmental awareness and occupational health and safety issues.

8.6 Environmental and Social Awareness

Awareness creation will include topics such as:

- Basic environmental terminologies.
- Ghana's Environmental Impact Assessment (EIA) procedures.
- Relevant environmental laws and regulations.
- Gender Based Violence (GBV), Sexual Abuse and Exploitation (SEA) and Sexual Harassment (SH)
- Introduction to environmental management planning, impact assessment, monitoring, and mitigation measures.

8.7 Occupational Safety and Health

Key areas of focus for occupational safety and health include compliance with the Factories, Offices and Shops Act, 328 (1970), fire prevention, and fire-fighting methods.

8.8 Information, Education, and Communication (IEC)

The project will implement continuous Information, Education, and Communication (IEC) programs to ensure public safety. These programs will raise awareness among community members about project-related risks, such as uncontrolled bushfires, tower climbing, and adherence to warning signs.

8.9 Record Keeping

GRIDCo will maintain a General Register as required by the Factories, Offices and Shops Act, 1970. The register will include records of accidents, fire system testing, and inspections of pressure vessels and lifting equipment.

8.10 Scheduling and Reporting

Monitoring will be documented, detailing data handling, analysis requirements, and reporting responsibilities. GRIDCo will ensure regular reporting to management, relevant stakeholders, and government authorities, including:

- Monthly reports on environmental protection activities.
- Emergency reports to GRIDCo Management, EPA, and the World Bank in case of emergencies.
- Biannual and annual environmental reports submitted to relevant authorities.

10 EMERGENCY RESPONSE PROCEDURES DURING CONSTRUCTION PHASE

Response measures have been proposed for the following emergencies, which may arise during project implementation:

- t. Fire.
- u. Medical emergencies or Accident; and
- v. Oil Spills.

10.1 Fire Emergency

10.1.1 Small Fires

In the event of a small fire, these steps will be followed:

- w. The first person to detect the fire must raise the alarm by shouting "FIRE!" or activating the fire alarm on-site.
- x. Only workers trained in using fire extinguishers should attempt to extinguish the fire.
- y. All others should evacuate the area immediately.
- z. Fire should be tackled at its source in its early stages, ensuring your own and others' safety.
 - aa. Ensure a clear escape route and avoid situations where the fire blocks exits or the fire's source cannot be determined.
 - bb. If the fire is contained, the Environment, Social Health, and Safety Officer (ESHSO) of the contractor will investigate the cause and organize clean-up.

Report the incident to the Supervising Engineer for further safety precautions. **9.1.2 Large Fires:**

Raise the alarm immediately by shouting "FIRE!" or activating the alarm.

Evacuate the building or site to the ASSEMBLY POINT.

Notify the ESHSO and contact the National Fire Service (NFS).

The contact details of the nearest fire station must be displayed prominently on-site.

The ESHSO will oversee a calm and secure evacuation, ensuring all workers are accounted for through a headcount.

If there are any injuries, the casualties will be transported to the nearest medical facility.

All injuries and the fire event must be documented and reported to the Supervising Engineer.

10.1.2 Large Fires

These are fires that cannot be put out by trained fire volunteers and the SNFS will have to be called to fight them. The evacuation procedures to follow include:

- The first person to sight the fire must sound the fire alarm if at the premises or shout, 'FIRE!! FIRE!! FIRE!'
- Evacuate the building or area and report at the ASSEMBLY POINT;
- Immediately notify the Environment, Social Health and Safety Officer of the Contractor and call the National Fire Force;
- Contact numbers of the nearest fire station will be conspicuously displayed at offices, storerooms, workshops, and security posts;
- The Environment, Social Health, and Safety Officer of the Contractor has to check on the remaining workers and carry out a fast, calm, and secured evacuation;
- A head count will be conducted to ensure all workers are safe and present;
- If there have been any casualties, they will be conveyed to the nearest health facility; and
- Keep records of any injuries and the fire event and report to the Supervising Engineer

10.2 Medical Emergencies and Accidents

In the event of an accident or injury, follow these steps:

- For minor injuries where the victim can move, report to the ESHSO for first aid treatment.
- If the injury requires further treatment, the ESHSO will arrange for transport to the nearest health facility.
- If the injured person cannot move, stabilize the person and call for medical assistance from the nearest health facility.
- All accidents must be investigated, documented, and reported to the Supervising Consultant.

10.3 Bites from Reptiles or Insects

In case of snake bites, scorpion stings, or other insect bites:

- Identify the snake or scorpion (color, length) from a safe distance if possible.
- Keep calm and position the bite below the level of the heart.
- Clean the bite with soap and water, remove jewelry, and cover the wound with a clean, dry dressing.
- Transport the victim to the nearest health facility immediately for treatment with anti-venom.
- The following actions should be avoided: applying a tourniquet, cutting the wound, sucking out

venom, using ice or alcohol, and administering pain relievers like aspirin.

10.4 Oil/Solvent Spills

10.4.1 Spillage on Hard Surfaces

- Contain the spill using sawdust provided on-site to prevent spreading.
- Collect used sawdust for appropriate disposal, clean the surface with water and disinfectant, and report the incident to the ESHSO.

10.4.2 Spillage on the Ground

- cc. Use a shovel to scoop the contaminated soil into a container and ensure all contaminated soil is removed.
- dd. Dispose of the contaminated soil at an approved landfill site.
- ee. Report the incident to the ESHSO, and if any contact with the body occurred, wash the affected area thoroughly.

11 ESMP BUDGET

11.1 Assumptions

The assumptions underlying this budget are as follows:

1. **Disclosure of Environmental & Social Impact Assessment Report (\$10,000.00):** This cost assumes the need for public disclosure and stakeholder engagement activities required to share the findings of the Environmental and Social Impact Assessment (ESIA) with affected communities and other stakeholders.
2. **Environmental Monitoring, (\$150,000.00):** This budget item is based on continuous monitoring of environmental parameters throughout the construction and operational phases to ensure compliance with environmental standards, medical care, psychological support, legal assistance and to mitigate potential impacts.
3. **Cost of Implementation of EIS, RAP, and ESMP (\$75,000.00):** This covers the costs associated with implementing the Environmental Impact Statement (EIS), Resettlement Action Plan (RAP), and Environmental and Social Management Plan (ESMP) over the project's life cycle, including monitoring and mitigation measures.
4. **Training of Environmental Management Team (\$50,000.00):** This allocation is for the training and capacity building of the environmental management team to ensure they are equipped with the skills and knowledge required to manage the project's environmental and social aspects effectively.
5. **Unforeseen Pacification Rites (\$20,000.00):** This budget item accounts for unexpected cultural or social rites that may need to be conducted to appease local communities or address unforeseen cultural issues that arise during the project.
6. **Decommissioning and Reclamation of Lay Down Areas (\$85,000.00):** This is for the restoration and reclamation of areas used as temporary laydown yards or construction sites at the end of the project, ensuring these areas are returned to their original condition or better.

11.2 ESMP Budget

The budget outlined in Table 11 covers the necessary environmental and social management activities for the project over the duration.

Table 11: Environmental management Plan budget estimate

Nº	ITEM	US \$
1.	Disclosure of Environmental & Social Impact Assessment Report	10,000.00
2.	Environmental Monitoring	150,000.00
3.	Cost of implementation of EIS and ESMP	75,000.00
4.	Training of environmental management team	50,000.00
5.	Unforeseen pacification rites	20,000.00
6.	GBV Sensitization and Support Services	20,000.00
	Establishment and Maintenance of Grievance Redress System (including training of GRCs)	15,000.00
6.	Decommissioning and reclamation of lay down areas	85,000.00
	Total estimates for environmental issues	425,000.00

12 DECOMMISSIONING PLAN

12.1 Introduction

The proposed transmission line is expected to be operational for more than fifty years and it is likely that this period may be extended. The current trend in the power industry is by upgrading older equipment with more efficient ones and ancillary equipment. However, if not upgraded the transmission line and associated substation will be decommissioned. The purpose of this conceptual Decommissioning Plan (DP) is to describe the general objectives for the post project land use, and the planning processes leading to development of a Final DP Plan. The specific objectives in managing the decommissioning process will be:

- To ensure that rehabilitation and decommissioning are carried out in a planned sequential manner, consistent with best practice,
- To ensure that agreed post-project land-use outcomes are achieved, and
- To avoid on-going liability

Removal of machinery, equipment, and all other materials related to the project is to be completed within one year of decommissioning. Thus, within twelve (12) months of initiating the decommissioning, the relevant project components will have been removed from the acquired land.

12.2 Decommissioning During Construction

While not expected and considered to be extremely unlikely, if construction of the proposed project and associated work may not be completed, the project would be decommissioned in a manner as described in this report. Further, mitigation measures as described in the Chapter 7 would be implemented.

12.3 Decommissioning After Ceasing Operation

The decommissioning of the power facility will follow GRIDCo's Health & Safety Policy along with any applicable national, and the relevant District Assembly's Regulations and standards. During decommissioning activities, the Physical Planning Department of the five Assemblies namely Upper Denkyira East, Wassa Amenfi East, Wassa Amenfi West, Aowin municipal Assemblies and Wassa Amenfi Central District Assembly and the EPA Office shall have access to the site, pursuant to reasonable notice, to inspect the results of complete decommissioning. All decommissioning and restoration activities will be in accordance with all applicable state and local permits and requirements.

12.4 Restoration of Land and Water Negatively Affected by Facility

Once all the facilities are removed, the remaining work to complete the decommissioning will consist of shaping and grading of the areas to as near as practicable to the original contour prior to construction of the power facilities. All areas will be restored as near as practical to their original condition with native soils

and revegetated. The decommissioning will affect the agricultural practices directly around the access roads, substation locations, but only during their removal.

Like the construction phase, the decommissioning will follow a storm water protection plan that will ensure proper steps are followed to mitigate erosion and silt/sediment runoff. As with the project's construction, noise levels around the decommissioning work will be higher than average. Proper steps will be followed to minimize this disturbance, such as working only during daylight hours. Also, as with the project's construction, road traffic in the area will increase temporarily due to crews and heavy equipment movements.

12.5 Procedures for Managing Waste and Materials

GRIDCo shall aim to engage a contractor for this assignment, and the option of the 3Rs of the Environment (Reuse, Reduce & Recycling) shall guide the process.

12.6 Decommissioning Notification

The process for notification of decommissioning activities will be the same as the process for notification of construction activities. EPA will be formally notified of the process to enable them to provide relevant guidance as required. A report describing the performance of the final DP Plan in working towards its objectives, based on monitoring results, and the extent to which it has been complied with, will be submitted to the EPA. The report will be provided to relevant stakeholders and be available to any entity or person(s) upon request. Files and documents used to collate information regarding closure commitments, licenses, approvals, and other information concerning closure will be catalogued and maintained in accordance with standard GRIDCo practices.

12.7 Conditions of Approval

GRIDCo will ensure that the decommissioning stage of the proposed facility is carried out in accordance with EPA/Energy Commission as well as the District Assembly's requirements and the measures/practices as described in this report. The DP Plan will be finalised and submitted to the relevant authorities for approval at least six months prior to closure of the site.

12.8 Calculations for Decommissioning Costs

To provide financial assurance before the end of the useful life of the equipment, GRIDCo agrees to deliver to relevant agencies prior to the decommission and closure phase, a financial instrument with an aggregate initial face amount equal to the decommissioning cost estimate prepared and certified by a professional engineer in accordance with national and respective local laws.

APPENDIX I: COPY OF THE EXPIRED ENVIRONMENTAL PERMIT

Tel: (0302) 664697 / 664698 / 662465
 667524 / 0289673960 / 1 / 2
Fax: 233 (0302) 662690
Email: info@epa.gov.gh



Environmental Protection Agency
 P. O. Box MB 326
 Ministries Post Office
 Accra
Website: <http://www.epa.gov.gh>

Permit No. CE0019720102

ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL PERMIT

ENVIRONMENTAL ASSESSMENT REGULATIONS 1999 (LI 1652)

This is to authorize

GHANA GRID COMPANY LIMITED

To commence the proposed 120Km 330kV Cote D'Ivoire – Ghana Interconnection Reinforcement Project (Ghana Section) as per the attached schedule

Located across four Districts (Wassa Amenfi West, Wassa Amenfi East, Aowin Suaman and Upper Denkyira East) of the Western and Central Regions

Date Issued: March 13, 2015

Expiry Date: September 12, 2016

NB: This Permit is only valid with the Seal of the Environmental Protection Agency and conditioned upon obtaining other permits from relevant institutions among others



E. APPAH-SAMPONG
 Ag. DEPUTY EXECUTIVE DIRECTOR
 (TECHNICAL)
 FOR: EXECUTIVE DIRECTOR

Tel: (0302) 664697 / 664698 / 662465
667524 / 0289673960 / 1 / 2
Fax: 233 (0302) 662690
Email: info@epa.gov.gh



Environmental Protection Agency

P. O. Box MB 326
Ministries Post Office
Accra

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

SCHEDULE TO THE ENVIRONMENTAL PERMIT

1.0 CONTACT : THE CHIEF EXECUTIVE
2.0 PROponent : GHANA GRID COMPANY LIMITED (GRIDCo)
P. O. BOX CS 7979
TEMA.
3.0 REGISTRATION NO. : CE: 1972/01/02
4.0 PERMIT NO. : CE0019720102
5.0 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)
PROPOSED 120KM 330KV COTE D'IVOIRE – GHANA INTERCONNECTION
REINFORCEMENT PROJECT (GHANA SECTION)

In pursuance of the Environmental Protection Agency Act 1994, Act 490 Sections 2(i) and 12(1) and the Environmental Assessment Regulations, 1999, LI 1652 and, on the basis of the information provided in the Environmental Impact Statement (January 2014), this Environmental Permit is issued authorizing **GHANA GRID COMPANY LIMITED (GRIDCo)** to commence work on the proposed 120Km 330kV Cote D'Ivoire – Ghana Interconnection Reinforcement Project (Ghana Section) upon obtaining the necessary development permits from the relevant District Assembly.

6.0 CONDITIONS OF PERMIT

6.1 Commitment to Project Specification

- Comply with all project specifications, mitigation, monitoring and other environmental management provisions as indicated in the project (EIS). The project involves the construction of the proposed 120Km, 330kV Cote d'Ivoire – Ghana Interconnection reinforcement project with the following components:
- Construction of high voltage transmission line(118.8km) from Bibianiha near Dunkwa-on-Offin to Omanpe on the border with Ivory Coast
- Construction of 330/161kVsubstation at Bibianiha

6.2 Location

- The proposed construction of the transmission line will be carried out across four districts of the Central and Western Regions. These are Wassa Amenfi West, Wassa Amenfi East, Aowin Suaman and Upper Denkyira East Districts.

6.3 Acquisition and Protection of Right of Way (ROW) and Compensation

- A detailed survey of all Project Affected Persons (PAPS) and properties should be compiled and valued and the appropriate compensation paid for their loss prior to start of construction activities.
- Buildings, land and crops should be duly compensated for in accordance with the provisions of the law at the appropriate values in line with (GRIDCo)/Land Valuation Board procedures.
- Institute local-level grievance committees to deal with disputes over compensation and

GRIDCo, Ghana-Côte d'Ivoire Interconnection Reinforcement (Ghana Section), CE0019720102 Page 1 of 4

resettlement. A grievance registration form should be used by the committee in order to standardize the records,

- Provide a tracking system for dispute resolution.
- Take steps to restrict public access to Right-of-Way (ROW).
- Prevent the construction of unauthorized structures in the ROW.

6.4 Compliance with Factories, Offices and Shops Act.

- Comply with the requirements of the Factories, Offices and Shops Act, 1970 (Act 328), Consult with the Factories Inspectorate Department in order to satisfy the requirements of the Act and the Department.

6.5 Occupational Health and Public Safety Measures

Occupational health and safety measures should include among others:

- Environmental awareness training programmes to sensitise workers on the need to follow laid down procedures and the handling of equipment/machinery etc.
- Provision of appropriate personal protective clothing/gear such as helmets, earmuffs, climbing belts, wellington boots, hand gloves etc. to workers.
- Provision of a well-stocked first aid kit with all items prescribed by the Factories, Shops and Offices Act 328 for minor injuries that might occur in the course of construction.
- Towers should be clearly marked with a "DANGER- 161,000 Volts" signal in red on white background to warn off trespassers.
- Tower base excavations in or near settlements or farms should be protected or clearly marked to prevent people from falling into these excavations.
- All potentially hazardous machinery should undergo statutory examination by a certified engineer.
- Carry out the operation and maintenance of the transmission line based on acceptable international best practice.

6.6 Archaeological and Cultural Heritage

- Project construction should avoid, as much as possible the destruction of any sacred, cultural and/or archaeological sites/items.
- Where cultural properties (e.g. cemeteries) are affected by the project construction, the necessary performance of pacification rites should be undertaken under an agreement with the local communities.
- Procedures for managing chance finds from archaeological discoveries should be in line with procedures of the National Museum Decree 1969 (NLCD 387).

6.7 Traffic Management

- Drivers delivering equipment/materials should be provided with guidelines on how to minimize increased risk of accidents.
- Speed limits should be imposed on the sensitive sections of roads through settlements as well as the use of speed ramps at those locations.
- Trucks and vehicles conveying construction materials should display appropriate road safety signals (e.g. red flags and flashing amber lights).
- Traffic wardens should be employed to direct traffic during the stringing of transmission lines across public roads.
- Due notification should be given to the general public and appropriate authorities (GHA and DUR) where line stringing will cross public roads.

6.8 Compliance with the requirements of the Chemicals Control and Management Centre (CCMC) of the EPA

- Ensure that transformer units, transformer cooling systems and transformer oils do not contain PCBs (Polychlorinated Biphenyls) or ODS (Ozone Depleting Substances).
- Purchase transformer units, transformer cooling systems and transformer oils that meet international requirements on environmental, Health and Safety guidelines
- Ensure that there is no soil and water contamination caused by the leakage/spillage of non-polluting transformer oils or no ODSs cooling refrigerants in transformer cooling systems.
- PCB-containing transformer oils and ODSs-containing cooling systems (refrigerants) will be eliminated from (GRIDCo)/ECG operating systems.

6.9 Noise

- Noise from construction activities should be within EPA permissible limits for the various areas and zones.

6.10 Pollution of Water Bodies

- Appropriate measures should be adopted to prevent wastewater from excavations and accidental spillage of oil from polluting water bodies.
- Work camps should not be established close to any water body.

6.11 Work Camps/Sites Management

- Approval must be sought and obtained from the relevant EPA Regional Office in the selection and siting of work camps or sites.
- Under no circumstance should the siting and operation of work camps create any social, health or environmental nuisance.
- Work camps and worksites must be re-instated to blend with the surrounding natural conditions.
- Establish work camps 500m away from water bodies and closest settlement to prevent water pollution and minimize noise on the community.
- Prevent accidental spillage of oil, fuel and lubricants from contaminating the soil and water bodies.

6.12 Environmental Monitoring

- Monitor the following parameters and activities during the operational phase of the project:
 - Occupational health and safety monitoring
 - Accidents and public safety
 - Right of Way
 - Transmission line
- Submit Annual Monitoring Reports to the Agency for review.

6.13 Completion Notice

- Notify EPA on the completion of the project infrastructure (i.e. before the 120Km 330kV Cote D'Ivoire – Ghana Interconnection Reinforcement Project (Ghana Section) Transmission Line Project commences operations).

6.14 Notification of Changes

- Notify EPA of any major changes in the planned development of the project contrary to the information provided in the EIS.

6.15 Annual Environmental Report

- Submit Annual Environmental Report on the transmission line operations after 12 months from the issuance of this permit and thereafter every 12 months to the Agency in accordance with Regulation 25 of LI 1652.

6.16 Environmental Management Plan

- Submit within eighteen (18) months on commencement of operations, an Environmental Management Plan on the project in accordance with Regulation 24 of LI 1652.

6.17 Environmental Certificate

- An Environmental Certificate must be obtained within 24 months (**i.e. before March 13, 2017**) of satisfactory performance and compliance with relevant permit conditions, in accordance with Regulation 22 of LI 1652.

6.18 Other Relevant Permits

- Notwithstanding this permit, the project is further subject to other relevant regulations and permits pertaining to the sector and must be observed.

6.19 Validity Period

- This permit is valid for a period of eighteen (18) months from the date of issue and shall expire on **September 03, 2016**.

6.20 Permit Renewal

- This permit shall be renewed by submitting the necessary renewal application to the Agency.

6.21 Permit Transferability

- This permit is not transferable. It covers only **Ghana Grid Company Limited's (GRIDCo)'s** proposed 120Km 330kV Côte D'Ivoire – Ghana Interconnection Reinforcement Project (Ghana Section) located across the four Districts of the Western and Central Regions

6.22 Penalty for Breach of Conditions of Environmental Permit

Provision of false information or failure to comply with or observe all of the permit conditions above shall:

- Attract administrative penalties as shall be prescribed by the Agency.
- Attract the necessary fines as prescribed under Regulation 26 of the Environmental Assessment Regulations 1999, LI 1652.
- Render this Environmental permit invalid.
- Lead to the suspension or revocation of this permit.

**7.0 Ag. Deputy Executive Director
(Technical)**



E. Appah-Sampson
For: Executive Director

**March 13, 2015
Date Issued**

**8.0 NOTIFICATION**

*The Hon. Minister, Ministry of Environment, Science, Technology and Innovation, Accra
The Hon. Minister, Ministry of Power, Accra
The Executive Secretary, Energy Commission, Accra
The Regional Director, Town & Country Planning Department, Central Region, Cape Coast
The Regional Director, Town & Country Planning Department, Western Region, Sekondi
The Regional Director, EPA, Western Region, Sekondi
The Regional Director, EPA, Central Region, Cape Coast*

APPENDIX II: EPA RESPONSE TO APPLICATION FOR RENEWAL OF ENVIRONMENTAL PERMIT

EPA Response to Application for Renewal of Environmental Permit pending.

Let's not forget to provide the attachment

APPENDIX III: SCOPING NOTICES IN NATIONAL DAILIES



SCOPING NOTICE

- The West African Power Pool (WAPP), a specialized institution of the Economic Community of West African States (ECOWAS), headquartered in Cotonou, Republic of Benin, has applied financing from the World Bank the **330kV Ghana - Côte d'Ivoire Double Circuit Interconnection Project**. The Interconnection transmission line in Ghana will start from proposed Second Bulk Supply Point at Dunkwa- on-Offin in the Central Region to at the border of Côte d'Ivoire in the Western region. The approximately 125km stretch of the transmission line within Ghana will traverse five (5) administrative municipalities/districts namely: Aowin Municipality, Wassa Amenfi East Municipality, Wassa Amenfi West Municipality, Amenfi Central District and Upper Denkyira East Municipality. The development is known as the **“400/330kv Wapp Ghana-Côte D'ivoire Interconnection Reinforcement Project”**
- The proposed undertaking would traverse a number communities within the aforementioned districts /municipalities; notable among them are Kwawu, Enchi-Jomoro, Domeabra, Sureso, Anyinabirem, Dadieso, Bibianiha.
- Notice of the proposed transmission line project is hereby served for public information, as required under the procedures for the conduct of ESIA in accordance with Regulation 15(1) of LI. 1652. Any person(s) who have an interest, concern, or special knowledge relating to potential environmental and social effects of the proposed undertaking may contact or submit such concerns, etc., to:

■ **Chief Executive**
 ■ a Grid Company
 ■ Box CS 7979, Tema
 ■ os: +233-30-3318700
 ■ +233-30-2660049
 ■ Address: GK - 0208 22447
gridco@gridcogh.com

■ **Executive Director**
 ■ Environmental Protection Agency
 ■ Box M 326, Accra
 ■ o: +233-302-664697/8
info@epa.gov.gh

■ After than February 4, 2024

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www.graphic.com.gh/mirror

Daily Graphic, Monday, February 12, 2024

SCOPING NOTICE

The West African Power Pool (WAPP), a specialised institution of the Economic Community of West African States (ECOWAS), headquartered in Cotonou, Republic of Benin, has applied financing from the World Bank to fund the construction of 400/330kV WAPP Ghana - Côte d'Ivoire Interconnection Reinforcement Project. The Interconnection Transmission Line in Ghana will start from a proposed Second Bulk Supply Point at Dunkwa-on-Offin in the Upper Denkyira East Municipal District of Central Region to Kwawu near the border of Côte d'Ivoire in the Aowin Municipal District of Western North Region. The approximately 125km stretch High Voltage Transmission Line in Ghana will traverse five (5) administrative districts, namely: Aowin, Wassa Amenfi East, Wassa Amenfi West, Amanfi Central and Upper Denkyira East Municipal.

The proposed undertaking will closely traverse a number of communities within the aforementioned districts. Notable among these communities are Babianha near Dunkwa-On-Offin, Domeabira, Wassa Akropong, Bonuakrom, Wassa Dunkwa, Jonoro Enchi, Asantekrom, Yiwabra, Nyaney, Agyankwa, Alatakrom, Akotoséy, Omanpe and Kwawu.

Notice of the proposed transmission line project is hereby served for public information, as required under the procedures for the conduct of ESIA in accordance with Regulation 15(1) of L.I. 1652. Any person(s) who has an interest, concern, or special knowledge relating to potential environmental and social effects of the proposed undertaking may contact or submit such concerns, etc., to:

The Chief Executive
 Ghana Grid Company
 P. O. Box CS 7979, Tema
 Tel Nos. +233-30-3318700
 +233-30-2660049
 AND
 Digital Address: GK - 0208 22447
 Email: gridco@gridcogh.com

Not later than February 28, 2024

The Executive Director
 Environmental Protection Agency
 P. O. Box M 326, Accra
 Tel No: +233-302-6646977/8
 Email: info@epa.gov.gh

APPENDIX IV: PICTURES OF THE STAKEHOLDER ENGAGEMENT



APPENDIX V: ATTENDANT SHEETS OF PARTICIPANTS DURING THE STAKEHOLDER CONSULTATIONS

LIST OF COMMUNITIES where stakeholders' consultations were held between 17th and 20th of January:

- ff.** Aboe nkwanta
- gg.** Anyinabirem
- hh.** Asantekrom
- ii.** Asankrangwa
- jj.** Bibianiha
- KK.** Bonnakrom
- ll.** Bonuama
- mm.** Dadieso
- nn.** Domeabra
- oo.** Enchi
- pp.** Jakpa
- qq.** Jomoro enchi
- rr.** Kwawu
- ss.** Manso Amenfi
- tt.** Nananko
- uu.** Sureso
- vv.** Wassa akropong
- ww.** Yiwabra

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization Asante from District _____
 Date 18th January 2024 Time 9:32

No.	Name	Designation	Contact
1	Nana Asante II	Chief	0540 612560 - 02097704
2	Jufuhene	Chair	0560 700612 / 0559 143588
3	Gyamfi Samuel	Farmer	0247314591
4	NAIYA QUWUSA GY ASI	CUEF	0245 698412 - 0204 899646
5	Ekorme Donkor	Farmer	
6	Yalo Essam	Farmer	056 498725
7	Dewrell Asmalu	Unit Committee Chairman	0204 898945
8	Alex Kondu	Farmer	0549144271
9	Adoko Fratia	Farmer	0241310899
10	Steve Aboagye Achier	Farmer	0205016674
11	Mensah	Farmer	
12	Joseph Tindoh	Farmer	0241924628
13	Almasan Mohammed	Farmer	0256 287450
14	Seliga Usof	Farmer	0506602157
15	Masama Seidu	Farmer	0552509614
16	Esedwo Yifoli	Farmer	057 968650
17	Babs Adoko	Farmer	0549242857
18	Prince Tini	Buyer Agent/GoD	0538644210
19	Bianca Awoodo		0548043380
20	Richard Awoodo	Teacher	03 780 72380

Nana Asante II

Mr. Kwame Djourou-Boadi

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization Asante from District _____
 Date 18th January 2024 Time _____

No.	Name	Designation	Contact
1	Tofi Mensah	Farmer	0548043380
2	Daniel Adoko	Farmer	024122914
3	Adam Asomah	Committee	0208140204405488
4	Ibrahim Adams	Farmer	0205933273
5	Christopher Mensah	Driver	0557651858
6	Isaac Tofi Mensah	Farmer	0201770302
7	Margrete Adanku	Farmer	0248342007
8	Guaduwa Joyce	Farmer	0257243666
9	Isho Joyce	Farmer	0262501005
10	Sierra Isho	Farmer	0599926445
11	Gifty Nkrumah	Teacher	
12	Hilda Danork	Farmer	0550537921
13	As Adoko		
14	Oroubus Grace	Farmer & Food Seller	
15	Amma Adomase	Farmer	02091353219
16	Comfort Mensah	Farmer	0248544773
17	Suleman Ibrahim	Farmer	0241701430
18	Emmanuel Teng	Committee Member	
19	Agyemang Finet	Farmer	
20	Hannah Awo		0246187624

Nana Asante II

Mr. Kwame Djourou-Boadi

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization - Asantekrom District - - - - -
Date - 18th January 2024 Time - - - - -

No.	Name	Designation	Contact
1	Philemon Kofi	Farmer	0209770334
2	Bismark Effah Ofori	Farmer	0240052960
3	Abedu London	Farmer	0243452320
4	Kess Mensah	Farmer	031458238
5	Appiah Sanku	Seller	0209456126
6	Hogya Kofi	Farmer	
7	Comfort Nyamasi	Farmer	055357977
8	Felix Appiah	Farmer	
9	Folther Appiah	Farmer	
10	Kwame Atebas	Farmer	049385899
11	Hamed Ibrahim	Farmer	0201774826
12	Itafo Seidu		0304493233
13	Kofi Akyeampong	Farmer	
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Name & Signature
Name and Signature of Community Representative

Mr. Kwame Ofori - Board
GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization - Asantekrom District - Amansie West Municipal
Date - 17th January 2024 Time - - - - -

No.	Name	Designation	Contact
1	Daniel Konye	Mun. Corp. Director	0546277115
2	Cyril Bright Aikomah	Dev. Planning	0241771923
3	Akuah Prince Obeng	Physical Planning	0240622549
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Daniel Konye
Name and Signature of Community Representative

Mr. Kwame Ofori - Board
GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization Aber Nkwanta District ...
 Date 17 January 2024 Time 130 - 200pm

No.	Name	Designation	Contact
1	Nana Kofi Nene	Chairman	0558333635
2	Francis Glance	Committee Member	0242047215
3	SSGC Chum	Community Elder	0555142893
4	Appiah Steven	Youth Chief	0241506793
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Name Kofi NeneName Mr. Kwame Owusu - Boadi

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization Somoro Fachi District ...
 Date 17 January 2024 Time 5:46 - 6:26

No.	Name	Designation	Contact
1	Joyce Nimo	Charcoal Seller	0241696916
2	Patience Agnes Aduku	Seller	055034676
3	Patience Adam		0506002387
4	Kwadwo Asamah	Committee Member	0548391129
5	Atta Ameyawu	Farmer	0241099384
6	Vincent Tonybo	ASS Committee	0355701910
7	Sarah Bisan	Seller	0512979495
8	Peter Aforzuke	Worker	024141664
9	Aforzuke Michael		0548200190
10	EFO Ganyo	Worker	
11	Bonsu Foster	Farmer	
12	Samuel A. Addo	Farmer (Farmer)	0245057204
13	Abaya Simon	Farmer	0501832151
14	Akudorizig Rebecca	Worker	
15	Doku John	Worker	05442982635
16	Jakubu Rahibah	Worker	0540879496
17	Aishentu Jakubu	Seller	0248084517
18	Kwame Emmanuel	Worker	0540533477
19	Aforz Francis	Committee	033072763
20	Richard Yeo Fese	Small Scale Miner	0545058657

Name Moses AforzName Mr. Kwame Owusu - Boadi

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization - Isomoro Fiebi District - - - - -
 Date - 18th January 2024 Time - - - - -

No.	Name	Designation	Contact
1	Nyame Esie Immanuel	Worker	05480541886056
2	Oben Kastey Sotgah	Farmer	0545776799
3	Moses Ayoka	Committee Chair man	0502202122
4	Okyere Emmanuel	Worker	0659492490
5	Nene Kwadwo Antra Nambu	Seller	0593007445
6	Florence Kubolo	Seller	0645957456
7	Ruth Siedani	Farmer/Seller	0556218285
8	Heaven Adio	Farmer	0554658344
9	James Adua	Farmer	
10	Abena Mary	Farmer	
11	Emmanuel Kwadie	Committee Member	0533629374
12	Alice Tano	Farmer	
13	Yaa Kofi Quafo	Farmer	
14	Robert Aboeku	Teacher	0341118133
15	Matthew Amish	Worker	0533161521
16	Eto Sartson	Worker	0553001227
17			
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19			
20			

Moses Ayoka

Name and Signature of Community Representative

Mr. Kwame Daryu - Board

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization - Domeabro District - - - - -
 Date - 18th January 2024 Time - 7:56-8:33

No.	Name	Designation	Contact
1	Nana Kwaku Appiah	Chief	0546908399
2	John Kwei	Farmer	0540649990
3	Mba Ama Lega	Farmer	0241700086
4	Sampson Tamposi	Chief Farmer	0540759158
5	Rebecca Adua	Farmer	0594967165
6	Amadu Aburima	Farmer	0241685042
7	Janet Yakubu	Farmer	05977635948
8	Francis Mobrta	Eyesame	0240230375
9	Joseph Tsiuam	Kufame	0246948315
10	Lawrence Nsakia	Farmer	0542997338
11	Richard Appiah	Unit Committee	0597182731
12	Hannah Adaga	Farmer	
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Moses Ayoka

Name and Signature of Community Representative

Mr. Kwame Daryu - Board

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization <u>Yinabreh</u>		District	
Date <u>18th January 2024</u>		Time <u>11:00</u>	
No.	Name	Designation	Contact
1	Nana Kwaw Akoto (odikro)	Odikro	05440250
2	Nana Kwame Boadu	Secretary	0244681938
3	Nana Atobra	Communicator	054776456
4	James Atobra	Farmer	
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Nana Kwaw Akoto

Mr. Kwame Boadu - Boadi

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization <u>Akroso Fiehi</u>		District <u>Aowin Municipal Assembly</u>	
Date <u>18th January 2024</u>		Time <u>12:30</u>	
No.	Name	Designation	Contact
1	Hon. Samuel Adu-Gyamfi	MGE	0243217124
2	Planner Abubu-Kazuk Monyuu	MPO	0240117185
3	Isaac Bentuo Appiah	ADPO	0245203750
4	Daniel Gyame	ADPO	0502907456
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Hon. Samuel Adu-Gyamfi

Mr. Kwame Boadu - Boadi

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

No.	Name	Designation	Contact
1	Haus Tano Kabash II	Chairman	0293487541
2	Digrin Somah Jagyhh	Counselor	0544626946
3	Isaac Agame	Messenger	0547280554
4	Daniel Kudjo	Messenger	0594549032
5	John Dabu	Kyeame	
6	Joseph Kyeame Quaque	Kyeame	
7	Kyeame Panin Appiah Kubi	Kyeame Panin	
8	Daniel Kyeame Quaque	Kyeame	
9	Philip Kyeame Quaque	Messenger	
10	Joseph Tandoh	Messenger	0296019523
11	Haus Bempeng	Administrator	0544031241
12	Philip Hira	Chief Advisor	
13	Obabemaa Atese	Obachemaa	
14	Francis Bonyame	king makers	0243488310
15	Kwabena Musah	Kwachihene	0593373548
16	Rebecca Tano	Farmer	
17	Sophia Agyspong	Farmer	
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Haus Tano Kabash II *[Signature]*

Mr. Kyeame Oware - Boadi

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

No.	Name	Designation	Contact
1	Alex Abo	Messenger	
2	Eftah Rebecca	Farmer	
3	Sophia Abo	Seller	
4	Aedisa Abdullah	Farmer	
5	Yobrah Alata	Farmer	
6	Acidua Alata	Farmer	
7	Achima	Farmer	
8	Alex Dogbe	Farmer	
9	Rosena Couie	Farmer	
10	Arthur Dennis	Farmer	0591461252
11	Lucy Amuhi	Farmer	
12	Rebecca Tei	Farmer	
13	Socila Fatima	Farmer	
14	John Mission	Farmer	
15	Vida Asamoah	Farmer	
16	Ibenezer Mesu	Operator	
17	Grace Appiah	Farmer	0541051817
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Haus Tano Kabash II

Mr. Kyeame Oware - Boadi

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization SUSCO District Amenfi Central
Date 17th January 2024 Time 8:00

No.	Name	Designation	Contact
1	Nana Eba	Farme	0556272445
2	Nene Boga	Farme	
3	John Tevorah	Farme	
4	John Menu	Farme	0546382624
5	Kwame Anthony Sanful	Farme	0531257678
6	Abdulai Kaka Atta	Farme	02417836768
7	Daniel Amoako Hene	Farme	0548327432
8	Kwadwo Emmanuel	Farme	0346570363
9	Amoako Mensah	Farme	0535494054
10	Badaku Daniel	Farme	0540810971
11	Kwaku Adziri	Farme	0551645993
12	Mr. Stephen Opong	Farme	0548891778
13	Desire	Farme	0248220040
14	Brother John Cobena	Abuakapen	05481474716533792323
15	Stephen Agbenu	Farme	0533441690
16	Stephen Aker	Farme Businessman	0548147874 - Communicator
17	Soso Amoako	Farme	0540696262
18	Bogey Frank	Farme	0553254786
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Nana Eba

Mr. Kwame Opong - Boga

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization Kwame Asare District -
Date 18th January 2024 Time 12:25

No.	Name	Designation	Contact
1	Opoku Kofi Aponteng	Farme	0546619468
2	Kwame Blay	Cultivator	
3	Mr. Timothy Benson	Chairman	0549577773
4	Kwaku Adziri	Counsel	0243024879
5	Kwame Ashie	Chairman	
6	Adwoa Kennedy	Seller	
7	Rebecca Thompson	Electrician	0540391395
8	Francis Essah	Farme	0265813289
9	Kwaku Ampomah	Committee	0592828317
10	Emmanuel Asare	Farme	0546206812
11	Emmanuella Asare	Farme	
12	Abdulai Aboah	Farme	
13	Patuaa	Seller	0548389447
14	Ama Benson	Seller	0543524533
15	Nana Yaa Asare	Seller	0547731237
16	Robert Yemi	Farme	
17	Teeku Amfia	Businessman	0248149122
18	Kwame Tedork	Farme	
19	Kwame Nwana	Farme	0547720247
20	Kwame Asare	Farme	0541652940

Kwame Asare

Mr. Kwame Opong - Boga

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization		District	Time
Date			
No.	Name	Designation	Contact
1	Kwesi Agyenabrim	Farmer	024902573
2	Opoku Kwesi Agyenabrim	Ahensufanin	
3	Ewusu Agyenabrim	Farmer	0542997371
4	Ewusu Agyenabrim	Farmer	
5	Stephen Nyarko	Farmer	025783415
6	SOFO Amo	Farmer	
7	Kwame Agyenabrim	Farmer	0594163251
8	Kwame Agyenabrim	Farmer	0597198367
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Kwame Agyenabrim

Name and Signature of Community Representative

Mr. Kwame Agyenabrim - Board

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization		District	Time
Date			
No.	Name	Designation	Contact
1	Jalil Ali Mahama	Mun. Planning officer	0207404362
2	Donmuz Koro Amanah	Asst. Planning officer	0208022222
3	Mr. Frederick Kurankye	MCE	0501261230
4	Ishmael Anaman	MCD	0240784556
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Jalil Ali Mahama

Name and Signature of Community Representative

Mr. Kwame Agyenabrim - Board

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization - <u>Bonaventure</u>		District
Date		Time
No.	Name	Designation
1	Vincent Adzua	Assemblyman
2	Atus Adzua	
3	Grace Arthur	
4	Ama Mfomea	Farmer
5	Theresa Afari	Farmer
6	Appiah Agyei	
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Anthony Ofori

Mr. Kwame Ofori - Board

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization - <u>Bonaventure</u>		District
Date		Time
No.	Name	Designation
1	Douglas Andoh	Farmer
2	Lawrence Arthur	Farmer
3	Sarah Gyimah	Farmer
4	Peter Atobiah	Businessman
5	Anna Rebecca Quaque	Farmer
6	Matthew Arthur	Farmer
7	Augustine Ofori	Farmer
8	Patience Boah	Farmer
9	Kwasi Kwabre	Farmer
10	Kwasi Philip	Farmer
11	Kwasi Boah	Farmer
12	Thomas Ofori	President Elder
13	Abeak Ama	Farmer
14	Enock Anapaa	Farmer
15	Glendah	Committee
16	Mary Amoasi	Farmer
17	Sister Cee	Farmer
18	Bismack Agyekoo	Farmer
19	Yaw Iddrisu	Farmer
20	Mamudu Abduallah	Farmer

Anthony Ofori

Mr. Kwame Ofori - Board

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEETName of Community/Organization BingervilleDate 19 January 2024District Amenfi CentralTime 10:30

No.	Name	Designation	Contact
1	Peter K. Ackrah	Committee Chair	05408471649
2	Cofi Boardy	Farmer	0537130316
3	Kosmas Kpjeru Legtimo	Teacher	0247881735
4	Michael Anor	Gyapa	0242536141
5	Lucas Bonne Binnah	Driver	0542720077
6	Issaka Brakim		0541757197
7	Clement Diakor	Farmer	
8	Kwadwo Kwadwo Karantey	Farmer	
9	Anthony Efion	Land owner	0544404516
10	Atiako Francis	Farmer	0257868732
11	Awabera F.	Worker	0551224819
12	David Amuah	Farmer	0240123643
13	Tempong Francis	Farmer	0597880317
14	Yaw Mensah	Rakoma hene	05975899195
15	George Atuobi	Farmer	0997880324
16	Osmaidu Sandu	Farmer	0591986757
17	Emmanuel Benu	Farmer	0556977121
18	Adrian Daniel	Farmer	0896198966
19	Ibrahim Abdullah	Com. Member	0231159766
20	Anuadu Nkrumah	Farmer	0246674859

Anthony Ofori Affort

Name and Signature of Community Representative

Mr. Kwame Drouse - Boardy

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEETName of Community/Organization JakpaDate 20th January 2024District Amenfi EastTime 9:30

No.	Name	Designation	Contact
1	Okyame Bomaa	Chairman	054076508
2	Reina Tuomasi Akrah	Chairman	0246071667
3	Yao Mahama	Committee	05426388828
4	Kwadwo Asare Mathew	Committee	0207574606
5	Mr. Asante Isaac	Resident Member	0240033476
6	Elori Prosper Philip	Committee	054490185
7	Abel Amoako	Committee	0248485886
8	Abdul Amponsah	Secretary	0209002189
9	Nana Kwame Appiah	Assemblyman	0541884524
10	Nana Yao Nkrumah	Branch Chairman	0204172990
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Nana Tuomasi Akrah (Signature)Mr. Kwame Drouse - Boardy

Name and Signature of Community Representative

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization Nkontoko District _____
 Date 20th January 2024 Time 12:00

No.	Name	Designation	Contact
1	Hause Bokuda	Kyempe Division	0597457437
2	Mast Bokuda	Committee	0596153429
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Mast Bokuda

Name and Signature of Community Representative

Mrs. Esome Owusu - Boadi

GRIDCo Representative

330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET

Name of Community/Organization Bibianha District Upper Denkyira East
 Date 20th January 2024 Time 2:00

No.	Name	Designation	Contact
1	Hon. Francis Amual Bokuda	Assemblyman	0540922997/0277740886 0597448475
2	Mike Bokuda		
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Hon. Francis Amual

Name and Signature of Community Representative

Mrs. Esome Owusu - Boadi

GRIDCo Representative

**330kV BINGERVILLE (COTE D'IVOIRE)-DUNKWA (GHANA) INTERCONNECTION REINFORCEMENT
STAKEHOLDER ENGAGEMENT ATTENDANCE SHEET**

Name of Community/Organization Sodoso District _____
 Date 20th January 2021 Time 6:00

No.	Name	Designation	Contact
1	Kyeame Amponsah	Kyeame	0246476701
2	Hon. Yaw Doku	Open Assemblyman	02444639557
3	Mr. J. K. Kyeame John Twos	Chairman	0595801092
4	Nana Gyasi Kwadwo	Gyasi hene	05470439834
5	Hon. Adoko Atibam	Former Chairman	0587002525
6	Kyeame Anthony	Kyeame	0242017787
7	King Opong Akabio	Chairman	0246349454
8	Mack Dorfor	Committee	0249004771
9	Ben Bright Oforieng Senior	Secretary unit 2	0297296678
10	John Ofori	Committee	0242096293
11	Musa Adam	Chairman hene	0248604811
12	Rita Appiah	Chairwoman	
13	Evorku Seidu	Farmer	0541249117
14	Mary Gyasi	Chairwoman	
15	Emmanuel Oduro	Adv. Counsel	0593498269
16	Rev. Dr. Francis	Unit Committee Chairman	0242541797
17	Kwadwo Recto	Chairman hene	02479970592
18	Nana Ama Antipa	Chairwoman	0554289337
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King Opong Akabio

Name and Signature of Community Representative

Mr. Kyeame Ofori - Board

GRIDCo Representative

APPENDIX VI: GENERAL CONCERNS OF THE DISTRICTS AND COMMUNITIES

Consultations with District Assemblies

The districts through whose jurisdictions the proposed transmission line is expected to traverse were all consulted on the project and its impacts on the communities in the area of environmental influence. They all pledged their support to the project and requested that local communities which will be affected must be adequately compensated. They further requested that the survey team, during their operation, must be careful of the 'galamsay' operators and land acquisition - intensive education was recommended.

Consultations with the Communities

The following concerns raised were unanimous across all communities:

- prompt, equitable, and sufficient provision of compensation to impacted properties.
- creation of jobs for young people. There was a recurring demand for jobs, especially for unskilled labor, to be found in the several impacted localities.
- activities that are allowed in the corridor. Communities wanted to know if farming in particular was permitted in the 40 m right-of-way.
- restitution for arable land inside the proposed route that is impacted. In every community that was visited, a request was made to recompense the arable lands within the planned corridor rather than just the crops and building features.
- the distribution of electricity to areas not yet serviced by the national grid.
- preservation and observance of communal values (honoring the customs, holidays, and places of worship that are part of the community's cultural legacy).
- the proposed high-voltage line's potential health effects on the surrounding populations due to electromagnetic field emissions.
- request for the supply of fundamental social amenities, regardless of the project that is being suggested.
- all compensations were to be paid prior to the project's actual start date, according to requests.
- payment must be made for crops that the survey team would destroy.
- make sure that trees cut down outside of the 40-meter corridor receive enough recompense for their construction-related damages, as it is thought that doing so could harm the line.
- the parties impacted by the project should have access to a document that details all compensation policies and legislation related to forced land acquisition.
- Every community that was interviewed remembers a study of a route that was completed. The team destroyed farmers' crops, but they did not receive any payment.

Appendix VIII: Meeting to exchange views with Stakeholders in the Ghana-Côte d'Ivoire High Tension Transmission



WEST AFRICAN POWER POOL

SYSTÈME D'ÉCHANGES D'ÉNERGIE ÉLECTRIQUE OUEST AFRICAIN

400/330 kV WAPP GHANA-CÔTE D'IVOIREINTERCONNECTION REINFOCEMENT PROJECT

MEETING TO EXCHANGE VIEWS ON THE TECHNICAL, ENVIRONMENTAL AND SOCIAL ASPECTS OF THE PROJECT AND ON THE PROGRESS OF PROJECT PREPARATION STUDIES

Meeting minutes

MICROSOFT TEAMS, August 2, 2024

I.INTRODUCTION

1. Following the meeting of participants on the reconnaissance mission for the 400/330 kV Côte d'Ivoire-Ghana interconnection line was held at the GRIDCo Substation at Elubo near Ghana-Côte d'Ivoire border on Friday, July 26, 2024, a follow up meeting was held on August 02, 2024.
2. The meeting was attended by representatives from the Republic of Côte d'Ivoire (CI-ENERGIES), the Republic of Ghana (Ghana Grid Company LTD. / GRIDCo), the World Bank, the WAPP Secretariat and Studio Pietrangeli Srl (SP).

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3. The list of participants is attached in Appendix A.

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4. The meeting was moderated by Mr. Alphonse EMADAK, Senior Environmental Safeguards Specialist at the World Bank
5. The adopted agenda is attached in Appendix B.

I PROJECT TIMELINES - ESIA

1. World bank noted that the ESIA needed to be disclosed 120 days before the bank meets in December ,2024. The World Bank therefore inquired on the status of the ESIA report.
2. SP confirmed it had received relevant inputs from its CIE on the draft ESIA Report but none from GRIDCo. GRIDCo noted that it found the ESIA largely acceptable ESIA since it incorporated its previous comments and the second round of comments, after the site visit with the World Bank the previous week, would be issued soon.
3. World Bank noted that due to the tight deadlines it would disclose the current draft version of the ESIA report prior to any additional comments could be provided for incorporation. SP advised that it would submit the draft ESIA report to WAPP Secretariat on August 6, 2024. GRIDCo indicated that the final draft version will be submitted to WAPP by August 7, 2024World Bank comments will be received not later than August 30, 2024. The final ESIA, which incorporates all relevant comments, would be expected to be ready by October 30, 2024.
4. The meeting noted that the Stakeholder Engagement Plan (SEP) would be included in the ESIA Report as a summary
5. The World Bank confirmed the following important dates for the Project:
6. Project Appraisal Mission - September 4-16 2024
7. Negotiation from October 8-11, 2024
8. The following documents were expected to be provided before September 4, 2024 for the Appraisal Mission:
9. SEP and ESCP - draft by mid August, 2024
10. SEP and ESCP - final version before end of August 2024
11. GRIDCo noted that during the site visit from July 24-28 2024, the World Bank raised issues on

grievance mechanisms and critical issues such as the challenges with galamsey. GRIDCo was therefore reviewing the submitted documentation to incorporate these comments and would provide them to the WAPP Secretariat soon.

12. SP noted that its reports had a lot of documentation on grievance mechanism and this would also be further discussed in the RAP report. The World noted that grievance was not only related to RAP issues and advised that it should also be critical for the SEP.
13. SP noted that the requirements of the SEP were different in both countries and requested the Utilities to verify the requirements of the SEP with its respective sub consultants for each country.
14. World bank noted that the guidance for SEP is in the ESS 10 document and the SEP needed to contain some outcomes of stakeholder engagement as well as how the engagements have shaped the remainder of the exercise and evidence of the preliminary consultations to be included.
15. SP will empower the local consultant with GRIDCo to produce a good draft of SEP before August 15, 2024. SEP/ESCP to be transmitted to the World Bank by August 16, 2024
16. World Bank confirmed that both utilities would have to disclose the draft of the ESIA Report on their websites.

II- PROJECT TIMELINES - RESETTLEMENT ACTION PLAN (RAP)

1. World Bank noted that it had learnt that SP was preparing an RPF for Côte d'Ivoire and not a RAP. SP clarified that RPF would only cover rural electrification and it would undertake the detailed RAP for Côte d'Ivoire.
2. For Ghana, SP had received a list of towns to consider for rural electrification but none for Côte d'Ivoire
3. GRIDCo noted that an introductory letter was provided to SP more than a month previously but no activity seemed to have been taking place. GRIDCo therefore requested for a confirmation from SP that it would meet the deadline
4. SP advised that it had issues with undertaking the pillaring of the line route. It was covering the Ghana activities with support from an Ivoirian Contractor for pillaring. SP advised that it was ready to commence activities on the RAP and that it was in line with the WAPP timeline of September 29, 2024 for the RAP report.
5. GRIDCo proposed for SP to consider using a team of surveyors to cut a strip along the proposed line route and define the center line before the pillaring to expedite the preparation of the RAP
6. The World bank also suggested that defining the center line, enumeration of the PAP's and community engagements should be done for communities during the same period of time. The World Bank also suggested for SP to consider using multiple gangs to crush a lot of time for the PAP preparation
7. GRIDCo noted that waiting for pillaring before undertaking the RAP would prevent SP from meeting

the required timeline. SP advised that it would engage to its subconsultants to talk to GRIDCo on the strategies to expedite the RAP workers

8. The meeting noted that the RAP needed to be as accurate as possible for implementation
9. GRIDCo inquired if the estimates for the RAP could be considered at the project appraisal mission. World Bank noted that the Project Appraisal Mission would note that the RAP would be in progress. The team could discuss the provision of the compensation for the RAP to be included in the project cost at the project negotiations

III- RECOMMANDATIONS

The following recommendations were made:

- World Bank recommended the utilities to work together with SP's subconsultant on the review of the documents to lengthening the review process with back and forth reviews.
- The World Bank would share a sample SEP and template for the ESCP with the team to expedite review and preparation of the relevant reports
- World bank requested GRIDCo to formalize the request to the Bank for the Bank to consider financing the RAP

IV- ACKNOWLEDGEMENTS

1. The participants expressed their sincere thanks to the Ministry of Energy of Ghana for the warm welcome and hospitality extended to them and for the provision of adequate resources which contributed to the success of the meeting.
2. The participants expressed their sincere thanks to the WAPP General Secretariat for the coordination and development of the project between the stakeholders and insisted that the partners involved in the project meet regularly for its follow-up.
3. The participants in the meeting also expressed their deep gratitude to the People and Government of Ghana, and in particular to His Excellency, Mr Nana Addo Dankwa Akufo-Addo , President of the Republic of Ghana, Head of State, for the warm hospitality extended to them during their stay in Ghana.
4. After three hours of fruitful exchanges to the satisfaction of all project stakeholders, the meeting ended with words of thanks from Ms. Nicholina N. N. YEMBILAH Director, Project Implementation Unit (PIU), who appreciated the relevance and quality of the exchanges.
5. Finally, she wished each delegation a safe journey home. The meeting was officially closed with a family photo (see Appendix C).

Done Online at Microsoft Teams, August 2, 2024.

Signed by:

Pour CI-ENERGIES	Pour la Compagnie GRIDCo	Pour le Consultant SP (Représentant ENVAL)	Pour la Banque mondiale	Pour le WAPP
Abou OUTTARA (Cadre Environnementaliste)	Nichollina N.N. YEMBILAH (Director PIU)	Gédéon SAVANE (Expert social ENVAL)	Alphonse EMADAK (Senior Environmental Specialist)	Sotelle HOUESSOU (Expert Résident en Environnement)

Annex A: List of participants

LISTE DES PARTICIPANTS A LA REUNION D'ELUBO LE 26 JUILLET 2024



N°	PRÉNOM(S) & NOM	FONCTION	CONTACTS	E-MAIL
GRIDCo				
1	Nicholina N. N. YENBILAH	Director Procurement, PIU	+233 (0)207700090	n.yembilah@gridcogh.com
	Abdul Samed Ibrahim	Project Manager, PIU		Samed.ibrahim@gridcogh.com
2	Martin Kain Kasanga	Principal Electrical Engineer	+233 (0)243664772	martin.kasanga@gridcogh.com
3	Rashid Alhassan	Surveyor	+233 (0) 509511159	rashid.alhassan@gridcogh.com
4	Kwame Owusu-Boadi	Principal Environment Officer	+233 (0) 244845124	kwame.owusu-boadi@gridcogh.com
CI-Energies				
5	Dognymé M.M. Ouattara	Ingénieur Planification Transport	+225 0759325650	douattara@ciernegies.ci
6	Ouattara Abou	Cadre Environnementaliste	+2250708270905	abouattara@energies.ci
BANQUE MONDIALE				
7	Alphonse OMADAK	Senior Environmental Speialist	+2250779995122	aemadak@worldbank.org
8	Emmanuel A. Abeke	Senior Social Specialist	+233208115495	eabeke@worlbank.org
9	Kobina Oku Okyne	Environmental Specialist	+233 (0) 208245297	okyne@worldbank.org
10	Ahmed Siba Shani	Social Développement Specialist	+233 (0) 549946220	ashani@worldbank.org
11	Marie Kouabenan	Jeune Assistant	+2250544602274	mkouabenan@worldbank.org
CONSULTANT STUDIO PIETRANGELI (ENVAL)				

N°	PRÉNOM(S) & NOM	FONCTION	CONTACTS	E-MAIL
12	Gégéon SAVANE	ROP	+225 05 96 63 49 49	bsavane@evalgroup.com
	WAPP / EEEOA			
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Annexe B : Adopted Agenda



WEST AFRICAN POWER POOL

SYSTÈME D'ÉCHANGES D'ÉNERGIE ÉLECTRIQUE OUEST AFRICAIN

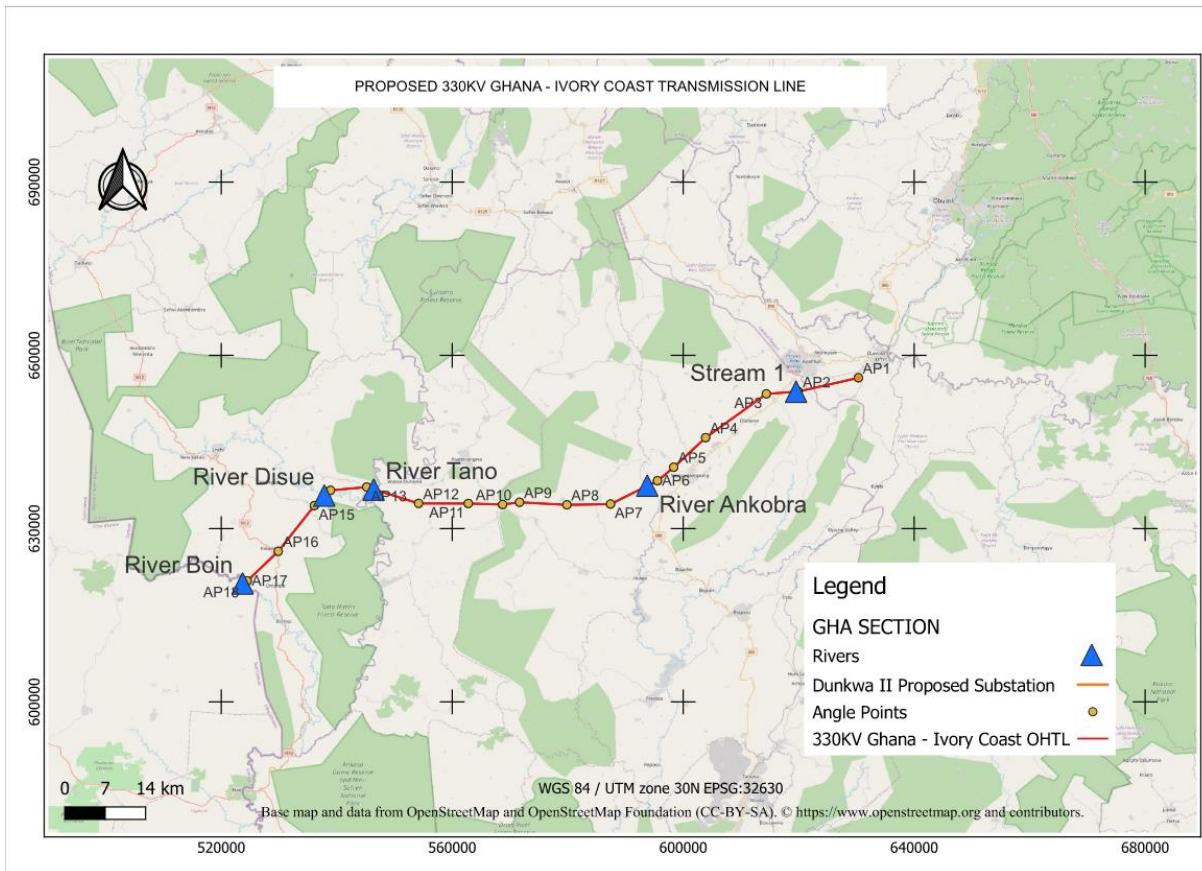
400/330 KV WAPP CÔTE D'IVOIRE GHANA INTERCONNECTIO Project

Ordre du jour adopté

ELUBO (Ghana) Vendredi 26 juillet 2024	
15h 15 -	
18h15	ITEMS ON THE AGENDA
I	Introduction of meeting participants
II -	Project Timelines – ESIA
III	Project Timelines – RAP
IV -	Others

NB: Ghana Time = GMT.

APPENDIX IX: MAP OF THE LINE ROUTE



APPENDIX X: REPORT OF SURVEY OF VEGETATION AND FAUNAL ASSESSMENT

400/330KV CÔTE D'IVOIRE-GHANA INTERCONNECTION REINFORCEMENT PROJECT

SURVEY OF VEGETATION AND FAUNA WITHIN THE 40M BY 125KM RIGHT OF WAY (ROW)

SUMMARY

The report presents a comprehensive biodiversity assessment conducted as part of the Environmental and Social Impact Assessment (ESIA) for the 400/330kV Côte d'Ivoire-Ghana Transmission Line reinforcement project. The project route spans 125 km from Babianiha near Dunkwa in the Central Region to Omanpe in the Western Region, traversing various land use types. The assessment focuses on documenting vegetation and fauna within a 40-meter-wide right-of-way (ROW) to evaluate the potential impact on local biodiversity. The objectives of the study were as follows:

- Document and analyze vegetation and structural characteristics along the ROW;
- Quantify flora and fauna species diversity and abundance;
- Assess direct and indirect impacts on biodiversity, especially critical habitats and endangered species;
- Propose mitigation measures to minimize biodiversity loss;
- Create a framework for ongoing monitoring.

The method used were as follow: Field Surveys were conducted across 21 sampling sites at 6 km intervals along the 125 km route, using GPS to navigate the ROW. The assessment focused on vertebrate fauna (birds, mammals, amphibians, reptiles) and vascular plants. Bird surveys were conducted in the early morning and late afternoon, using visual and auditory identification methods. Mammals were surveyed through direct and indirect sightings (e.g., tracks, nests). Herpetofauna were examined by exploring refuges like logs and water bodies. The Rapid Botanical Survey (RBS) method was used to evaluate plant diversity, and trees with a diameter of $\geq 10\text{cm}$ were counted. The IUCN Red List was applied to assess the conservation status of species.

Results of the study indicated that the ROW primarily passes through off-reserve agricultural areas, with land uses including cocoa farms, oil palm and rubber plantations, food crop farms, fallow lands, and riparian marshes. The survey identified 108 vascular plant species, including trees like *Milicia excelsa*, *Terminalia ivorensis*, and *Khaya ivorensis*. The vegetation is largely secondary and tertiary growth due to significant human activity. Fauna communities were sparse due to intensive agriculture and human presence. Bird surveys recorded 71 species, while mammals included *Maxwell's Duiker* and *Bushbuck*. The herpetofauna community was limited, consisting of 16 species. The area holds both local and global conservation significance: Most species are classified as "Least Concern" on the IUCN Red List. Exceptions include herpetofauna such as the dwarf crocodile and Gabon viper, which are vulnerable. Seven plant species are listed as globally threatened, including *Milicia excelsa* and *Nesogordonia papaverifera* (both vulnerable). Many species have rare conservation status based on Ghana's Star Rating system. The construction will involve vegetation clearance, leading to habitat fragmentation and biodiversity loss. Specific impacts include: Clearing vegetation and preventing regrowth will alter the landscape, affecting species' habitats; disturbed areas may promote the spread of invasive species like *Broussonetia papyrifera*; large mammals and reptiles are expected to be more

vulnerable due to habitat disturbance and hunting pressure. Recommendations have been made to control invasive species as part of the maintenance regime; Implement erosion control in areas prone to soil erosion; engage stakeholders to prevent the spread of crop pests and diseases; Avoid routing access roads through sensitive areas like marshes.

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INTRODUCTION

As part of the Environmental and Social Impact Assessment (ESIA) for the GRIDCO High Tension Transmission Line project, a comprehensive biodiversity baseline study was conducted. This study focuses on the proposed 400/330kV Côte d'Ivoire-Ghana Transmission Line reinforcement project, which extends 125 kilometers from Babianiha near Dunkwa in the Central Region to Omanpe in the Western Region of Ghana. Given the substantial environmental and social impacts anticipated from the construction and operation of this transmission line, it is crucial to assess the potential effects on local flora and fauna within the project's corridor.

The study initially planned for two field surveys one during the dry season and one during the wet season, which includes both 'wet' and 'wetter' phases typical of Ghana's high forest zone. However, due to the expectation of minimal seasonal variation in the fauna community for this area, only one field season of data collection was conducted.

OBJECTIVES

1. To document and analyze the current vegetation types and their structural characteristics along the 40-meter wide by 125-kilometer-long transmission line corridor.
2. To identify and quantify the species diversity and abundance of both flora and fauna within the designated right of way, highlighting any significant ecological patterns.
3. To assess the potential direct and indirect impacts of the transmission line construction on local biodiversity, including effects on critical habitats and endangered species.
4. To propose effective mitigation measures to minimize adverse impacts on the identified flora and fauna and ensure the conservation of key biodiversity areas during and after construction.
5. To design a framework for ongoing monitoring of vegetation and fauna to track changes and assess the effectiveness of implemented mitigation measures.

METHODOLOGY

A biodiversity assessment was conducted along the transmission line's right-of-way, focusing on vertebrate fauna and vascular plants. The assessment covered the entire line route, with 21 sampling sites systematically selected at 6.0 km intervals, representing different topographies, land uses, and vegetation covers. The route was navigated using a KMZ shapefile on a Locus Map app, and assessments were carried out within a 40m for a distance of 3.0km at each site, with the transmission line route forming the central line.

Fauna assessment employed the transect count method, a reliable and cost-effective approach, conducted from August 21 to September 5, 2024. Observations took place from 6:00 am to 5:30 pm each day, focusing on identifying vertebrate species within the transmission line's right-of-way. Bird surveys took place from 6:00 am to 9:00 am and 3:00pm to 5:30 pm each day on species identification, through direct

observation and sound, using binoculars and field guides for unfamiliar species and calls African Birds Sounds (Chappuis, 2000), whereas taxonomic order and nomenclature follow Borrow and Demey (2010).

Large mammals were surveyed using transect walks along trails, footpaths, and access routes at each site, recording both direct sightings and indirect signs such as tracks, footprints, faecal droppings and nests. These mammals play crucial ecological and socio-cultural roles, including seed dispersal and biological control, but are vulnerable in areas with high human population density. Kingdon (1997) was used as the main field to confirm the identity of species encountered and nomenclature follows same.

Herpetofauna, particularly amphibians and reptiles, were surveyed by examining refuges like rocks, fallen logs, and water bodies. Amphibians are early indicators of environmental health due to their sensitivity to pollutants. Identification followed standard references, focusing on species that are often the first to decline in degraded environments. Nomenclature followed Hughes (1988) and Leache et al. (2006) while reptiles followed Hoogmoed (1974) and Chippaux (1999)

Vascular plant species and vegetation cover were assessed using the Rapid Botanic Survey (RBS) method, which provides a detailed evaluation of plant diversity and distribution within the landscape. The survey included counting trees with a diameter at breast height (dbh) of $\geq 10\text{cm}$ or Girth of 31.5cm , with plant taxonomy following updated nomenclature standards (Hawthorne & Jongkind, 2006).

DATA ANALYSIS

Where field data collection methods permitted, species diversity and richness were assessed for each taxon. The conservation significance of each taxon was determined using the IUCN Red List of Threatened Species, while the Ghana Wildlife Conservation Regulation was applied to evaluate the protection status of species in Ghana. All fauna species listed in Appendix I of the Wildlife Conservation Regulation are fully protected, making it illegal to hunt or capture them at any time of the year.

Checklists of recorded fauna species were created for each taxon using the most relevant taxonomic references. Bird species checklists for each plot were compiled using Borrow and Demey (2010), which also provided the avifauna taxonomy, nomenclature, and information on the conservation status, abundance, relative abundance, density and relative density of the birds recorded. The global and national conservation status of each bird species was evaluated using the 2024 IUCN Red List of Threatened Birds and Ghana's Wildlife Conservation Regulation 1971 (LI 685), with a particular focus on globally threatened, biome-restricted, and range-restricted species. All IUCN threat categories were considered in the conservation status assessment of the recorded species.

The checklist for large mammals was created using Kingdon (1997). Due to the data collection methods and the nature of the acquired data, assessments of species diversity and richness were not feasible. Data analysis concentrated primarily on evaluating the global conservation and national protection significance of the recorded species, utilizing the IUCN Red List and Wildlife Conservation Regulation 1971 (LI 685).

Checklists of recorded flora were created for each taxon using the most relevant taxonomic references (Hawthorne & Jongkind, 2006). Information on the conservation status, abundance, relative abundance, density and relative density of the flora recorded. The rarity of plant species identified in the study was assessed using Ghana's Star Rating system and the IUCN Red List.

RESULTS AND DISCUSSIONS

Land Cover Types Along the Transmission Line

The transmission line traverses an off-reserve agricultural area within Ghana's high forest zone. The vegetation in this region is largely modified, consisting of secondary and tertiary succession stages of the once-lush high forest. The remaining vegetation is primarily farm bush and farmlands. Along the right of way, four distinct land use types were identified: plantation agriculture, food crop farms, farm fallows, and riparian marshes.

Cocoa farms, oil palm, and rubber plantations were the primary forms of plantation agriculture observed along the transmission line. Among these, cocoa farms were the most widespread, with plantations at various stages of maturity. Oil palm and rubber plantations were common, but appearing only sporadically along the route. The farms and plantations were intermixed with characteristic tree species typical of the moist evergreen and moist semi-deciduous forest zones.

Tree species like *Milicia excelsa*, *Terminalia ivorensis*, *Khaya ivorensis*, *Khaya anthotica*, *Nauclea diderrichii*, *Petersianthus macrocarpus*, and *Nesogordonia papaverifera* were frequently found in some of the cocoa farm patches.

Riparian forest patches, characterized by typical riparian vegetation along streams and riverine areas, were among the most common habitat types along the transmission line (Figure 1). These patches seemed to represent areas of disturbed natural vegetation within the transmission line's landscape.



Picture of Riparian Forest

These areas are generally unsuitable for farming due to their seasonal or permanent inundation. They were found in almost all 21 sampling sites evaluated and contained characteristic flora species typical of the moist semi-deciduous and moist evergreen vegetation zones.

Food crop farms growing staples like cassava, plantains, maize, and mixed crops were a prominent and widespread land use along the transmission line. Rice fields in wet valleys were also frequently observed along the route. While food crop farms were mixed with economic crops, some areas featured extensive stretches of food crops, especially cassava, maize, and rice.

Adjacent to these food crop farms were fallow lands in various stages of regeneration. These fallow areas were not continuous but were scattered among the cultivated lands. The fallow areas were characterized by vegetation in different stages of regeneration, with species like *Chromolaena odorata*, *Alchornea cordifolia*, *Trema orientalis*, *Cecropia peltata*, *Rauvolfia vomitoria*, *Macaranga barteri* and *Musanga cecropioides* being prominent in the flora community.



Cocoa farms



Cassava forms(a) and fallow lands (b)



Pictures of Oil Palm plantation

Fauna Species Community in the Proposed Line Route Corridor

In heavily cultivated regions, fauna communities are typically sparse, with low species diversity and richness. This is largely due to the high human activity, intense farming practices, significant hunting pressure, and the absence of secure refuges, which make fauna, particularly large mammals, more vulnerable as they are often hunted for food. The decline of fauna communities in Ghana's off-reserve cultivated landscapes is driven by rapid deforestation and habitat degradation. Wildlife in many cultivated areas within the high forest zone is now mainly limited to small rodents, common birds, and herpetofauna associated with open habitats. This is partly due to the widespread use of inappropriate farming practices, including herbicides, weedicides, and burning.

Avifauna

Birds are among the most prevalent and easily observed fauna in most terrestrial ecosystems. A bird survey conducted along the right of way of the transmission line recorded 71 species from 26 avian families. The species identified were primarily common birds associated with cultivated areas in the high forest zone. Although the high forest zone is the most biodiversity-rich area in Ghana, the birds observed were mostly those linked to open habitats within this zone. Species diversity and richness were relatively low, likely due to the high intensity of farming and human activities across the transmission line landscape.

The bird species observed in the study were those typically found in both closed and open habitats within forest areas, reflecting the general vegetation cover at the sites. Although the sites are within Ghana's high forest zone, known for its rich diversity of flora and fauna, the intense human activity has significantly altered the vegetation. Since birds are often specific to particular habitats, changes in habitat conditions usually lead to changes in the bird community. The conservation value of the area, in terms of avifauna, was relatively low; none of the 71 bird species recorded is of conservation concern, with all being classified as "Least Concern" on the IUCN Red List of Threatened Species.

Mammals

The presence of large mammals in and around the right of way of the transmission line was minimal. The area, dominated by food and cash crop cultivation, experiences high human activity and habitat disturbance, compounded by hunting pressure, resulting in the near absence of large mammals. The mammal assessment recorded the presence of some medium mammal species indirectly such as Maxwell's Duiker (*Philantomba maxwellii*) Bay Duiker (*Cephalophus dorsalis*); Black Duiker (*Cephalophus niger*); Bushbuck (*Tragelaphus scriptus*); Brush-tailed Porcupine (*Atherurus africanus*) and few of African Palm Squirrel (*Epixerus ebi*) were observed directly. Signs were at sampling sites 2, 3, 8,12 and evidence of grass cutter (*Thryonomys swinderianus*) feeding in fallow farm areas across several sites.

Grass-cutter was the most commonly observed species and tree hyrax were heard in night hours in the project area. Droppings of civet cats and trails of brush-tailed porcupines were some of the signs of large mammals noted at certain sites. The situation with the large mammal community is typical of cultivated landscapes, where hunting pressure and human activities have greatly reduced their presence. However, a rare sighting of a bushbuck was made in a cocoa farm at transect 19. None of the large mammal species encountered in the study is of conservation concern, with all listed as "Least Concern" on the IUCN Red List of Threatened Species.

Herpetofauna

Despite the presence of some water bodies within the transmission line area, herpetofauna species were relatively scarce. The recorded herpetofauna community, consisting of snakes, lizards, and frogs, included species that are commonly found throughout Ghana's high forest zone. However, this community was notably limited, likely representing remnants of a once more diverse herpetofauna population that has been significantly reduced due to probably years of intense agricultural activities. The apparent scarcity of herpetofauna species can be attributed to the extensive use of agrochemicals, particularly herbicides, which have had a detrimental impact on fauna in the area.

The study identified 16 herpetofauna species belonging to 10 families, comprising seven amphibians and eight reptiles. Among the reptiles, there were four snakes and five lizards. The herpetofauna species observed were predominantly common species, likely the remnants of a previously thriving community

that has been decimated by intense land use, adversely affecting the herpetofauna population. Details of a Check list of the herpetofauna species found in *Appendix 2*.



A picture of male Agama agama (agama lizard)

Flora

Despite Ghana's high forest zone being home to numerous permanent forest reserves, the proposed transmission line route does not intersect any of these reserves. Instead, the entire 125 km stretch traverses through off-reserve, cultivated land. The vegetation along the transmission line route has been significantly altered due to various human activities. The remaining plant communities in the right of way primarily consist of secondary and tertiary successions of the original climax flora that once dominated the area. The land use along the transmission line includes mainly food crops and cash crops, with cocoa plantations being the most prominent. Other identified land uses include food crop farms, oil palm plantations, and rubber plantations. Among these cultivated areas, there are also fallow lands left to regenerate. Riparian buffers around rivers and streams, with their distinctive plant communities, show remnants of the natural vegetation that once covered the landscape.

Throughout the transmission line's length, the multilayered canopy typical of Ghana's high forest zone has been replaced by an open, discontinuous canopy with isolated trees in cocoa plantations and various shrubs and climbers in fallow areas. The plant composition includes a mix of deciduous and evergreen species, along with species characteristic of degraded forest zones.

Flora Community Composition

A rapid botanical survey conducted at 21 sampling sites along the transmission line recorded a total of 108 vascular plant species across several families. The distribution of these species was relatively uniform among the 21 sampling sites, with many species appearing throughout but varying in frequency. Species richness was 1,173 at the density of 18.6 tree/km site. The other plant life forms recorded included 29 species of shrubs, herbs, climbers, and lianas with abundance of 315 and density of 5.0/km.

Conservation Significance Along the Transmission Line Route

The conservation significance of an area is determined by the value of its flora and fauna. As noted earlier, the fauna community's conservation value is relatively low, with the exception of two herpetofauna species listed on the Red List of Threatened Species. All other fauna recorded are classified as Least Concern on the IUCN Red List.

In contrast, the flora community's conservation value is notable due to its high diversity. Out of the 108 recorded vascular plant species, seven (7) are listed as globally threatened on the IUCN Red list including two Near Threatened and five Vulnerable as follows: *Entandrophragma angolense*: Vulnerable (VU); *Guarea cedrata*: Vulnerable (VU); *Milicia excelsa*: Near Threatened (NT); *Milicia regia*: Near Threatened (NT); *Nauclea diderrichii*: Vulnerable (VU); *Nesogordonia papaverifera*: Vulnerable (VU); *Terminalia ivorensis*: Vulnerable (VU). In addition to the species of global conservation concern, many of the plant species recorded within the transmission line's right of way are classified with Red, Scarlet, or Pink Star ratings, indicating their rarity. Thus, despite the significant modification of vegetation around the transmission line, there are still plant species that are rare in their occurrence and distribution within their geographic range (Appendix 3,4).

Expected Impact of the Proposed Transmission Line

The proposed transmission line project will involve clearing vegetation within the designated right-of-way, which will disrupt local ecosystems, leading to habitat fragmentation and loss for various species. The impact of this construction will vary depending on the terrain and existing land uses. For instance, significant habitat disruption is anticipated in areas with pristine forest as vegetation is removed for the construction. To maintain the right-of-way, tree removal and prevention of regrowth will create a long stretch of open land with altered vegetation structures. In agricultural regions, the use of heavy machinery may halt agricultural production.

The route for the 400/330 kV Côte d'Ivoire-Ghana transmission line primarily traverses off-reserve cultivated land. While no pristine forests are affected, the construction and operation of the power line will modify land use within the right-of-way. The 40-meter-wide right-of-way along the 125 km transmission line will undergo changes during and after construction, likely becoming unsuitable for farming due to the removal and suppression of vegetation. Consequently, one expected impact is the reduction in farming opportunities within the right-of-way.

Additionally, the construction and maintenance of the above-ground power transmission line may have potential adverse effects on wildlife, especially birds. Although the baseline assessment did not find any congregator bird species that could be disrupted by the transmission line, it is anticipated that wildlife, particularly large mammals and reptiles, may become more vulnerable. The baseline assessment revealed limited presence of these species.

The transmission line route features intensive food and cash crop cultivation. The construction of the line could result in the formation of a long stretch of open area with altered vegetation structures, potentially facilitating the spread of invasive species such as *Broussonetia papyrifera*, which is already expanding in other parts of the high forest zone.

Moreover, constructing the transmission line close to existing lines could further create open habitats in vital cocoa production areas, possibly triggering the spread of the cocoa swollen shoot virus disease (CSSVD) in cocoa farms along the route. The construction and maintenance could also increase edge effects, potentially impacting cocoa farms and other parts of the landscape.

Expected Impact on Local Biodiversity and Species of Conservation Concern

Despite the significant conservation value of the areas along the transmission line, the construction and maintenance of the line are not expected to adversely affect local biodiversity. The transmission line area is part of a larger landscape where the fauna and flora are distributed over a broader geographic range. The species recorded have wide distributions beyond the construction area, meaning that while there will be some localized impacts during and after construction, these are not expected to affect the broader landscape's biodiversity.

Although the area includes species of global conservation concern, particularly among the flora, the expected impact will be localized and not severely affect the overall biodiversity and conservation value of the region. This is because no species of global conservation significance is endemic to this area or even to Ghana; they have broader distributions within the Upper Guinea forest biome.

Critical habitats, such as riparian vegetation in wet marshes and along streams, are not anticipated to be negatively impacted by the construction and maintenance of the above-ground transmission line for several reasons:

1. **Above-Ground Construction:** The transmission line will be built above ground, reducing direct physical disturbance to riparian and wetland areas. This avoids excavation and grading that could damage sensitive vegetation and soil.
2. **Selective Vegetation Management:** Vegetation management around transmission lines typically involves selective clearing rather than widespread deforestation, allowing critical riparian vegetation to be preserved, especially where it is crucial for ecosystem stability and water quality.
3. **Buffer Zones:** Buffer zones are often established around critical habitats to ensure construction

and maintenance activities occur at a safe distance, protecting the integrity of riparian zones.

4. Use of Existing Routes: Construction activities are planned to use existing access routes, minimizing the creation of new paths that could disrupt riparian vegetation and limit additional intrusion by humans and machinery.
5. Environmental Management Plans: These plans usually include measures to protect sensitive areas, such as riparian zones, including erosion control, runoff management, and careful placement of transmission towers.
6. Small Footprint: The physical footprint of transmission towers is relatively small, and with careful placement, these towers can avoid critical habitats. Maintenance activities can be performed with minimal disturbance, often using techniques that do not require heavy machinery near sensitive areas.
7. Ongoing Monitoring: Continuous monitoring during and after construction can help identify and address any unforeseen impacts on riparian habitats, with adaptive management strategies allowing adjustments to mitigate negative effects.

RECOMMENDED MITIGATION MEASURES

- i. Integrate the identification and control of invasive species into the regular maintenance schedule for the transmission line.
- ii. Implement erosion control measures, such as planting cover crops, in areas prone to soil erosion, especially where there are significant elevation changes.
- iii. Where feasible, consider planting trees to mitigate edge effects in sensitive cocoa-growing regions.
- iv. GRIDCO should collaborate with organizations such as the Department of Crop Services under the Ministry of Food and Agriculture and the Ghana Cocoa Board to prevent and manage the spread of crop pests and diseases.
- v. Exercise caution when constructing the transmission line through riparian zones and marsh forests to minimize impacts on delicate habitats and ecosystems. Install culverts over streams to prevent localized flooding.
- vi. Whenever possible, GRIDCO should avoid routing maintenance access roads through marsh forests and areas that are seasonally inundated along the transmission line.

Appendix 1: Checklist of avian species encountered during the survey

Common Name/Family	Scientific Name	Cons. Status	Abundance	R. Abundance	Density	R.Density
Phasianidae						
Ahanta francolin	<i>Pternistis ahantensis</i>	LC	21	1.05	0.33	1.05
Columbidae						
Tambourine Dove	<i>Turtur tympanistria</i>	LC	20	1.00	0.32	1.00
Blue-headed Wood-Dove	<i>Turtur brehmeri</i>	LC	23	1.15	0.37	1.15
African Green-Pigeon	<i>Treron calvus</i>	LC	32	1.60	0.51	1.60
Laughing Dove	<i>Spilopelia senegalensis</i>	LC	14	0.70	0.22	0.70
Musophagidae						
Yellow-billed Turaco	<i>Tauraco macrorhynchus</i>	LC	23	1.15	0.37	1.15
Cuculidae						
Black-throated Coucal	<i>Centropus leucogaster</i>	LC	6	0.30	0.10	0.30
Blue Malkoha	<i>Ceuthmochares aereus</i>	LC	14	0.70	0.22	0.70
Dideric Cuckoo	<i>Chrysococcyx caprius</i>	LC	10	0.50	0.16	0.50
African Emerald Cuckoo	<i>Chrysococcyx cupreus</i>	LC	17	0.85	0.27	0.85
Apodidae						
Black Spinetail	<i>Telacanthura melanopygia</i>	LC	48	2.40	0.76	2.40
Sabine's Spinetail	<i>Rhaphidura sabini</i>	LC	16	0.80	0.25	0.80
African Palm-Swift	<i>Cypsiurus parvus</i>	LC	42	2.10	0.67	2.10
Sarothruridae						
White-spotted Flufftail	<i>Sarothrura pulchra</i>	LC	26	1.30	0.41	1.30
Accipitridae						
Red-thighed Sparrowhawk	<i>Accipiter erythropus</i>	LC	6	0.30	0.10	0.30
Black Goshawk	<i>Accipiter melanoleucus</i>	LC	9	0.45	0.14	0.45
Bucerotidae						

African Pied Hornbill	<i>Lophoceros fasciatus</i>	LC	51	2.54	0.81	2.54
White-crested Hornbill	<i>Horizocerus albocristatus</i>	LC	17	0.85	0.27	0.85
Piping Hornbill	<i>Bycanistes fistulator</i>	LC	12	0.60	0.19	0.60
Alcedinidae						
African Dwarf Kingfisher	<i>Ispidina lecontei</i>	LC	18	0.90	0.29	0.90
Blue-breasted Kingfisher	<i>Halcyon malimbica</i>	LC	13	0.65	0.21	0.65
Meropidae			0	0.00	0.00	0.00
Little Bee-eater	<i>Merops pusillus</i>	LC	28	1.40	0.44	1.40
Coraciidae			0	0.00	0.00	0.00

Appendix 1 Continued

Common Name/Family	Scientific Name	Cons. Status	Abundance	R. Abundance	Density	R.Density
Blue-throated Roller	<i>Eurystomus gularis</i>	LC	22	1.10	0.35	1.10
Lybiidae						
Yellow-billed Barbet	<i>Trachyphonus purpuratus</i>	LC	15	0.75	0.24	0.75
Naked-faced Barbet	<i>Gymnobucco calvus</i>	LC	21	1.05	0.33	1.05
Speckled Tinkerbird	<i>Pogoniulus scolopaceus</i>	LC	12	0.60	0.19	0.60
Red-rumped Tinkerbird	<i>Pogoniulus atroflavus</i>	LC	6	0.30	0.10	0.30
Yellow-throated Tinkerbird	<i>Pogoniulus subsulphureus</i>	LC	25	1.25	0.40	1.25
Hairy-breasted Barbet	<i>Tricholaema hirsuta</i>	LC	9	0.45	0.14	0.45
Picidae						
Fire-bellied Woodpecker	<i>Chloropicus pyrrhogaster</i>	LC	12	0.60	0.19	0.60
Buff-spotted Woodpecker	<i>Campethera nivosa</i>	LC	13	0.65	0.21	0.65
Oriolidae						
Western Black-headed Oriole	<i>Oriolus brachyrynchus</i>	LC	32	1.60	0.51	1.60
Black-winged Oriole	<i>Oriolus nigripennis</i>	LC	12	0.60	0.19	0.60
Platysteiridae						
West African Wattle-eye	<i>Platysteira hormophora</i>	LC	24	1.20	0.38	1.20

Red-cheeked Wattle-eye	<i>Platysteira blissetti</i>	LC	14	0.70	0.22	0.70
Dicruridae						
Velvet-mantled Drongo	<i>Dicrurus modestus</i>	LC	9	0.45	0.14	0.45
Monarchidae						
Blue-headed Crested-Flycatcher	<i>Trochocercus nitens</i>	LC	14	0.70	0.22	0.70
Black-headed Paradise-Flycatcher	<i>Terpsiphone rufiventer</i>	LC	25	1.25	0.40	1.25
Nicatoridae						
Western Nicator	<i>Nicator chloris</i>	LC	26	1.30	0.41	1.30
Macrospheidae						
Kemp's Longbill	<i>Macrospheus kemp</i>	LC	13	0.65	0.21	0.65
Gray Longbill	<i>Macrospheus concolor</i>	LC	17	0.85	0.27	0.85
Green Hylia	<i>Hylia prasina</i>	LC	19	0.95	0.30	0.95
Tit-hylia	<i>Pholidornis rushiae</i>	LC	22	1.10	0.35	1.10
Cisticolidae						
Yellow-browed Camaroptera	<i>Camaroptera superciliaris</i>	LC	18	0.90	0.29	0.90
Olive-green Camaroptera	<i>Camaroptera chloronota</i>	LC	17	0.85	0.27	0.85

Appendix 1 Continued

Common Name/Family	Scientific Name	Cons. Status	Abundance	R. Abundance	Density	R.Density
Hirundinidae						
Fanti Sawwing	<i>Psalidoprocne obscura</i>	LC	30	1.50	0.48	1.50
Pycnonotidae						
Slender-billed Greenbul	<i>Stelgidillas gracilirostris</i>	LC	11	0.55	0.17	0.55
Swamp Greenbul	<i>Thescelocichla leucopleura</i>	LC	28	1.40	0.44	1.40
Red-tailed Greenbul	<i>Criniger calurus</i>	LC	16	0.80	0.25	0.80
Gray Greenbul	<i>Eurillas gracilis</i>	LC	13	0.65	0.21	0.65

Yellow-whiskered Greenbul	<i>Eurillas latirostris</i>	LC	23	1.15	0.37	1.15
Little Greenbul	<i>Eurillas virens</i>	LC	55	2.74	0.87	2.74
Common Bulbul	<i>Pycnonotus barbatus</i>	LC	58	2.89	0.92	2.89
Pellorneidae						
Brown Illadopsis	<i>Illadopsis fulvescens</i>	LC	12	0.60	0.19	0.60
Sturnidae						
Splendid Glossy Starling	<i>Lamprotornis splendidus</i>	LC	36	1.80	0.57	1.80
Nectariniidae						
Collared Sunbird	<i>Hedydipna collaris</i>	LC	16	0.80	0.25	0.80
Blue-throated Brown Sunbird	<i>Cyanomitra cyanolaema</i>	LC	10	0.50	0.16	0.50
Olive Sunbird	<i>Cyanomitra olivacea</i>	LC	25	1.25	0.40	1.25
Buff-throated Sunbird	<i>Chalcomitra adelberti</i>	LC	13	0.65	0.21	0.65
Ploceidae						
Black-necked Weaver	<i>Ploceus nigricollis</i>	LC	32	1.60	0.51	1.60
Red-vented Malimbe	<i>Malimbus scutatus</i>	LC	20	1.00	0.32	1.00
Village Weaver	<i>Ploceus cucullatus</i>	LC	223	11.13	3.54	11.13
Viellots Weaver	<i>Ploceus nigerrimus</i>	LC	150	7.49	2.38	7.48
Blue-billed Malimbe	<i>Malimbus nitens</i>	LC	36	1.80	0.57	1.80
Red-headed Queala	<i>Quelea erythrops</i>	LC	57	2.84	0.90	2.84
Estrildidae						
Orange-cheeked Waxbill	<i>Estrilda melpoda</i>	LC	54	2.69	0.86	2.69
Black-and-White Mannikin	<i>Spermestes bicolor</i>	LC	6	0.30	0.10	0.30
African Firefinch	<i>Lagonosticta rubricata</i>	LC	49	2.45	0.78	2.45
Black-bellied Seedcracker	<i>Pyrenestes ostrinus</i>	LC	17	0.85	0.27	0.85
Bronze Mannikin	<i>Spermestes cucullata</i>	LC	106	5.29	1.68	5.29
Chestnut-breasted Nigrita	<i>Nigrita bicolor</i>	LC	27	1.35	0.43	1.35

Appendix 1 Continued

Common Name/Family	Scientific Name	Cons. Status	Abundance	R. Abundance	Density	R.Density

Gray-headed Nigrita	<i>Nigrita canicapillus</i>	LC	18	0.90	0.29	0.90
TOTAL			2004	100.00	31.81	100.00

Appendix 2: Checklist of Herpetofauna during the survey

Common Name	Scientific Name	IUCN	Abundance	R. Abundance	Density	R.Density
DICROGLOSSIDAE						
Crowned Bullfrog	<i>Hoplobatrachus occipitalis</i>	LC	17	10.56	0.27	10.56
HYPEROLIIDAE			0	0.00	0.00	0.00
Hallowell's sedge frog	<i>Hyperolius concolor</i>	LC	7	4.35	0.11	4.35
PHRYNOBATRACHIDAE			0	0.00	0.00	0.00
Ahl's river frog	<i>Phrynobatrachus latifrons</i>	LC	23	14.29	0.37	14.29
Boutry river frog	<i>Phrynobatrachus calcaratus</i>	LC	18	11.18	0.29	11.18
Natal puddle frog	<i>Phrynobatrachus natalensis</i>	LC	14	8.70	0.22	8.70
BUFONIDAE			0	0.00	0.00	0.00
Common toad	<i>Sclerophrys regularis</i>	LC	26	16.15	0.41	16.15
REPTILES			0	0.00	0.00	0.00
AGAMIDAE			0	0.00	0.00	0.00
Agama lizard	<i>Agama agama</i>	LC	13	8.07	0.21	8.07
GEKKONIDAE			0	0.00	0.00	0.00
Nigeria leaf-toed gecko	<i>Hemidactylus ansorgii</i>	LC	5	3.11	0.08	3.11
SCINCIDAE			0	0.00	0.00	0.00
Senegal mabuya	<i>Trachylepis affinis</i>	LC	10	6.21	0.16	6.21
Guinea mabuya	<i>Trachylepis albilabris</i>	LC	10	6.21	0.16	6.21
VARANIDAE			0	0.00	0.00	0.00
Nile Monitor	<i>Varanus niloticus</i>	LC	6	3.73	0.10	3.73
Snakes			0	0.00	0.00	0.00
VIPERIDAE			0	0.00	0.00	0.00
bush viper	<i>Atheris broadleyi</i>	LC	1	0.62	0.02	0.62
spotted night adder	<i>Causus maculatus</i>	LC	4	2.48	0.06	2.48
ELAPIDAE			0	0.00	0.00	0.00

West Africa Greenv Mamba	Dendroaspis viridis	LC	3	1.86	0.05	1.86
TESTUDINIDAE			0	0.00	0.00	0.00
Forest hinged- backed tortoise	Kinixys erosa	LC	4	2.48	0.06	2.48
Total			161	100.00	2.56	100.00

Appendix 3: Checklist of tree species enumerated along the transmission line route

Name of tree	Family	Guild	Star rating	IUCN rating	Abundance	R. Abundance	Density	R. Density
<i>Aidia genipiflora</i>	Rubiaceae	Shade-b	gn	LC	6	0.5	0.1	0.5
<i>Albizia adianthifolia</i>	Fabaceae	NPLD	gn	LC	19	1.6	0.3	1.6
<i>Albizia ferruginea</i>	Fabaceae	NPLD	Sc	LC	18	1.5	0.3	1.5
<i>Albizia zygia</i>	Fabaceae	NPLD	gn	LC	21	1.8	0.3	1.8
<i>Alchornea cordifolia</i>	Euphorbiaceae	Pioneer	gn	LC	21	1.8	0.3	1.8
<i>Allanblackia parviflora</i>	Clusiaceae	NPLD	Pk	LC	3	0.3	0.0	0.3
<i>Alstonia boonei</i>	Apocynaceae	Pioneer	gn	LC	21	1.8	0.3	1.8
<i>Amphimas pterocarpoides</i>	Fabaceae	NPLD	gn	LC	13	1.1	0.2	1.1
<i>Anthocleista nobilis</i>	Loganiaceae	Pioneer	gn	LC	9	0.8	0.1	0.8
<i>Anthocleista vogelii</i>	Loganiaceae	Pioneer	gn	LC	9	0.8	0.1	0.8
<i>Antiaris toxicaria</i>	Moraceae	NPLD	gn	LC	14	1.2	0.2	1.2
<i>Artocarpus altilis</i>	Moraceae	Exotic		LC	7	0.6	0.1	0.6
<i>Bambusa vulgaris</i>	Apocynaceae	Swamp	gn	LC	12	1.0	0.2	1.0
<i>Baphia nitida</i>	Fabaceae	Shade-b	gn	LC	19	1.6	0.3	1.6
<i>Baphia pubecens</i>	Fabaceae	Pioneer	gn	LC	13	1.1	0.2	1.1
<i>Blighia sapida</i>	Sapindaceae	NPLD	gn	LC	10	0.9	0.2	0.9
<i>Blighia welwitschii</i>	Sapindaceae	NPLD	gn	LC	6	0.5	0.1	0.5
<i>Bombax buonopozense</i>	Bombacaceae	Pioneer	gn	LC	10	0.9	0.2	0.9
<i>Bridelia grandis</i>	Euphorbiaceae	Pioneer	gn	LC	9	0.8	0.1	0.8
<i>Canarium schweinfurthii</i>	burseraceae	Pioneer	Pk	LC	7	0.6	0.1	0.6
<i>Carapa procera</i>	Meliaceae	Shade-b	gn	LC	9	0.8	0.1	0.8
<i>Carpolobia lutea</i>	Polygalaceae	Shade-b	gn	LC	6	0.5	0.1	0.5
<i>Cedrela odorata</i>	Meliaceae	Exotic		LC	6	0.5	0.1	0.5
<i>Ceiba pentandra</i>	Bombacaceae	Pioneer	gn	LC	21	1.8	0.3	1.8

<i>Celtis mildbraedii</i>	Ulmaceae	Shade-b	gn	LC	13	1.1	0.2	1.1
<i>Celtis zenkeri</i>	Ulmaceae	NPLD	gn	LC	11	0.9	0.2	0.9
<i>Chassalia kolly</i>	Rubiaceae	Pioneer	gn	LC	12	1.0	0.2	1.0

Appendix 3 Continued

Scientific Name	Family	Guild	Star rating	IUCN Redlist	Abundance	R. Abundance	Density	R. Density
<i>Cleistopholis patens</i>	Annonaceae	Pioneer	gn	LC	4	0.3	0.1	0.3
<i>Cola gigantea</i>	Sterculiaceae	NPLD	gn	LC	8	0.7	0.1	0.7
<i>Cola millenii</i>	Sterculiaceae	NPLD	gn	LC	7	0.6	0.1	0.6
<i>Cola nitida</i>	Sterculiaceae	Shade-b	Pk	LC	6	0.5	0.1	0.5
<i>Cordia platythyrsa</i>	Boraginaceae	Pioneer	gn	LC	4	0.3	0.1	0.3
<i>Daniella ogea</i>	Fabaceae	Pioneer	Pk	LC	14	1.2	0.2	1.2
<i>Dialium dinklaipei</i>	Fabaceae	NPLD	gn	LC	13	1.1	0.2	1.1
<i>Diospyros heudelotii</i>	Ebenaceae	Shade-b	bu	LC	7	0.6	0.1	0.6
<i>Distemonanthus benthamianus</i>	Fabaceae	NPLD	Pk	LC	6	0.5	0.1	0.5
<i>Dracaena arborea</i>	Agavaceae	Pioneer	gn	LC	3	0.3	0.0	0.3
<i>Dracaena fragrans</i>	Agavaceae	Shade-b	gn	LC	8	0.7	0.1	0.7
<i>Drypetes afzelii</i>	Euphorbiaceae	Shade-b	gn	LC	4	0.3	0.1	0.3
<i>Drypetes principum</i>	Euphorbiaceae	Shade-b	gn	LC	5	0.4	0.1	0.4
<i>Elaeis guineensis</i>	Arecaceae	Pioneer	Pk	LC	21	1.8	0.3	1.8
<i>Entandrophragma angolense</i>	Meliaceae	NPLD	R	VU	9	0.8	0.1	0.8
<i>Ficus exasperata</i>	Moraceae	Pioneer	gn	LC	21	1.8	0.3	1.8
<i>Ficus ottonifolia</i>	Moraceae	Strangler	gn	LC	6	0.5	0.1	0.5
<i>Ficus sur</i>	Moraceae	Pioneer	gn	LC	7	0.6	0.1	0.6
<i>Ficus thonningii</i>	Moraceae	Pioneer	gn	LC	3	0.3	0.0	0.3

<i>Funtumia africana</i>	Apocynaceae	Pioneer	gn	LC	17	1.4	0.3	1.4
<i>Funtumia elastica</i>	Apocynaceae	NPLD	Pk	LC	14	1.2	0.2	1.2
<i>Glyphaea brevis</i>	Sterculiaceae	Pioneer	gn	LC	1	0.1	0.0	0.1
<i>Grewia mollis</i>	Malvaceae	Pioneer	gn	LC	15	1.3	0.2	1.3
<i>Guarea cedrata</i>	Meliaceae	NPLD	R	VU	5	0.4	0.1	0.4
<i>Hallea ledermannii</i>	Rubiaceae	NPLD	R	LC	9	0.8	0.1	0.8
<i>Hannoa klaineana</i>	Simaroubaceae	Pioneer	gn	LC	9	0.8	0.1	0.8
<i>Harunguna madagascariensis</i>	Guttiferae	Pioneer	gn	LC	10	0.9	0.2	0.9
<i>Hollarhena floribunda</i>	Apocynaceae	Pioneer	gn	LC	10	0.9	0.2	0.9
<i>Khaya grandifoliola</i>	Meliaceae	NPLD	R	LC	5	0.4	0.1	0.4
<i>Khaya ivorensis</i>	Meliaceae	NPLD	Sc	LC	6	0.5	0.1	0.5
<i>Lantana camara</i>	Verbenaceae	Pioneer	gn	LC	11	0.9	0.2	0.9

Appendix 3 Continued

Common Name/Family	Scientific Name	Guild	Cons. Status	IUCN Redlist	Abundance	R. Abundance	Density	R.Density
<i>Maesopsis eminii</i>	Rhamnaceae	Pioneer	gn	LC	7	0.6	0.1	0.6
<i>Margaritaria discoidea</i>	Euphorbiaceae	Pioneer	gn	LC	12	1.0	0.2	1.0
<i>Microdesmis puberula</i>	Pandaceae	Shade-b	gn	LC	10	0.9	0.2	0.9
<i>Milicia excelsa</i>	Moraceae	Pioneer	Sc	NT	20	1.7	0.3	1.7
<i>Milicia regia</i>	Moraceae	Pioneer	Sc	NT	9	0.8	0.1	0.8
<i>Monodora myristica</i>	Annonaceae	Shade-b	gn	LC	9	0.8	0.1	0.8
<i>Morinda lucida</i>	Rubiaceae	Pioneer	gn	LC	21	1.8	0.3	1.8
<i>Morus mesozygia</i>	Moraceae	Pioneer	gn	LC	5	0.4	0.1	0.4

<i>Musanga cecropioides</i>	Moraceae	Pioneer	gn	LC	12	1.0	0.2	1.0
<i>Myrianthus arboreus</i>	Moraceae	Shade-b	gn	LC	16	1.4	0.3	1.4
<i>Myrianthus libericus</i>	Moraceae	Shade-b	gn	LC	9	0.8	0.1	0.8
<i>Nauclea diderrichii</i>	Rubiaceae	Pioneer	sc	NT	6	0.5	0.1	0.5
<i>Nesogordonia papaverifera</i>	Sterculiacea	Shade-b	Pk	VU	10	0.9	0.2	0.9
<i>Newbouldia laevis</i>	Bignoniacea	Pioneer	gn	LC	21	1.8	0.3	1.8
<i>Panicum maximum</i>	Poaceae	Pioneer	gn	LC	11	0.9	0.2	0.9
<i>Pentaclethra macrophylla</i>	Fabaceae	NPLD	gn	LC	16	1.4	0.3	1.4
<i>Persea americana</i>	Lauraceae	Exotic		LC	4	0.3	0.1	0.3
<i>Petersianthus macrocarpa</i>	Lecythidacea	Pioneer	gn	LC	10	0.9	0.2	0.9
<i>Phyllocosmus africanus</i>	Ixonanthacea	NPLD	gn	LC	5	0.4	0.1	0.4
<i>Piptadeniastrum africanum</i>	Fabaceae	NPLD	Pk	LC	9	0.8	0.1	0.8
<i>Psydrax subcordata</i>	Rubiaceae	NPLD	gn	LC	12	1.0	0.2	1.0
<i>Pterygota macropcarpa</i>	Sterculiacea	NPLD	R	LC	7	0.6	0.1	0.6
<i>Pycnanthus angolensis</i>	Myristicacea	NPLD	Pk	LC	18	1.5	0.3	1.5
<i>Raphia palma-pinus</i>	Raphia Palm	NPLD	Gold	LC	21	1.8	0.3	1.8
<i>Rauvolfia vomitoria</i>	Apocynacea	Pioneer	gn	LC	14	1.2	0.2	1.2
<i>Rhaphia hookeri</i>	Arecaceae	Swamp	gn	LC	11	0.9	0.2	0.9
<i>Ricinodendron heudelotii</i>	Euphorbiacea	Pioneer	gn	LC	14	1.2	0.2	1.2

Appendix 3 Continued

Scientific Name	Family	Habit	Star Rating	IUCN Redlist	Abundance	R. Abundance	Density	R.Density
<i>Rothmania hispida</i>	Rubiaceae	Shade-b	gn	LC	7	0.6	0.1	0.6
<i>Scottellia klaineana</i>	Flacourtiaceae	Shade-b	Pk	LC	6	0.5	0.1	0.5
<i>Solanum erianthum</i>	Solanaceae	Pioneer	gn	LC	15	1.3	0.2	1.3
<i>Solanum torvum</i>	Solanaceae	Pioneer	gn	LC	9	0.8	0.1	0.8
<i>Spathodea campanulata</i>	Bignoniaceae	Pioneer	gn	LC	18	1.5	0.3	1.5
<i>Spondias mombin</i>	Anacardiaceae	Exotic		LC	7	0.6	0.1	0.6
<i>Sterculia rhinopetala</i>	Sterculiaceae	NPLD	Pk	LC	8	0.7	0.1	0.7
<i>Sterculia tragacantha</i>	Sterculiaceae	Pioneer	gn	LC	19	1.6	0.3	1.6
<i>Strombosia glaucescens</i>	Olacaceae	Shade-b	gn	LC	8	0.7	0.1	0.7
<i>Terminalia ivorensis</i>	Combretaceae	Pioneer	Sc	VU	18	1.5	0.3	1.5
<i>Terminalia superba</i>	Combretaceae	Pioneer	Pk	LC	21	1.8	0.3	1.8
<i>Tetrapleura tetraptera</i>	Fabaceae	Pioneer	gn	LC	11	0.9	0.2	0.9
<i>Tetrochidium didymostemon</i>	Euphorbiaceae	Pioneer	gn	LC	12	1.0	0.2	1.0
<i>Trema orrientalis</i>	Ulmaceae	Pioneer	gn	LC	13	1.1	0.2	1.1
<i>Trichilia monadelpha</i>	Meliaceae	NPLD	gn	LC	19	1.6	0.3	1.6
<i>Trichilia preureana</i>	Meliaceae	NPLD	gn	LC	7	0.6	0.1	0.6
<i>Trichilia tessmannii</i>	Meliaceae	NPLD	gn	LC	6	0.5	0.1	0.5

<i>Trilepesium madagascariense</i>	Moraceae	NPLD	gn	LC	1	0.1	0.0	0.1
<i>Triplochiton scleroxylon</i>	Sterculiaceae	Pioneer	Sc	LC	17	1.4	0.3	1.4
<i>Voacanga africana</i>	Apocynaceae	Pioneer	gn	LC	8	0.7	0.1	0.7
<i>Xylia evansii</i>	Fabaceae	NPLD	bu	LC	7	0.6	0.1	0.6
<i>Xylopia aethiopica</i>	Annonaceae	Swamp	bu	LC	12	1.0	0.2	1.0
<i>Zanthoxylon gilletii</i>	Rutaceae	Pioneer	gn	LC	12	1.0	0.2	1.0
Total					1173	100.0	18.6	100.0

Appendix 4: Checklist of climbers, shrubs and herbaceous plants enumerated along the transmission line route

Species Name	FAMILY	Habit	Guild	Star rating	Abundance	R. Abundance	Density	R. Density
<i>Acacia kamerunensis</i>	Fabaceae	Cl	NPLD	gn	21	6.7	0.3	6.7
<i>Anchomanes difformis</i>	Araceae	Hb	Shade-b	gn	7	2.2	0.1	2.2
<i>Ataenidia conferta</i>	Marantaceae	Hb	Shade-b	gn	7	2.2	0.1	2.2
<i>Baissea zygodoides</i>	Apocynaceae	Cl	Shade-b	bu	7	2.2	0.1	2.2
<i>Chromolaena odorata</i>	Asteraceae	Hb	Pioneer	gn	19	6.0	0.3	6.0
<i>Cnestis ferruginea</i>	Connaraceae	Cl	Pioneer	gn	11	3.5	0.2	3.5
<i>Costus afer</i>	Zingiberaceae	Hb	Pioneer	gn	9	2.9	0.1	2.9
<i>Costus dubius</i>	Zingiberaceae	Hb	Pioneer	gn	10	3.2	0.2	3.2
<i>Culcasia angolensis</i>	Araceae	Cr	NPLD	gn	6	1.9	0.1	1.9
<i>Culcasia scandens</i>	Araceae	Cr	Shade-b	gn	7	2.2	0.1	2.2
<i>Culcasia striolata</i>	Araceae	Cr	Shade-b	gn	10	3.2	0.2	3.2
<i>Dalbergia saxatilis</i>	Fabaceae	Cl	NPLD	gn	7	2.2	0.1	2.2
<i>Dioscorea bulbifera</i>	Dioscoreaceae	Cl	NPLD	Pk	9	2.9	0.1	2.9
<i>Flagellaria guineensis</i>	Flagellariaceae	Cl	Pioneer	gn	10	3.2	0.2	3.2
<i>Griffonia simplicifolia</i>	Fabaceae	Cl	NPLD	gn	21	6.7	0.3	6.7
<i>Mimosa pudica</i>	Fabaceae	Cl	Pioneer	gn	19	6.0	0.3	6.0
<i>Morinda morindoides</i>	Rubiaceae	Cl	Pioneer	gn	14	4.4	0.2	4.4
<i>Olyra latifolia</i>	Poaceae	CR	Shade-b	gn	10	3.2	0.2	3.2
<i>Palisota hirsuta</i>	Commelinaceae	Hb	Pioneer	gn	11	3.5	0.2	3.5

Parquetina nigrescens	Phytolaccaceae	Cl	Pioneer	gn	9	2.9	0.1	2.9
Paullinia pinnata	Sapindaceae	Cl	Pioneer	gn	19	6.0	0.3	6.0
Piper guineense	Piperaceae	Cl	Shade-b	Pk	15	4.8	0.2	4.8
Sida acuta	Malvaceae	Hb	Pioneer	gn	9	2.9	0.1	2.9
Smilax krausiana	Smilaceae	Cl	Pioneer	gn	12	3.8	0.2	3.8
Stachytapheta cayennensis	Verbenaceae	Hb	Pioneer	gn	5	1.6	0.1	1.6

Appendix 4 Continued

Common Name/Family	Scientific Name	Habit	Guild	Star rating	Abundance	R. Abundance	Density	R. Density
Strophanthus hispidus	Apocynaceae	L	Pioneer	Pk	7	2.2	0.1	2.2
Tetracera alnifolia	Dilleniaceae	L		gn	9	2.9	0.1	2.9
Thaumatomoccus danielii	Marantaceae	Hb	Pioneer	R	10	3.2	0.2	3.2
Zornia glochidiata	Fabaceae	Hb	Pioneer	gn	5	1.6	0.1	1.6
Total					315	100.0	5.0	100.0

APPENDIX XI: ELECTROMAGNETIC FIELD (EMF) EFFECTS

Electromagnetic fields (EMF) (properly called electric and magnetic fields) occur whenever a voltage is present or whenever a current is flowing. In nature EMF effects occur, as in lightning and in other phenomena such as the northern lights (aurora borealis) caused by the interaction of solar wind and the earth's magnetic field.

Since the early 1880s when public electricity supplies were introduced, man has lived increasingly in electric and magnetic fields that vary with time (oscillate). However, electricity transmission, distribution and generating equipment are by no means the only source of man-made EMF. Such fields are everywhere, and are created by wiring circuits in homes, including currents that are induced in water and gas pipes. In addition, all electrical appliances and equipment, together with electric trains and other forms of transport, even the motorcar, all produce EMF. It is almost impossible to avoid man-made electric and magnetic fields.

Over the last two decades, debate has raged over the impact of electro-magnetic fields (EMF) on human health. Power lines in particular have become a focus for conflicting conclusions. The Environmental Health Division of the Minnesota Department of Health (USA) has collated the current available results of research into EMF and health carried out worldwide. The information is readily available at their web site www.health.state.mn.us. In the table below, the conclusions from the available research information have been duly summarized and presented.

Summary of research findings on EMF and health

No.	Research Institution	Country	Year	Main Conclusions
1	American Physical Society	USA	2001	No plausible biophysical mechanisms for the systematic initiation or promotion of cancer by power line fields have been identified.
2	National Research Council	USA	2010	The conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human health hazard.
3	National Institute of Environmental Health Science	USA	2009	The scientific evidence suggesting that EMF exposures pose any health risk is weak. However EMF exposure cannot be said to be entirely safe.

No.	Research Institution	Country	Year	Main Conclusions
4	Institute of Electrical and Electronic Engineers + Engineers in Medicine and Biology	USA	2009	There is not enough relevant scientific data to establish whether common exposure to power-frequency fields should be considered a health hazard. There is general agreement that more research is needed to define safe limits of human exposure to EMF.
5	National Radiological Protection Board	UK	2021	Laboratory experiments have provided no good evidence that EMF causes cancer. However, the possibility remains that intense prolonged exposure to EMF can increase the risk of leukaemia in children.
6	International Agency for Research on Cancer	10 Countries US, UK, Japan etc	2021	There is no evidence that EMF is associated with childhood leukaemia, and there is no consistent relationship between EMF and childhood brain tumours.
7	Health Council of the Netherlands	Holland	2021	It is not likely that children (or adults) living near to high voltage power lines are at risk through exposure to EMF generated by those lines.
8	Japan EMF Research Program	Japan	2021	There is little evidence of any adverse effects from EMF exposure. Very high intensity EMF (over 10000 times higher than real-world environments) can have certain biological effects, which are positive.

Source: Minnesota Department of Health, Environmental Health Division: www.health.state.mn.us

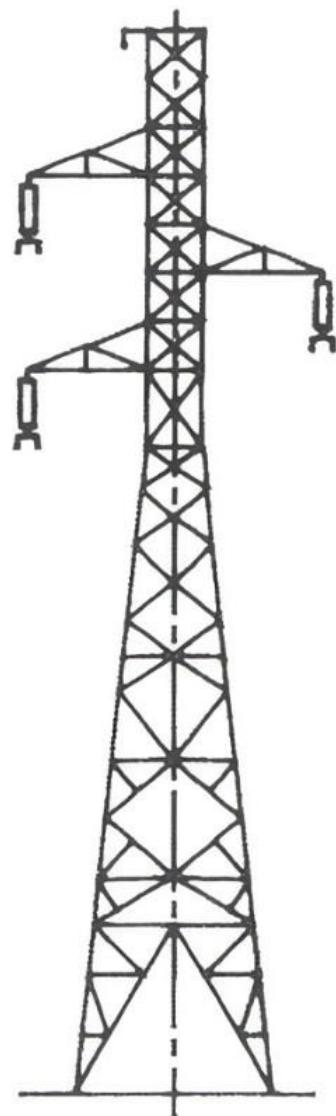
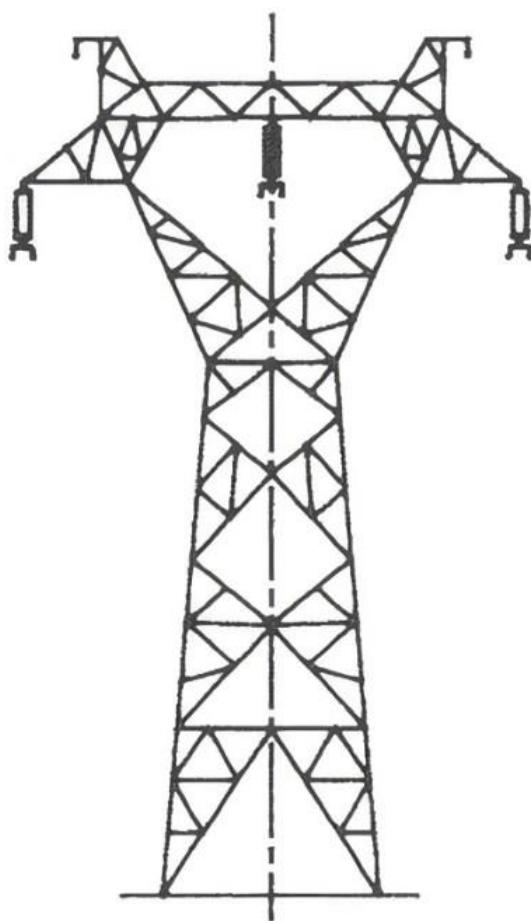
According to the International Commission for Non-Ionization Radiation Protection (ICNIRP), research evidence for EMF causing long-term, chronic, diseases such as cancer is not clear and therefore there are no guidelines based on this potential risk. The guidelines are based on short term, immediate health consequences such as stimulation of the peripheral nerves and muscles, and micro-shocks.

Only the higher voltage transmission lines at 400 kV would, under steady-state conditions, and directly beneath the lines, create a magnetic field maximum of 100 μ T (the ICNIRP reference value). However,

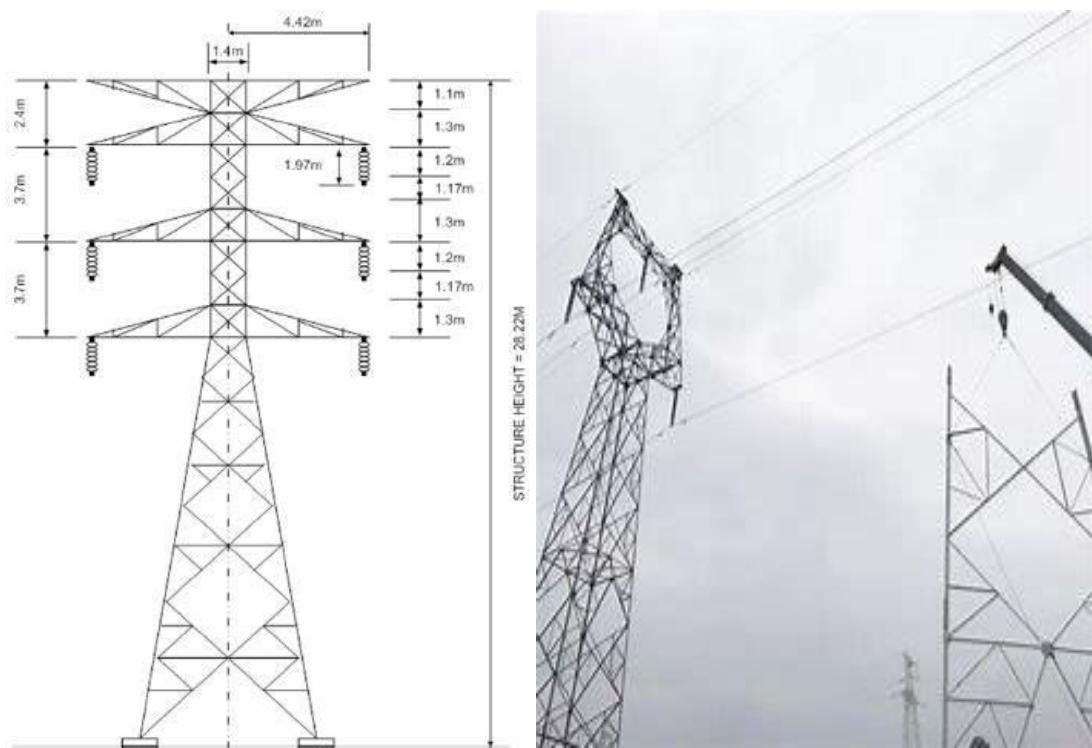
typical values are approximately a tenth of this field value. The same applies to electric field for 400 kV transmission lines, where maximum, steady-state, values could be above the reference value of 5 kV/m, but the typical values might only reach this. The magnetic and electric fields drop rapidly with distance from the centre lines of the power line.

In the light of the findings presented it is not expected that the proposed 330/400 kV Transmission line will have any adverse impacts on human health.

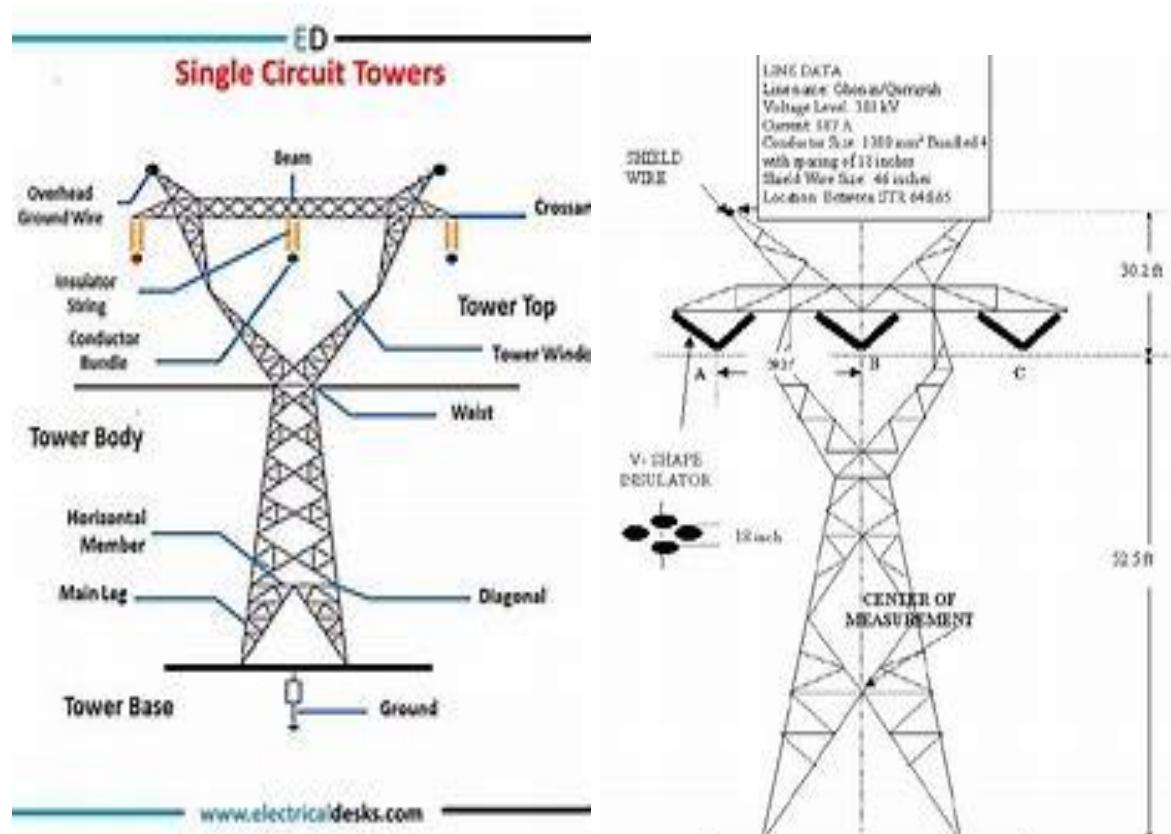
APPENDIX XII: PICTURES OF HIGH-TENSION TOWER CONFIGURATION TOWERS



Triangular configuration with two earth wires



Cat's Head Configuration Tower



Horizontal configuration towers

APPENDIX XIII: CULTURAL HERITAGE ASSESSMENT REPORT

400/330kV Côte d'Ivoire-Ghana Interconnection Reinforcement Project

Cultural Heritage Assessment Report

September, 2024

Abstract

This report presents the findings of a cultural heritage assessment conducted for the 330kV Côte d'Ivoire-Ghana Transmission Line reinforcement project. The project spans 125 kilometers across five districts in Ghana, including Upper Denkyira East, Wassa Amenfi East, Wassa Amenfi West, Wassa Amenfi Central, and Aowin Municipal Assembly, all under three traditional authorities. The assessment aimed to identify, document, and evaluate cultural heritage sites such as sacred groves, shrines, historical monuments, and archaeological sites within the 40-meter proposed Right-of-Way (RoW). Through a combination of desk-based research, field surveys, and community consultations, no significant cultural heritage sites, sacred groves, shrines, historical monuments, or community structures were identified within the RoW. However, potential archaeological sites were noted, particularly in Upper Denkyira East, though none were directly impacted by the proposed transmission line route. Mitigation measures recommended include route adjustments to avoid culturally significant sites, the establishment of buffer zones, continuous collaboration with local communities, archaeological monitoring during construction, and thorough documentation in case relocation of any heritage elements becomes necessary. The report concludes that the transmission line project poses no major threat to cultural heritage sites but emphasizes the importance of careful monitoring and adherence to mitigation strategies, especially in cases of "chance findings" during construction.

1. Introduction

The 330kV Côte d'Ivoire-Ghana Transmission Line reinforcement project is a key infrastructure initiative designed to enhance the power supply and distribution network between Ghana and Côte d'Ivoire. The proposed 125km transmission line route passes through five districts in Ghana, namely Upper Denkyira East, Wassa Amenfi East, Wassa Amenfi West, Wassa Amenfi Central, and Aowin Municipal Assembly. These Districts are controlled by three Traditional Authorities namely, Denkyira, Wassa Amenfi and Aowin Traditional Authorities. This report presents the findings of a cultural heritage assessment conducted along the transmission line route within 40m proposed Right-Of-Way, with a focus on identifying, documenting, and preserving cultural and historical assets that may be impacted by the project.

2. Objectives of the Assessment

- To identify and document all cultural heritage sites, including sacred groves, shrines, historical monuments, and archaeological sites, along the proposed transmission line route.
- To assess the potential impacts of the transmission line construction on the identified cultural heritage sites.
- To engage with local communities and stakeholders to understand the cultural significance of the sites and incorporate their views into the assessment.
- To recommend strategies and measures to mitigate any negative impacts on cultural heritage sites.
- To ensure that the project complies with national and international regulations regarding the conservation of cultural heritage.

3. Methodology

The cultural heritage assessment was conducted using a combination of desk-based research, field surveys, and community consultations. The assessment took place from 20th August to 8th September, 2024. The following steps were taken:

- **Literature Review:** A thorough review of existing records, including previous heritage assessments, historical documents, and archaeological surveys, was conducted to gather information on known heritage sites in the project area.
- **Field Surveys:** Field surveys were carried out along the transmission line route to identify and document cultural heritage sites.
- **Community Consultations:** Meetings were held with local chiefs, elders, and community members to gather insights into culturally significant sites and to understand the potential impact of the transmission line on these sites in 14 communities along the line route.
- **Impact Analysis:** The potential impacts of construction activities on cultural heritage sites were analyzed, taken into account the proximity of the sites to the transmission line RoW (20m ta each side of the central line) and the nature of the construction activities.

4. Findings

The cultural heritage assessment identified no significant sites along the proposed transmission line route, which are detailed as follows:

- **Sacred Groves:** No Sacred groves were identified along the route. These groves are revered by the local communities and are used for spiritual rituals and as burial sites but none was identified within the corridor.
- **Shrines:** Several shrines dedicated to local deities and ancestral spirits were mentioned but none was located within the proposed RoW. These shrines hold deep cultural significance and are actively used for religious ceremonies.
- **Historical Monuments:** The route did not contain any historical monuments nor remnants of colonial-era structures and war memorials, which are important to the local historical narrative.
- **Archaeological Sites:** Preliminary investigations suggest the presence of archaeological sites, particularly in Upper Denkyira East, where artifacts from pre-colonial civilizations may be found. However, none of them were located in the proximity of the proposed line route.
- **Community Structures:** No community structures, such as traditional meeting places and communal gathering spots, were also identified as culturally significant within the RoW.

5. Impact Assessment

The construction of the 330kV transmission line could have potentially impacted any identified cultural heritage sites in the following ways:

- **Physical Damage:** Construction activities, such as land clearing, excavation, and the erection of pylons, could result in physical damage to sacred groves, shrines, and historical monuments.
- **Disturbance of Sacred Sites:** Construction noise, dust, and increased human activity could disturb sacred sites, potentially leading to conflicts with local communities and disruption of traditional practices.
- **Loss of Archaeological Artifacts:** There is a risk that construction could have disturbed or destroyed archaeological sites, leading to the loss of valuable cultural artifacts.
- **Alteration of Cultural Landscapes:** The visual and physical intrusion of the transmission line could alter the cultural landscape, affecting the integrity of sites that are valued for their undisturbed natural settings.

6. Recommendations

To mitigate the potential impacts on cultural heritage sites that would be 'Chance find', the following measures are recommended:

- **Route Adjustment:** Where feasible, the transmission line route should be adjusted to avoid significant cultural heritage sites, particularly sacred groves and shrines.
- **Establish Buffer Zones:** Buffer zones should be established around identified cultural heritage sites

to protect them from direct construction activities. These zones should be clearly marked and respected by all construction personnel.

- *Community Collaboration:* Ongoing collaboration with local communities is essential to ensure that their concerns are addressed and that cultural heritage sites are protected. Regular consultations should be held throughout the project lifecycle.
- *Archaeological Monitoring:* Archaeologists should be present during construction activities in areas where archaeological sites would be 'chance find' to monitor and document any such findings. This will help in preserving cultural artifacts.
- *Documentation and Relocation:* If avoidance is not possible, thorough documentation of the cultural heritage sites should be conducted. In some cases, it may be necessary to relocate certain cultural elements, such as shrines, with the consent of the local community.
- *Training and Awareness:* Construction workers should be trained on the importance of cultural heritage preservation and made aware of the significance of the sites they may encounter.
- *Management of any "Chance Findings" during Construction:* If there are any accidental or "chance findings" during the project implementation the contractor shall immediately inform the project developer which in this case is the GRIDCo.

7. Conclusion

The cultural heritage assessment along the 125km route of the 330kV Côte d'Ivoire-Ghana Transmission Line has not identified any culturally significant sites that may be affected by the project.

APPENDIX XIV: CODE OF CONDUCT FOR WORKERS

CODE OF CONDUCT FOR WORKERS

This Code of Conduct outlines the standards of behavior and professional conduct expected of all employees. By signing this document, you agree to abide by these guidelines while employed by the company or project.

1. Respect for Others

- All employees must treat colleagues, supervisors, clients, and community members with respect, dignity, and fairness.
- Discrimination or harassment of any kind, including on the basis of gender, race, ethnicity, religion, age, disability, or sexual orientation, is strictly prohibited.
- Bullying, intimidation, or any form of abusive behavior will not be tolerated.

2. Integrity and Honesty

- Employees are expected to act with honesty, integrity, and transparency in all professional dealings.
- Fraud, theft, or any dishonest behavior will lead to disciplinary actions, including potential termination.
- All company assets, information, and resources must be used responsibly and for work-related purposes only.

3. Health, Safety, and Environmental Responsibility

- Every employee is responsible for maintaining a safe and healthy workplace by following safety regulations, wearing appropriate protective gear, and reporting any hazards or incidents.
- Employees must adhere to environmental policies and procedures aimed at reducing environmental impacts and promoting sustainability.
- Misconduct or negligence that results in harm to the environment or workplace safety will lead to disciplinary measures.

4. Anti-Corruption and Anti-Bribery

- Employees must not engage in any form of bribery or corrupt practices.
- All employees must reject and report any requests or offers for bribes or other corrupt behavior, whether by colleagues, contractors, or external partners.

5. Gender Equality and Non-Discrimination

- The company is committed to promoting gender equality and ensuring an inclusive workplace for all.
- Any form of gender-based violence, harassment, or unequal treatment will not be tolerated.
- Employees must contribute to a gender-sensitive working environment by treating all individuals fairly, regardless of their gender or background.

6. Conflict of Interest

- Employees must avoid situations where personal interests could conflict, or appear to conflict, with their professional responsibilities.
- Any potential conflict of interest must be disclosed immediately to a supervisor.

7. Confidentiality

- Employees must maintain the confidentiality of any proprietary or sensitive information related to the company, clients, or colleagues.
- Sharing or misusing confidential information for personal or external gain is strictly prohibited.

8. Attendance and Punctuality

- Employees are expected to be punctual and maintain regular attendance as scheduled.
- Unjustified absences or consistent tardiness will lead to disciplinary actions.

9. Substance Abuse

- The use, possession, or distribution of illegal substances on company premises or while conducting business is strictly prohibited.
- Employees must not be under the influence of alcohol or drugs while at work.

10. Grievance Redressal and Reporting

- Employees are encouraged to report any breaches of this Code of Conduct, unethical behavior, or concerns regarding workplace conduct to their supervisor or through the designated grievance mechanism.
- The company will ensure that reports are handled confidentially and that no retaliation occurs against those who report in good faith.

11. Compliance with Laws and Regulations

- All employees must comply with applicable local, national, and international laws and regulations.
- Failure to adhere to legal requirements may result in termination and legal consequences.

Declaration

I, the undersigned, acknowledge that I have read and understood the above Code of Conduct. I agree to comply with these guidelines and understand that failure to adhere to them may result in disciplinary actions, including termination of employment.

Name: _____

Position: _____

Signature: _____

Date: _____

APPENDIX XV: CULTURAL HERITAGE CHANCE FINDS PROCEDURES

CULTURAL HERITAGE CHANCE FINDS PROCEDURES

A chance finds procedure is a project-specific procedure which will be followed if previously unknown cultural heritage is encountered during project activities. It will be included in all contracts relating to construction of the project, including excavations, demolition, movement of earth, flooding, or other changes in the physical environment. The chance finds procedure sets out how chance finds associated with the project should be managed. The procedure includes a requirement to notify relevant authorities of found objects or sites by cultural heritage experts; to fence-off the area of finds or sites to avoid further disturbance; to conduct an assessment of found objects or sites by cultural heritage experts; to identify and implement actions consistent with the requirements of this ESS and national law; and to train project personnel and project workers on chance find procedures.

Steps to be taken during construction upon identification and/or exposure

During construction, through accidental exposure, cultural heritage may be identified. As soon as this occurs, the Contractor will carry out the procedure below to avoid any further damage:

1. Stop the construction activities in the area of the chance find

Where a suspected Chance Find is identified work must stop at the affected site and the Contractor's HSE Manager must be informed immediately that this is the case. Work may continue on other sites not affected by the find.

2. Delineate the discovered site or area

The area in which the artifact has been discovered will be marked out to protect the area and prevent accidental disturbance from site activity.

3. Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities or the National Museum takes over;

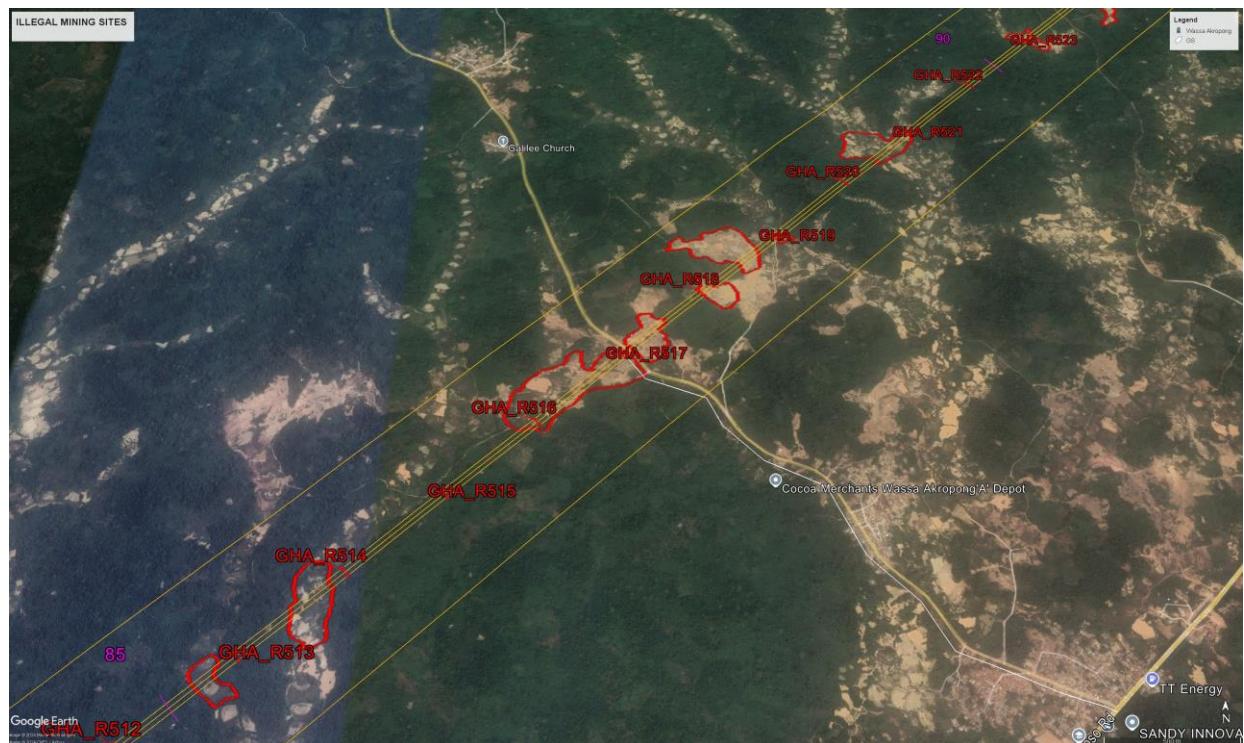
The Contractor's HSE Manager will instruct the security provider to post a guard at the site to ensure that the site is protected until the site can be handed over.

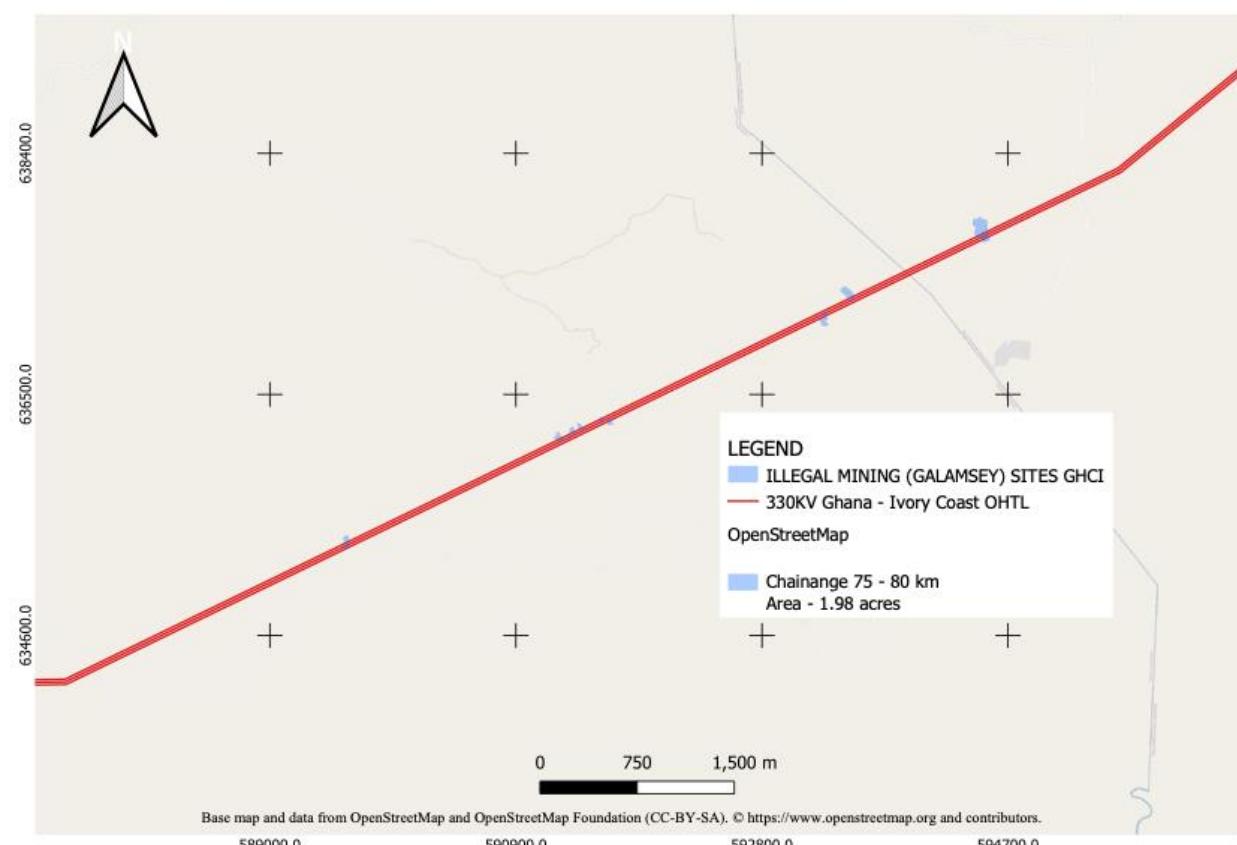
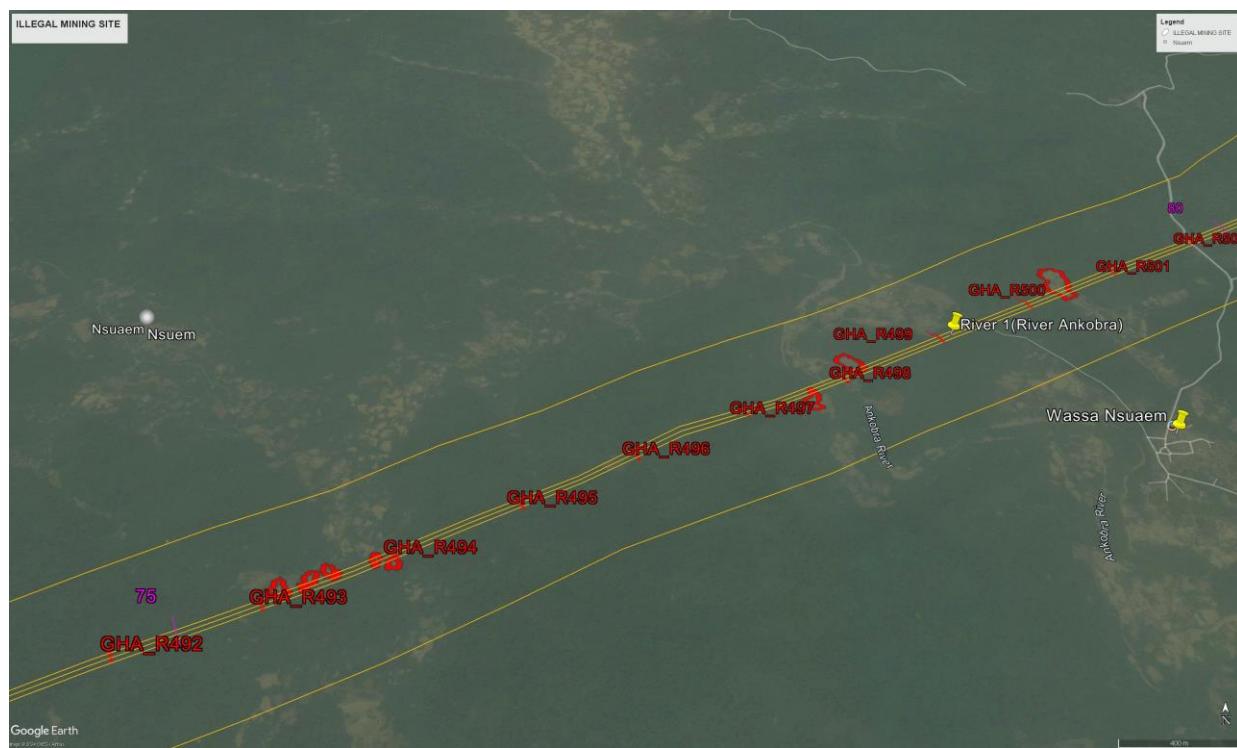
4. Notify the Construction Supervision Consultant who in turn will notify responsible local or national authorities in charge of the Cultural Property (within 24 hours or less)

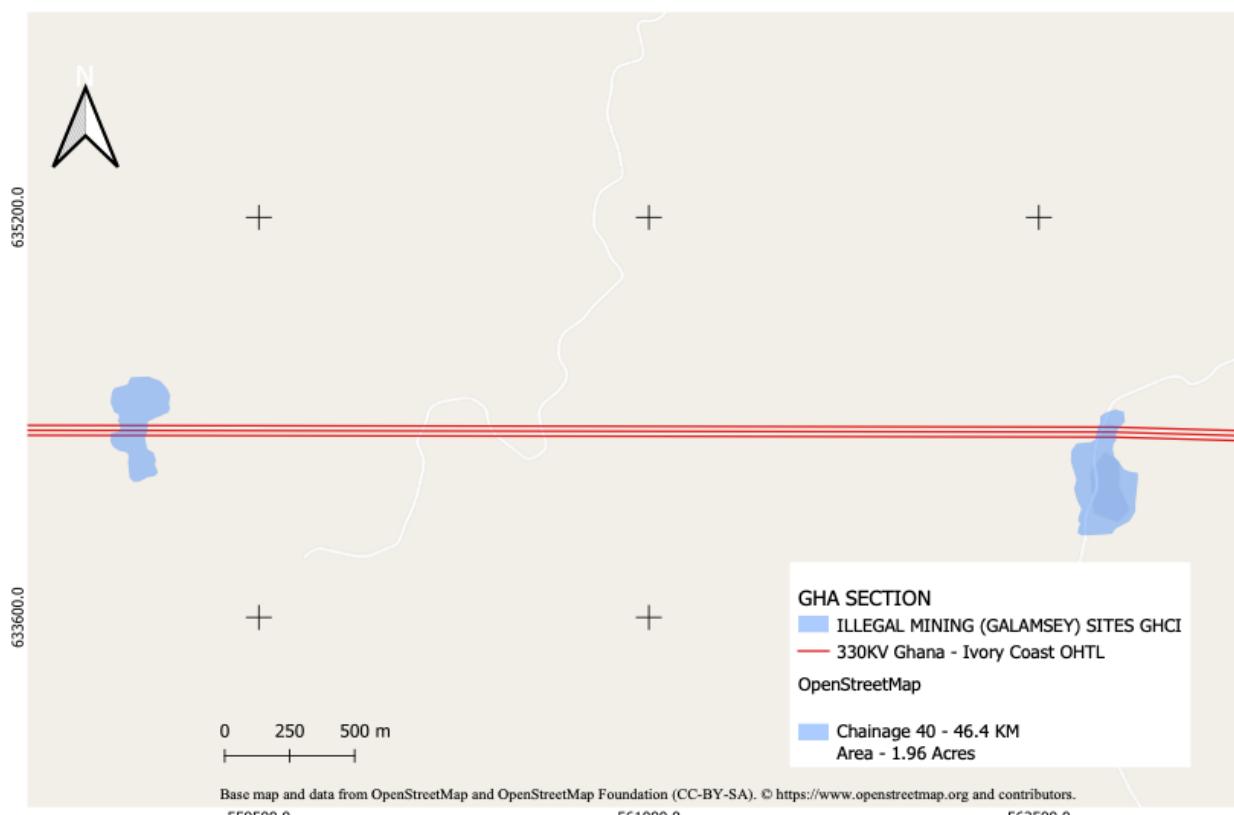
The Contractor's HSE Manager will notify the Client's Engineer of the potential find as soon as possible and within 4 hours of works stopping.

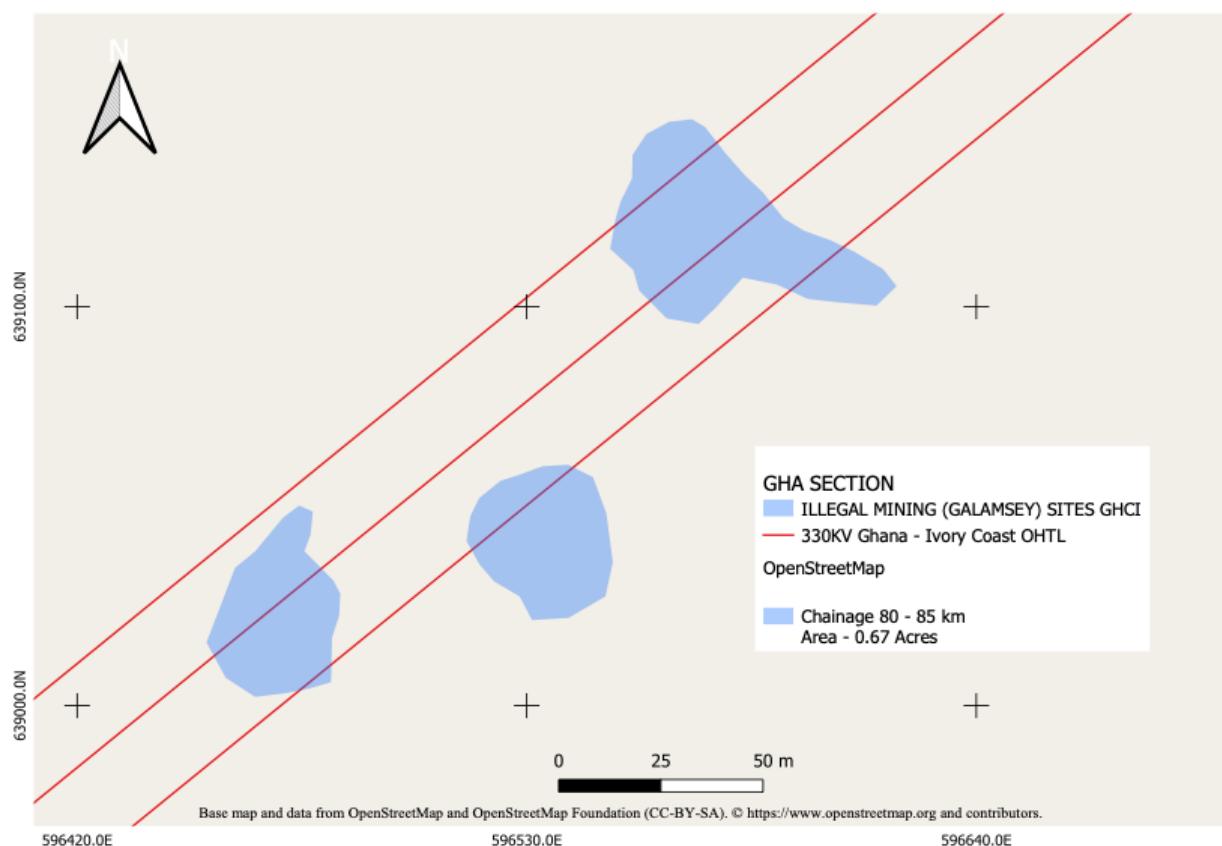
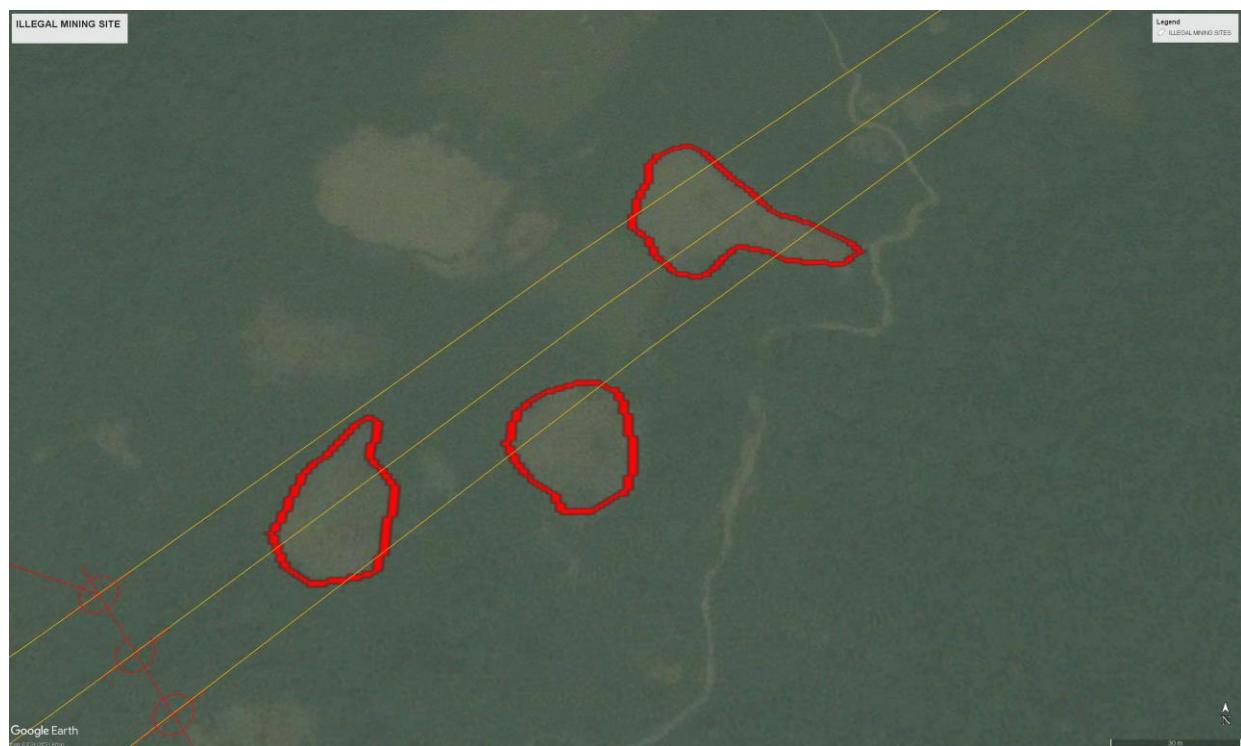
The Client's Engineer will be responsible for reporting the potential find to GRIDCo and the Ghana Museums and Monuments Board to determine the next steps. This must be achieved within 24 hours.

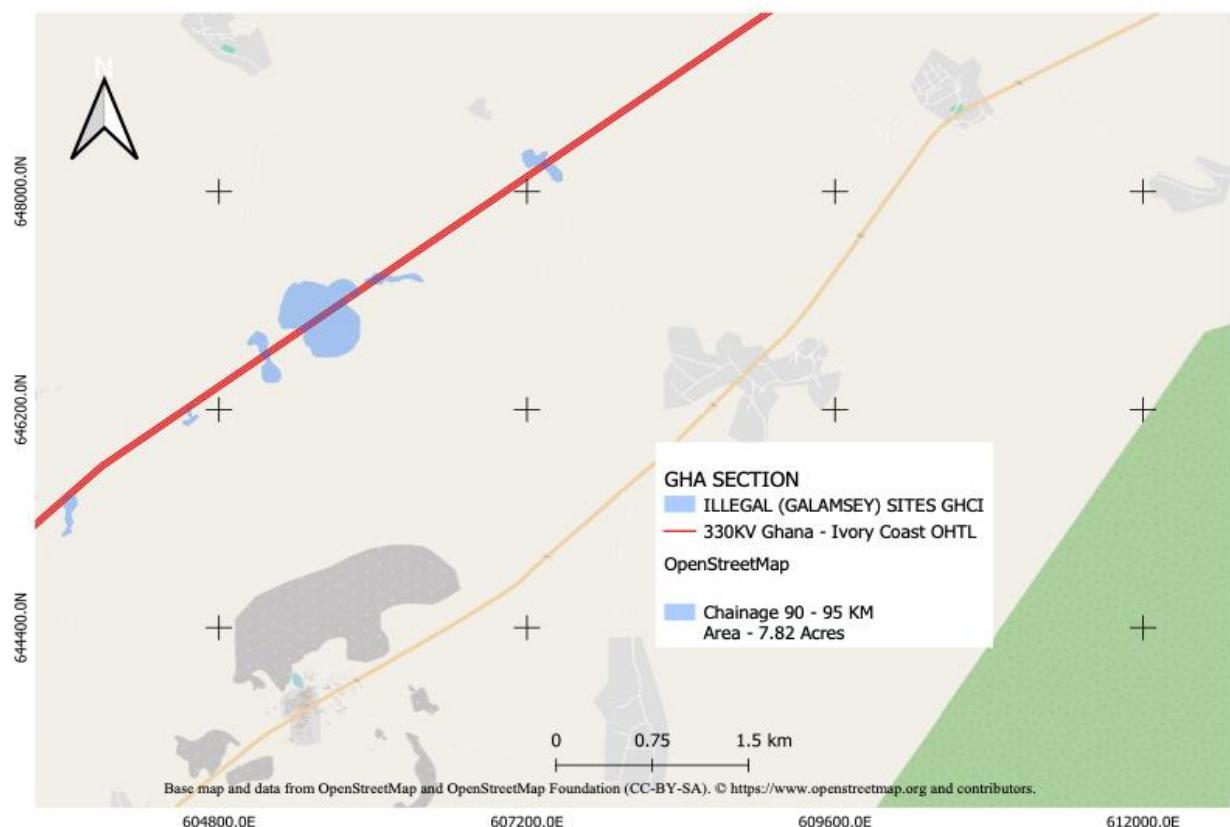
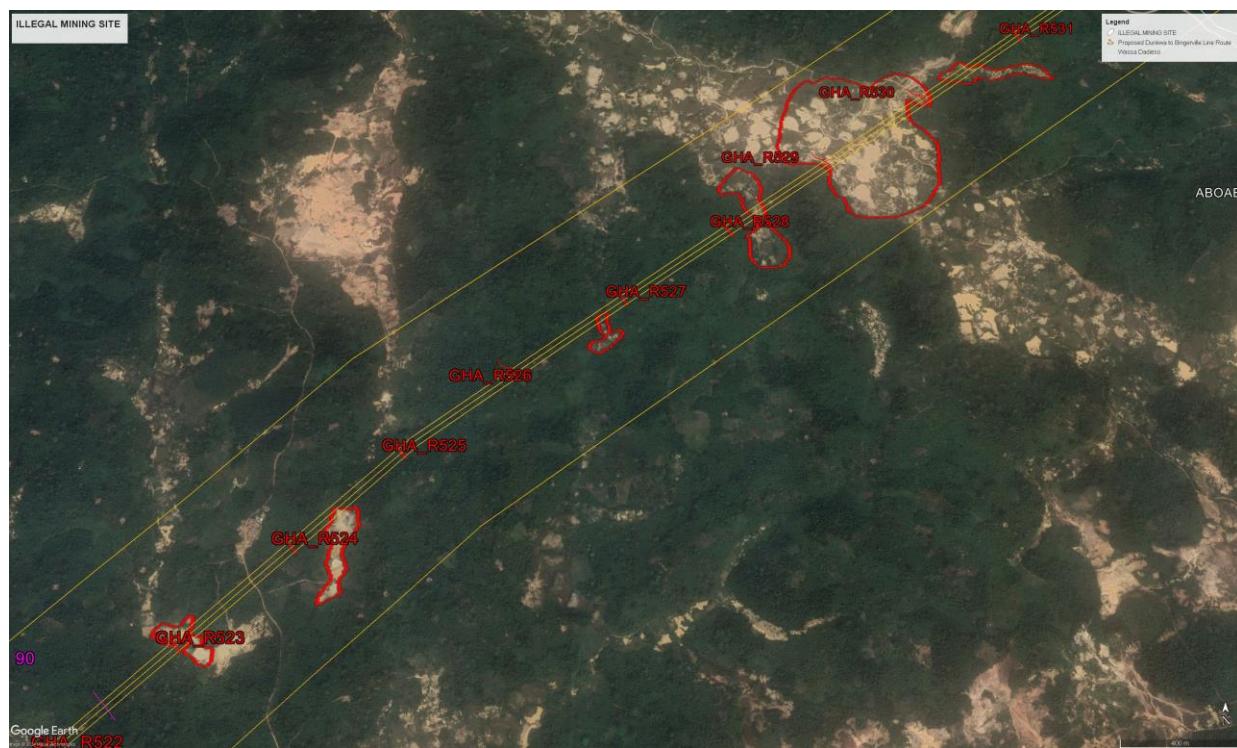
APPENDIX XVI: MAPS OF GALAMSEY SITES WITHIN THE ROUTE

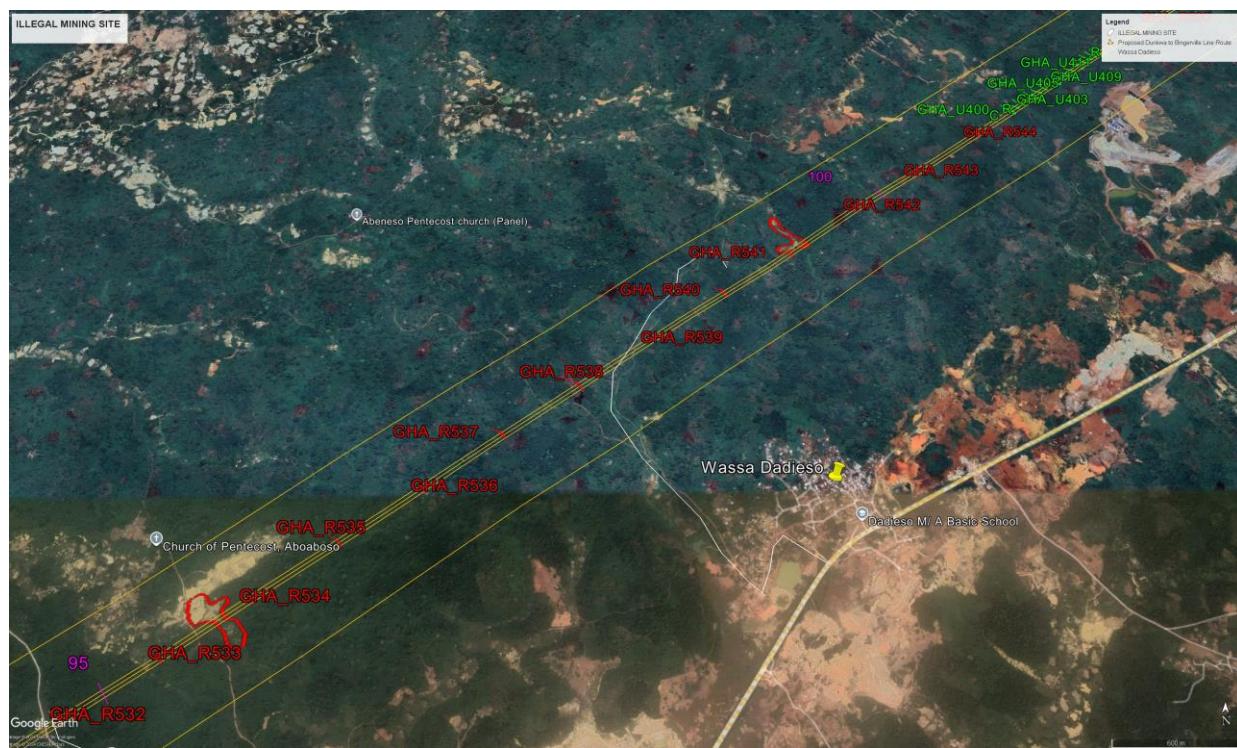


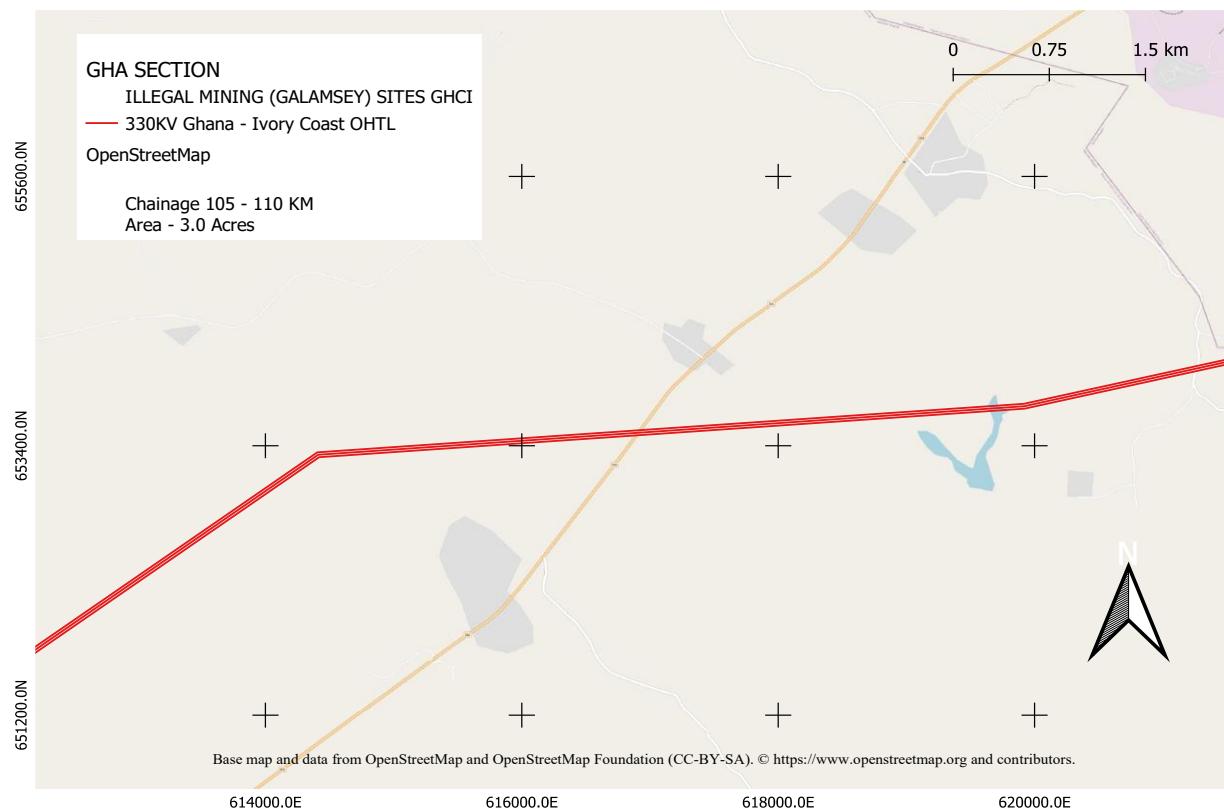
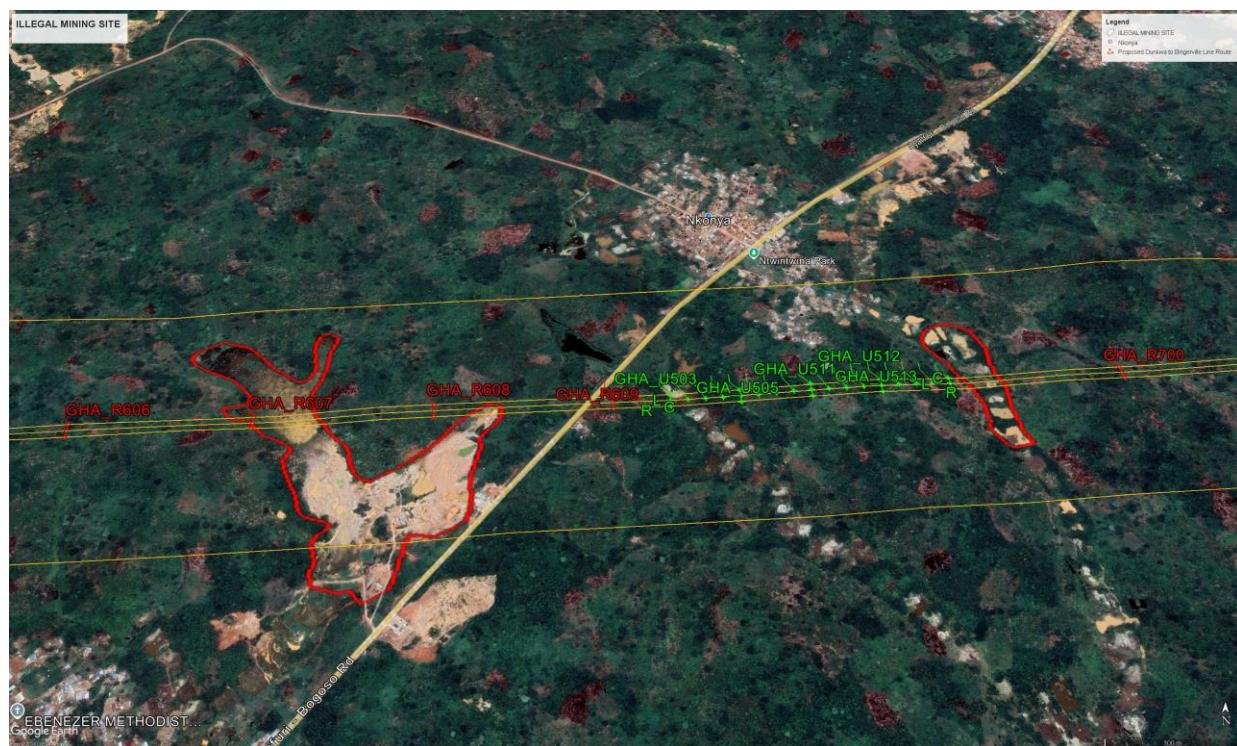












APPENDIX XVII: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

**400/330 KV CÔTE D'IVOIRE – GHANA INTERCONNECTION
REINFORCEMENT PROJECT**

**ENVIRONMENTAL AND SOCIAL
MANAGEMENT PLAN**

January, 2026

EXECUTIVE SUMMARY

INTRODUCTION

Ghana Grid Company (GRIDCo) will carry out the construction and operation of the Ghana section of the high voltage interconnection line from Bibianiha (SW of Dunkwa-on-Ofin) in the Central Region of Ghana to the capital of Côte d'Ivoire with associated high voltage substations at Akoupé Zeudji (NW Abidjan) and Bibianiha in Ghana.

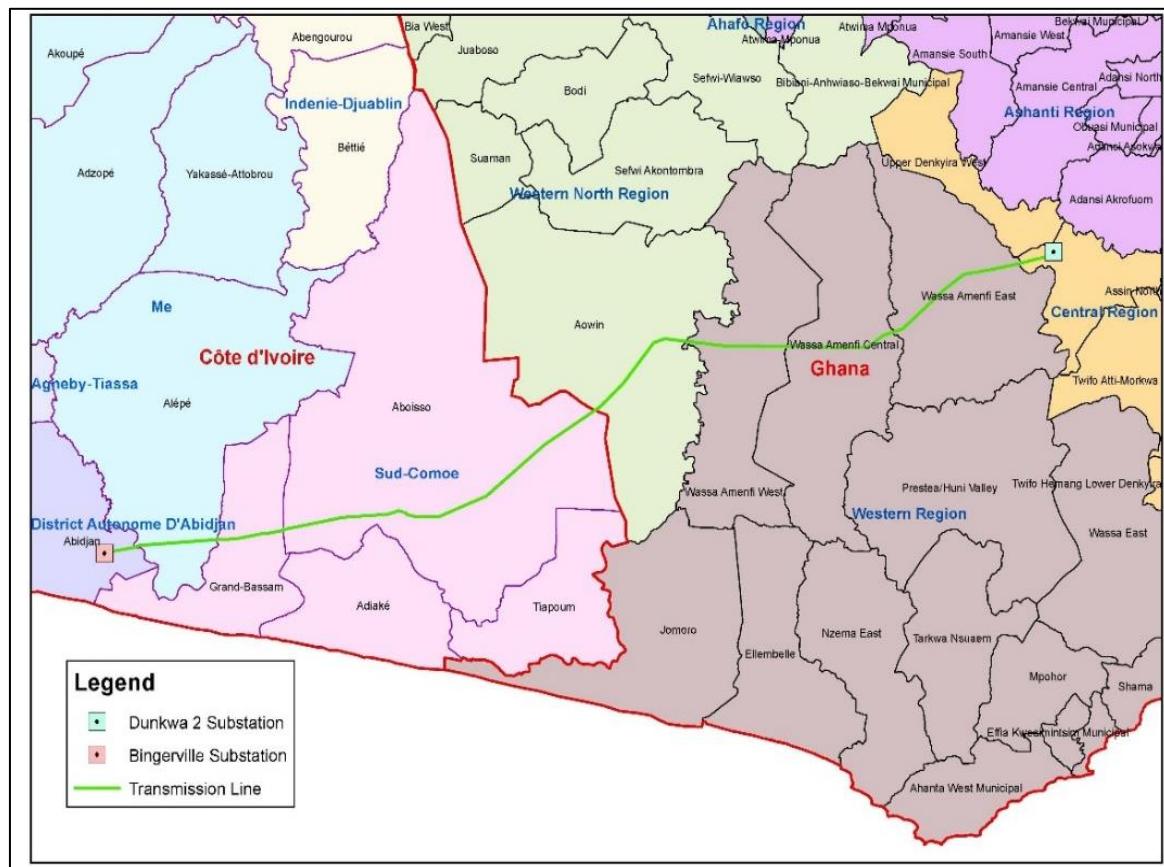
The Environmental and Social Management Plan has been prepared in accordance with the National Standards, and the best international practices and requirements of the project developer.

The aim of this Environmental and Social Management Plan (ESMP) is therefore to provide guidelines to the Project Owner to ensure that the measures identified in the ESIA are implemented during the different phases of the interconnection project.

This ESMP therefore provides a summary of activities, their related potential impacts and the recommended mitigations or offsets to be carried out during the pre-construction, construction, operational and maintenance phases of the project. It details out remedial and mitigation measures to be continuously carried out to prevent, minimize or offset impacts on the physical, biological and socioeconomic/socio-cultural environments as well as to promote occupational safety and health of employees. It also seeks to identify the various institutional responsibilities to manage the environmental aspects of the project as well as the cost involved

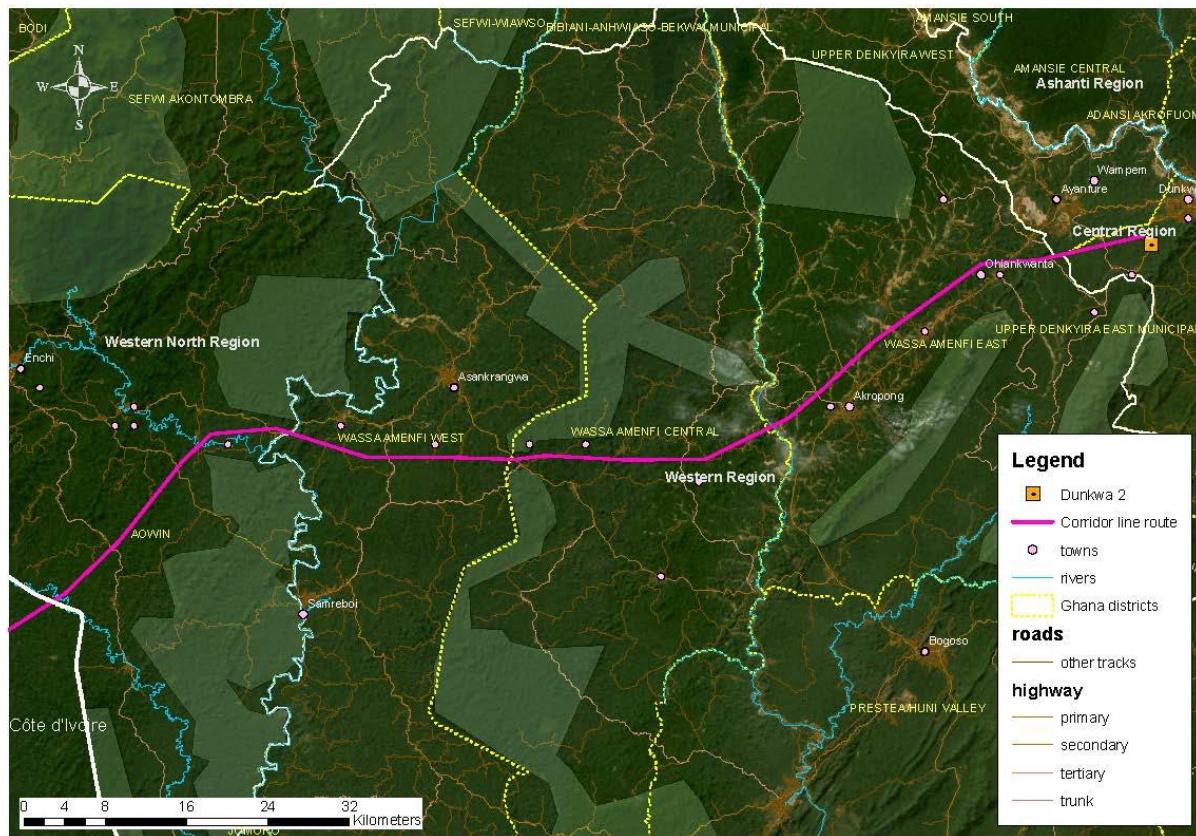
PROJECT DESCRIPTION AND LOCATION

The proposed transmission line project, spanning across Ghana and Côte d'Ivoire, focuses on constructing and operating a high-tension transmission line within Ghana.



Administrative map of the Ivory Coast-Ghana sections of the Transmission Line

The transmission line will stretch approximately 125 km, (from Bibianiha near Dunkwa-on-Offin to Omanpe -Ghana Ivory Coast border) crossing five districts within three regions of Ghana. These districts include Upper Denkyira East in the Central Region, Wassa Amenfi Central, Wassa Amenfi West, and Wassa Amenfi East in the Western Region, and Aowin Municipal in the Western North Region. The project also involves the development of the Dunkwa II Substation, strategically located near Dunkwa-on-Offin.



corridor location in Ghana and amministrative borders

The Bibianiha – Omanpe transmission corridor will have a “transmission line Right of Way” covering the area extending over a distance of twenty metres on either side from the axis of the transmission line . This project is considered as a ‘linear’ project. A 40-meter Right-of-Way (RoW) will be acquired for the project, requiring approximately 500 hectares of land. The acquisition will be managed by GRIDCo in collaboration with the Lands Commission, ensuring that affected properties are compensated. The construction phase will involve activities such as geotechnical investigations, tower spotting, assembling and the erection of 320 pylons across the designated regions. The project is expected to employ about 150 persons, working in various segments of the transmission line at the same time.

REGULATORY CONTEXT

Environmental Protection Agency (EPA) as the primary regulatory body in Ghana, responsible for enforcing environmental protection laws and ensuring compliance with Environmental Assessment (EA) protocols.

The project will be implemented in line with national legislations, including the Constitution of the Republic of Ghana (1992), which protects private property rights and ensures fair compensation in cases of compulsory land acquisition for public welfare. It also meets the requirements of specific laws related to energy, land use and acquisition, labor, social and environmental protection, such as Environmental Assessment Regulations, 1999 (Li 1652) and the Energy Commission Act 1997 (Act 541). It will also meet

the requirements of the Environmental and Social Framework (2018); and the Environmental and Social Standards (ESS 1-10).

KEY IMPACTS AND MITIGATION MEASURES

The management plan of the mitigation measures identifies feasible and cost-effective measures that may reduce potentially significant adverse environmental impacts to acceptable levels. The plan includes compensatory measures if mitigation measures are not feasible, cost-effective, or sufficient.

The environmental and social impacts of the project on natural resources, human beings and the ecosystems are identified through the direct survey and the information collected through the consultations.

Methods applied to the impact identification and the criteria used in evaluating the levels of impacts

The impacts analysis is focused on both positive and negative impacts and in order to state whether the impacts are positive or negative, direct or indirect, short term or long term, reversible or irreversible. The assessment focuses on the potential for negative environmental and social impacts caused by clearing of lands, increased pressure on fuel wood and water resources, social disruptions and conflicts, threats to woodlands and wildlife species composition and habitats and others.

On the basis of the Terms of Reference, the potential impacts determined by the proposed project have been divided in five different categories based on the type and the chronology of the event:

- Construction stage;
- Operation phase;
- Environmental management plans;
- Resettlement stage; and
- Livelihood restoration stage.

The assessment of the impacts are listed and described in detail taking into consideration the national and international environmental standards, legislation, treaties, and conventions that may affect the significance of the identified impacts.

Four factors will be considered when assessing the significance of all the social impacts such as the relationship of the impact to temporal scales (relating to measured time), the relationship of the impact to spatial scales (relating to space), the severity/beneficial scale (state or extent of badness or benefit), and the likelihood (degree of probability) of the impact occurring.

Significance matrix of the impacts based on likelihood and effect

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
		1	4	5	6	7	8	9	10	11	12	13
	2	5	6	7	8	9	10	11	12	13	14	15
	3	6	7	8	9	10	11	12	13	14	15	16
	4	7	8	9	10	11	12	13	14	15	16	17

Each criterion is ranked with scores assigned with the support of a ranking table to determine the overall significance of an activity.

CUMULATIVE IMPACT ASSESSMENT

One of the biggest risk management challenges currently facing project developers is the appropriate assessment and management of cumulative impacts and risks.

Factors such as climate change and unpredictability of climate patterns, decline of species biodiversity, degradation of ecosystem services, and changing socio-economic circumstances all add complexity to risk assessment and management. Potential system-wide consequences resulting from the combination of individual effects of multiple actions overtime are particularly important.

The cumulative impacts are impacts resulting from incremental changes caused by other past, present, or reasonably foreseeable actions together with the project. Sometimes the total effect is larger than the sum of individual impacts because each project, as well as each impact, can interact with the others.

This shall involve identifying and analyzing the cumulative impacts in Ghana and planning measures to mitigate them. Indeed, with the regular and continuous supply of electricity to industries, electrification of communities and towns in the rural areas along the power line and around the substations, there shall be potential for new development in the areas which shall put pressure on the availability of material resources for construction, water supply, sanitation, solid waste management, housing and agricultural development, biodiversity, etc. In Ghana, it is important to also consider housing and agricultural development, urbanization and road development. There may also be other development activities, such as mineral resource extraction projects, municipal infrastructure development, etc. that are already underway and would contribute to cumulative impacts

PROPONENT E&S MANAGEMENT PLANS

The Proponent's ESMP describes the environmental and social mitigation programme which the Proponent is responsible for implementing during the construction and operation phase. It consists of several subplans, which will be implemented by the Environmental and Social Management Unit, or be outsourced to service providers, e.g. nongovernmental organisations (NGOs).

Resettlement Action Plan (RAP)

The Project is expected to cause economic displacement or compensation in a minor magnitude and based on the detailed project design combined with a census and asset inventory. A Resettlement Action Plan (RAP) has been prepared to be implemented prior to the start of the construction works. The planning and implementation of the RAP shall be guided by the ESS5 of the WB Environmental and Social Framework (2017), "Land Acquisition, Restrictions on Land Use and Involuntary Resettlement", and ESS1 "Assessment and Management of Environmental and Social Risks and Impacts", and the most common international standards. The RAP has been prepared in a separate and standalone volume of the ESIA study.

Stakeholder Engagement Plan (SEP)

The Stakeholder Engagement Plan is developed as a result of the need to comply mainly with the Environment Management (EIA Process) Regulations (2007), the Agricultural Landlord and Tenant Act (ALTA), and the State Acquisition of Lands Act (SALA). International standards will be guided by the WB Environmental and Social Framework (2017), in particular the ESS10 "Stakeholder Engagement and Information Disclosure".

This plan presents the proposed public consultation and stakeholder engagement strategy for the transmission line Project. It outlines the processes and procedures to be used during the execution of the proposed project to ensure that all stakeholders are meaningfully involved and informed about the project activities, stakeholder opinions are received, incorporated and feedback is given promptly.

All site visits by the Consultant shall have representations from the national utilities. However, it is the responsibility of the Consultant to ensure that all civil society, potential affected peoples and grassroots stakeholders are included in the process. These consultations shall include presentation and guidance for stakeholders on the use of an agreed grievance mechanism.

Labour Management Procedures (LMP)

The LMP will develop and implement written labor management procedures applicable to the project. The procedures will set out the way in which project workers will be managed, in accordance with the requirements of the national law and ESS2. Relations between workers and managers are promoted with the aim of fostering project development by treating workers fairly and providing safe and healthy working conditions.

Environmental And Social Commitment Plans (ESCP)

The ESCP will describe the key measures and actions necessary for the project to comply with the requirements set out in the Environmental and Social Standards (ESS) of the World Bank's Environmental and Social Framework (ESF). The document will outline the organizational structure to be established for the implementation of the agreed actions.

Cultural Heritage Management Plans (CHMP)

The CHMP will identify all cultural heritage likely to be affected by the project and define procedures to avoid or mitigate likely impacts on such cultural heritage, in accordance with the requirements of national laws and ESS8.

Biodiversity Management Plans (BMP)

The Biodiversity management plans meet the World Bank ESF ESS6 and international best practice for biodiversity conservation.

Environmental And Social Management Frameworks (ESMFs)

An Environmental and Social Management Framework (ESMF) provides an initial assessment of the environmental and social risks, issues and impacts of local electrification and will establish a dialogue between environmental and social experts and technical experts to optimize the design. This includes avoiding negative impacts as much as possible by ensuring that the technical variants studied integrate environmental and social concerns.

Resettlement Policy Framework (RPF)

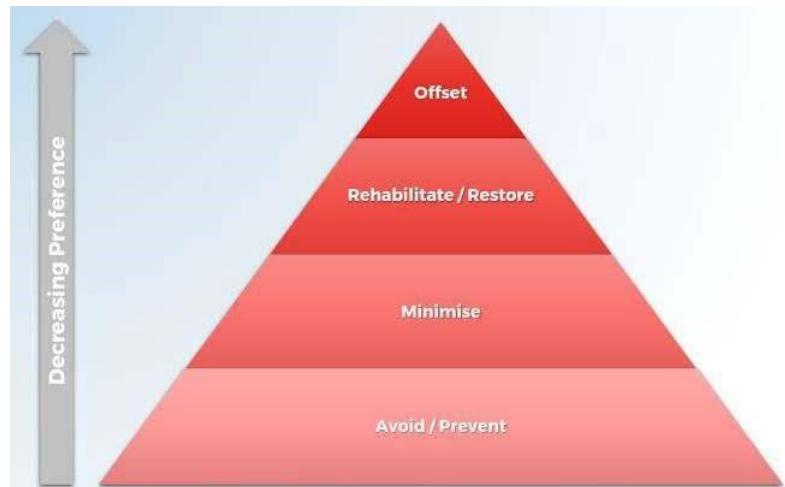
A Resettlement Policy Framework provide an initial assessment of the risks associated with involuntary resettlement, the main measures to be implemented, and the procedures to be followed to conduct due diligence on involuntary resettlement in the future.

ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

The Environmental Management and Monitoring Plan (EMMP) is a comprehensive document outlining the measures to be implemented to protect the environment during and after the construction of a power transmission line project. The EMMP specifies the parameters to be monitored, the frequency of measurements, the sampling and analysis methods, and the responsibilities of different parties involved. It also includes plans for record keeping, security, and audits to ensure compliance with environmental and social standards.

The EMMP will be included in the bidding documents for the construction company, guiding them in organizing the implementation of environmental and social measures. The plan will also address the acquisition of right-of-way for the project, taking into consideration environmental and social factors.

The EMMP includes a mitigation hierarchy that prioritizes avoiding and minimizing impacts on biodiversity and people. It identifies potential impacts and outlines measures to prevent, mitigate, or compensate for them. The plan also addresses the construction stage, operation phase, environmental management plans, resettlement stage, and livelihood restoration stage.



Impact Assessment Mitigation Hierarchy

The EMMP is a crucial tool for ensuring that the construction of the power transmission line project is carried out in a sustainable and responsible manner, protecting the environment and the rights of local communities.

MITIGATION MEASURES AND MONITORING MATRIX

The ESMP (Environmental and Social Management Plan) is a comprehensive plan designed to mitigate and monitor potential adverse environmental and social impacts of a project.

Mitigation:

- Identifies and summarizes potential negative environmental and social impacts.
- Describes mitigation measures to reduce these impacts.
- Estimates the potential environmental impacts of these measures.
- Links to other mitigation plans (e.g., for resettlement, indigenous peoples, or cultural property).

Monitoring:

- Provides information on key environmental and social aspects of the project.
- Evaluates the effectiveness of mitigation measures.
- Identifies monitoring objectives and specifies the type of monitoring.
- Links to the impacts assessed in the ESIA report and mitigation measures described in the ESMP.

Monitoring during Project Phases

1. Construction Phase:

- Construction site audits to ensure ESMP requirements are implemented.
- Monitoring of impacts like construction camp, solid waste, emissions, dust, noise, vegetation clearing, health, fire hazard, and influx of people.

1. Operation Phase:

- Multidisciplinary monitoring program involving various organizations.
- Monitoring of transmission lines, transports, bird electrocution, and other potential impacts.

2. Environmental Management Phase:

- Monitoring of land use patterns, soil degradation, landscape impacts, forest encroachment, fire hazard, vegetation, terrestrial fauna, and resettlement.

3. Resettlement Monitoring and Compensation Payments:

- Monitoring to ensure effective implementation of compensation and resettlement activities.
- Reviews project progress before and after land survey and construction.
- Independent audits to assess the adequacy of compensation payments and resettlement effectiveness.

Overall, the ESMP aims to ensure that the project is implemented in a way that minimizes negative environmental and social impacts while effectively managing and mitigating any unavoidable effects.

CAPACITY DEVELOPMENT AND TRAINING

The ESMP outlines a comprehensive plan to strengthen local institutions and ensure the effective implementation of resettlement and development initiatives.

The plan focuses on building capacity in human resources (staffing and training) and physical and logistical resources. It will recruit limited staff due to the project's scale and prioritize livelihood and extension development staff for the Resettlement Working Group (RWG). The project will also provide equipment and improve mobility.

Training is a key component, aiming to improve planning processes, resettlement management, and service delivery. The ESMP describes training phases and budgets for different units. The RWG will play a key role, and training will focus on understanding resettlement policies, developing the RAP, organizing resettlement activities, and managing tasks and funds.

Strengthening institutional capacity at the district level is essential for successful resettlement implementation. The ESMP addresses this need through a comprehensive capacity development and training plan tailored to the specific needs of local institutions.

COSTS AND BUDGET

A detailed budget of US\$ 425,000 USD has been estimated for environmental management planning and which includes monitoring, training, and unforeseen expenses, to ensure comprehensive management and response capabilities. The costs related to the RAP are calculated apart in the Resettlement Action Plan Report.

RÉSUMÉ EXÉCUTIF

INTRODUCTION

Ghana Grid Company (GRIDCo) assurera la construction et l'exploitation du tronçon ghanéen de la ligne d'interconnexion haute tension reliant Bibianiha (au sud-ouest de Dunkwa-on-Ofin), dans la région centrale du Ghana, à la capitale de la Côte d'Ivoire, avec les sous-stations haute tension associées à Akoupé Zeudji (au nord-ouest d'Abidjan) et à Bibianiha, au Ghana.

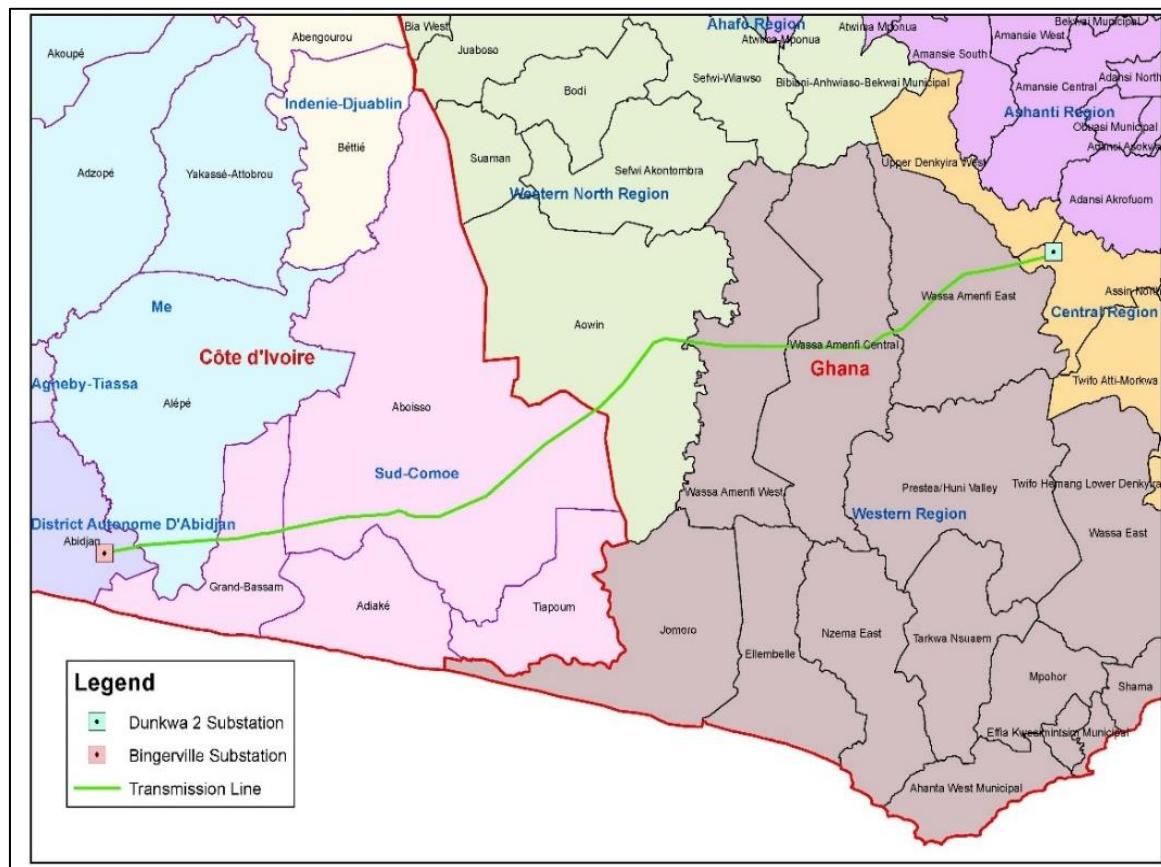
Le plan de gestion environnementale et sociale a été préparé conformément aux normes nationales, aux meilleures pratiques internationales et aux exigences du promoteur du projet.

L'objectif de ce Plan de Gestion Environnementale et Sociale (PGES) est donc de fournir des lignes directrices au Maître d'Ouvrage pour s'assurer que les mesures identifiées dans l'EIES sont mises en œuvre au cours des différentes phases du projet d'interconnexion.

Ce PGES fournit donc un résumé des activités, de leurs impacts potentiels et des mesures d'atténuation ou de compensation recommandées pour les phases de pré-construction, de construction, d'exploitation et de maintenance du projet. Il détaille les mesures correctives et d'atténuation à mettre en œuvre en permanence pour prévenir, minimiser ou compenser les impacts sur les environnements physique, biologique et socio-économique/socio-culturel, ainsi que pour promouvoir la sécurité et la santé des employés. Elle cherche également à identifier les différentes responsabilités institutionnelles pour gérer les aspects environnementaux du projet, ainsi que les coûts associés.

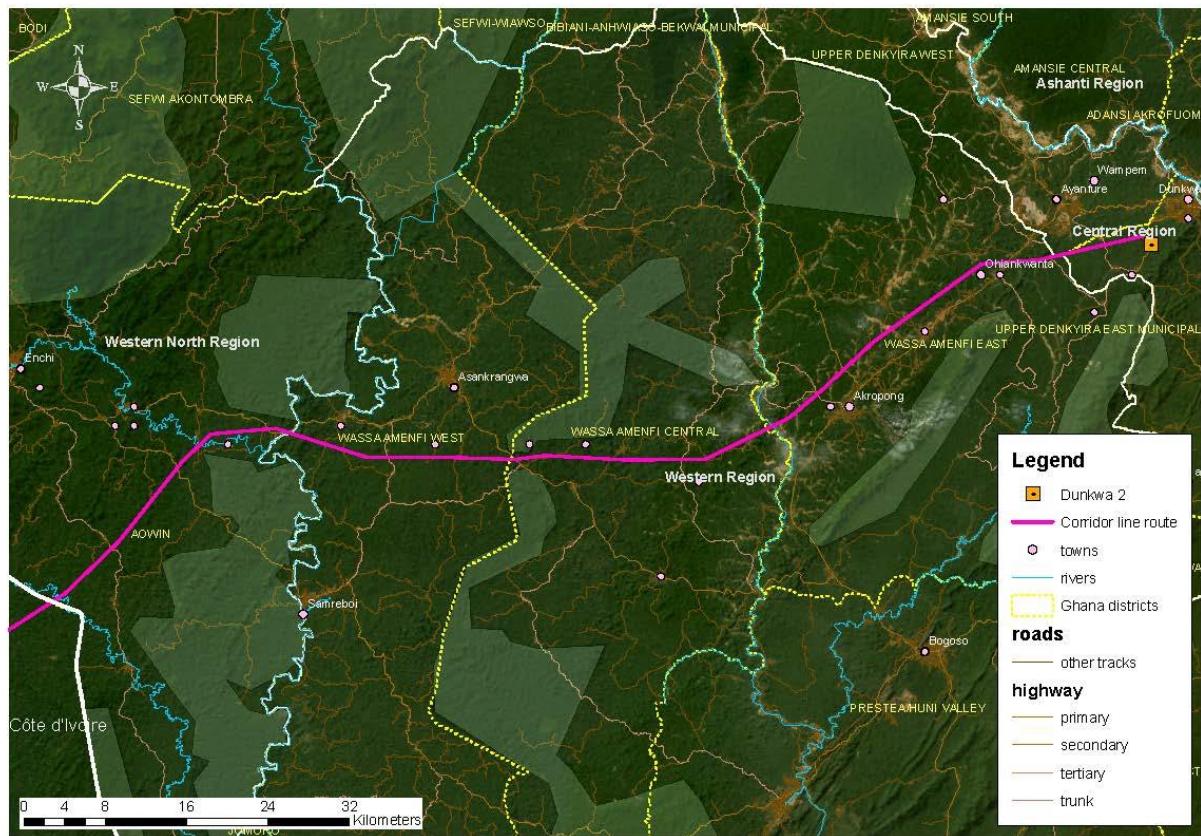
DESCRIPTION ET LOCALISATION DU PROJET

Le projet de ligne de transport proposé, qui traverse le Ghana et la Côte d'Ivoire, porte sur la construction et l'exploitation d'une ligne de transport à haute tension à l'intérieur du Ghana.



Carte administrative des sections Côte d'Ivoire-Ghana de la ligne de transmission

La ligne de transmission s'étendra sur environ 125 km (de Bibianiha près de Dunkwa-on-Offin à Omanpe - frontière entre le Ghana et la Côte d'Ivoire) et traversera cinq districts dans trois régions du Ghana. Ces districts comprennent Upper Denkyira East dans la région centrale, Wassa Amenfi Central, Wassa Amenfi West et Wassa Amenfi East dans la région occidentale, ainsi que la municipalité d'Aowin dans la région du nord-ouest. Le projet prévoit également le développement de la sous-station de Dunkwa II, stratégiquement située près de Dunkwa-on-Offin.



Localisation du corridor au Ghana et frontières administratives

Le corridor de transmission Bibianiha - Omanpe aura une « emprise de ligne de transmission » couvrant la zone s'étendant sur une distance de vingt mètres de part et d'autre de l'axe de la ligne de transmission. Ce projet est considéré comme un projet « linéaire ». Une emprise de 40 mètres sera acquise pour le projet, ce qui nécessitera environ 500 hectares de terrain. L'acquisition sera gérée par GRIDCo en collaboration avec la Commission foncière, en veillant à ce que les propriétés affectées soient indemnisées. La phase de construction comprendra des activités telles que les études géotechniques, le repérage des pylônes, l'assemblage et l'érection de 320 pylônes dans les régions désignées. Le projet devrait employer environ 150 personnes, qui travailleront simultanément sur différents segments de la ligne de transmission.

CONTEXTE RÉGLEMENTAIRE

L'Agence de protection de l'environnement (EPA) est le principal organisme de réglementation au Ghana. Elle est chargée de faire appliquer les lois sur la protection de l'environnement et de veiller au respect des protocoles d'évaluation environnementale (EE).

Le projet sera mis en œuvre conformément à la législation nationale, notamment la Constitution de la République du Ghana (1992), qui protège les droits de propriété privée et garantit une indemnisation équitable en cas d'acquisition obligatoire de terres à des fins d'intérêt public. Il répond également aux

exigences des lois spécifiques relatives à l'énergie, à l'utilisation et à l'acquisition des terres, au travail, à la protection sociale et environnementale, telles que le règlement sur l'évaluation environnementale de 1999 (Li 1652) et la loi sur la commission de l'énergie de 1997 (loi 541). Il répondra également aux exigences du cadre environnemental et social (2018) et des normes environnementales et sociales (NES 1-10).

PRINCIPAUX IMPACTS ET MESURES D'ATTÉNUATION

Le plan de gestion des mesures d'atténuation identifie les mesures réalisables et rentables qui peuvent réduire les impacts environnementaux négatifs potentiellement importants à des niveaux acceptables. Le plan prévoit des mesures compensatoires si les mesures d'atténuation ne sont pas réalisables, rentables ou suffisantes.

Les incidences environnementales et sociales du projet sur les ressources naturelles, les êtres humains et les écosystèmes sont identifiées grâce à l'enquête directe et aux informations recueillies lors des consultations.

Méthodes appliquées à l'identification des impacts et critères utilisés pour évaluer les niveaux d'impact

L'analyse des impacts est axée sur les impacts positifs et négatifs et vise à déterminer si les impacts sont positifs ou négatifs, directs ou indirects, à court terme ou à long terme, réversibles ou irréversibles. L'évaluation se concentre sur le potentiel d'impacts environnementaux et sociaux négatifs causés par le défrichement des terres, la pression accrue sur le bois de chauffage et les ressources en eau, les perturbations et conflits sociaux, les menaces sur la composition et les habitats des forêts et des espèces sauvages, etc.

Sur la base du cahier des charges, les impacts potentiels déterminés par le projet proposé ont été divisés en cinq catégories différentes basées sur le type et la chronologie de l'événement :

- Phase de construction ;
- Phase d'exploitation ;
- Plans de gestion environnementale ;
- Phase de réinstallation ; et
- phase de restauration des moyens de subsistance.

L'évaluation des impacts est énumérée et décrite en détail en tenant compte des normes environnementales nationales et internationales, de la législation, des traités et des conventions qui peuvent affecter l'importance des impacts identifiés.

Quatre facteurs seront pris en compte lors de l'évaluation de l'importance de tous les impacts sociaux : la relation de l'impact avec les échelles temporelles (relatives au temps mesuré), la relation de l'impact avec les échelles spatiales (relatives à l'espace), l'échelle de gravité/bénéfice (état ou étendue de la gravité ou du bénéfice) et la probabilité (degré de probabilité) de la survenance de l'impact.

Matrice de signification des impacts sur la base de la probabilité et de l'effet

PROBABILITÉ		EFFET										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Chaque critère est classé et des notes sont attribuées à l'aide d'un tableau de classement afin de déterminer l'importance globale d'une activité.

ÉVALUATION DE L'IMPACT CUMULATIF

L'un des plus grands défis en matière de gestion des risques auxquels sont actuellement confrontés les développeurs de projets est l'évaluation et la gestion appropriées des impacts et des risques cumulés.

Des facteurs tels que le changement climatique et l'imprévisibilité des régimes climatiques, le déclin de la biodiversité des espèces, la dégradation des services écosystémiques et l'évolution des conditions socio-économiques ajoutent à la complexité de l'évaluation et de la gestion des risques. Les conséquences potentielles à l'échelle du système résultant de la combinaison des effets individuels de multiples actions sont particulièrement importantes.

Les incidences cumulatives sont des incidences résultant de changements progressifs causés par d'autres actions passées, présentes ou raisonnablement prévisibles en même temps que le projet. Parfois, l'effet total est plus important que la somme des impacts individuels parce que chaque projet, ainsi que chaque impact, peut interagir avec les autres.

Cela implique d'identifier et d'analyser les impacts cumulés au Ghana et de planifier des mesures pour les atténuer. En effet, avec la fourniture régulière et continue d'électricité aux industries, l'électrification des communautés et des villes dans les zones rurales le long des lignes électriques et autour des sous-stations, il y aura un potentiel pour un nouveau développement dans les zones qui exercera une pression sur la disponibilité des ressources matérielles pour la construction, l'approvisionnement en eau, l'assainissement, la gestion des déchets solides, le développement de l'habitat et de l'agriculture, la biodiversité, etc. Au Ghana, il est important de prendre en compte le développement du logement et de l'agriculture,

l'urbanisation et le développement des routes. D'autres activités de développement, telles que des projets d'extraction de ressources minérales, le développement d'infrastructures municipales, etc. sont peut-être déjà en cours et contribueraient aux impacts cumulatifs.

PLANS DE GESTION E&S DU PROMOTEUR

Le PGES du promoteur décrit le programme d'atténuation environnementale et sociale que le promoteur est chargé de mettre en œuvre pendant la phase de construction et d'exploitation. Il se compose de plusieurs sous-plans, qui seront mis en œuvre par l'Unité de gestion environnementale et sociale, ou sous-traités à des prestataires de services, par ex. organisations non gouvernementales (ONG).

Plan d'action de réinstallation (PAR)

Le projet devrait entraîner un déplacement économique ou une compensation d'une ampleur mineure et sur la base de la conception détaillée du projet combinée à un recensement et à un inventaire des actifs. Un Plan d'Action de Réinstallation (PAR) a été préparé pour être mis en œuvre avant le début des travaux de construction. La planification et la mise en œuvre du PAR seront guidées par la NES 5 du Cadre environnemental et social de la BM (2017), « Acquisition de terres, restrictions sur l'utilisation des terres et réinstallation involontaire » et la NES 1 « Évaluation et gestion des risques et impacts environnementaux et sociaux ». », et les normes internationales les plus courantes. Le PAR a été préparé dans un volume distinct et autonome de l'étude EIES.

Plan de Mobilisation des Parties Prenantes (PMPP)

Le plan d'engagement des parties prenantes est élaboré en raison de la nécessité de se conformer principalement aux règlements sur la gestion de l'environnement (processus d'EIE) (2007), à la loi sur les propriétaires et locataires agricoles (ALTA) et à la loi sur l'acquisition des terres par l'État (SALA). Les normes internationales seront guidées par le Cadre environnemental et social de la Banque mondiale (2017), en particulier la NES 10 « Engagement des parties prenantes et divulgation des informations ».

Ce plan présente la stratégie proposée de consultation publique et d'engagement des parties prenantes pour le projet de ligne de transport d'électricité. Il décrit les processus et procédures à utiliser lors de l'exécution du projet proposé pour garantir que toutes les parties prenantes sont impliquées de manière significative et informées des activités du projet, que les avis des parties prenantes sont reçus, intégrés et que les commentaires sont donnés rapidement.

Toutes les visites de sites effectuées par le consultant doivent comprendre des représentations des services publics nationaux. Cependant, il est de la responsabilité du Consultant de veiller à ce que toute la société civile, les populations potentiellement affectées et les parties prenantes de base soient incluses dans le processus. Ces consultations comprendront une présentation et des conseils à l'intention des parties prenantes sur l'utilisation d'un mécanisme de réclamation convenu.

Plan de Gestion de la Main-d'œuvre (PGMO)

Le PGMO élaborera et mettra en œuvre des procédures écrites de gestion du travail applicables au projet. Les procédures définiront la manière dont les travailleurs du projet seront gérés, conformément aux exigences de la législation nationale et de la NES n°2. Les relations entre travailleurs et managers sont favorisées dans le but de favoriser le développement des projets en traitant les travailleurs équitablement et en offrant des conditions de travail sûres et saines.

Plans d'engagement environnemental et social (PEES)

Le PEES décrira les principales mesures et actions nécessaires pour que le projet soit conforme aux exigences énoncées dans les normes environnementales et sociales (NES) du cadre environnemental et social (CES) de la Banque mondiale. Le document décrira la structure organisationnelle à établir pour la mise en œuvre des actions convenues.

Plans de gestion du patrimoine culturel (PGPC)

Le PGPC identifiera tout le patrimoine culturel susceptible d'être affecté par le projet et définira des procédures pour éviter ou atténuer les impacts probables sur ce patrimoine culturel, conformément aux exigences des lois nationales et de la NES8.

Plans de gestion de la biodiversité (PGB)

Les plans de gestion de la biodiversité répondent aux normes ESF ESS6 de la Banque mondiale et aux meilleures pratiques internationales en matière de conservation de la biodiversité.

Cadres de gestion environnementale et sociale (CGES)

Un cadre de gestion environnementale et sociale (CGES) fournit une première évaluation des risques, des enjeux et des impacts environnementaux et sociaux de l'électrification locale et établira un dialogue entre les experts environnementaux et sociaux et les experts techniques pour optimiser la conception. Il s'agit notamment d'éviter autant que possible les impacts négatifs en veillant à ce que les variantes techniques étudiées intègrent les préoccupations environnementales et sociales.

Cadre politique de réinstallation (CPR)

Un cadre politique de réinstallation fournit une première évaluation des risques associés à la réinstallation involontaire, des principales mesures à mettre en œuvre et des procédures à suivre pour faire preuve de diligence raisonnable en matière de réinstallation involontaire à l'avenir.

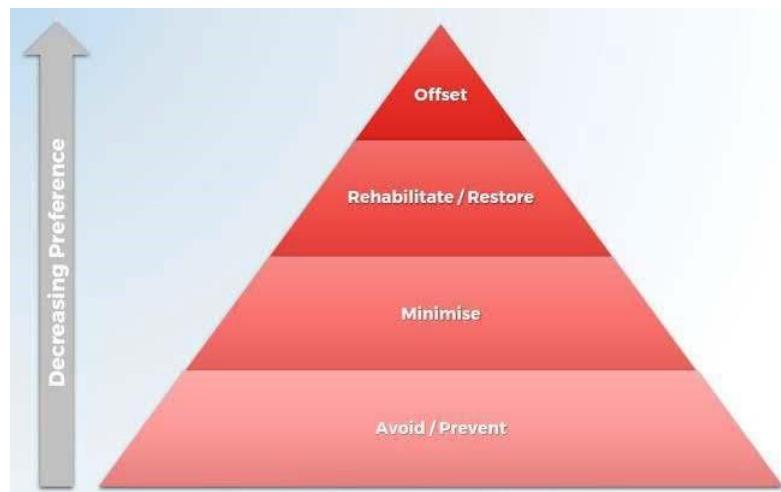
PLAN DE GESTION ET DE SUIVI DE L'ENVIRONNEMENT

Le Plan de Gestion et de Surveillance Environnementale (PGSE) est un document complet décrivant les mesures à mettre en œuvre pour protéger l'environnement pendant et après la construction d'un projet de ligne de transport d'électricité. L'EMMP précise les paramètres à surveiller, la fréquence des mesures, les méthodes d'échantillonnage et d'analyse ainsi que les responsabilités des différentes parties

impliquées. Il comprend également des plans de tenue de registres, de sécurité et d'audits pour garantir le respect des normes environnementales et sociales.

Le PGSE sera inclus dans les dossiers d'appel d'offres de l'entreprise de construction, la guidant dans l'organisation de la mise en œuvre des mesures environnementales et sociales. Le plan abordera également l'acquisition de l'emprise du projet, en tenant compte des facteurs environnementaux et sociaux.

Le PGSE comprend une hiérarchie d'atténuation qui donne la priorité à l'évitement et à la minimisation des impacts sur la biodiversité et les populations. Il identifie les impacts potentiels et décrit les mesures pour les prévenir, les atténuer ou les compenser. Le plan aborde également la phase de construction, la phase d'exploitation, les plans de gestion environnementale, la phase de réinstallation et la phase de restauration des moyens de subsistance.



Hiérarchie d'atténuation de l'évaluation d'impact

Le PGSE est un outil crucial pour garantir que la construction du projet de ligne de transport d'électricité soit réalisée de manière durable et responsable, en protégeant l'environnement et les droits des communautés locales.

MESURES D'ATTÉNUATION ET MATRICE DE SUIVI

Le PGES (Plan de Gestion Environnementale et Sociale) est un plan complet conçu pour atténuer et surveiller les impacts environnementaux et sociaux négatifs potentiels d'un projet.

Atténuation:

- Identifie et résume les impacts environnementaux et sociaux négatifs potentiels.
- Décrit les mesures d'atténuation pour réduire ces impacts.
- Estimation des impacts environnementaux potentiels de ces mesures.

- Liens vers d'autres plans d'atténuation (par exemple, pour la réinstallation, les peuples autochtones ou les biens culturels).

Surveillance:

- Fournit des informations sur les principaux aspects environnementaux et sociaux du projet.
- Évalue l'efficacité des mesures d'atténuation.
- Identifie les objectifs de surveillance et précise le type de surveillance.
- Liens avec les impacts évalués dans le rapport EIES et les mesures d'atténuation décrites dans le PGES.

Surveillance pendant les phases du projet

1. Phase de construction :

- Audits de chantier de construction pour garantir que les exigences du PGES sont mises en œuvre.
- Surveillance des impacts tels que le chantier de construction, les déchets solides, les émissions, la poussière, le bruit, le défrichement de la végétation, la santé, les risques d'incendie et l'afflux de personnes.

1. Phase d'exploitation :

- Programme de surveillance multidisciplinaire impliquant divers organismes.
- Surveillance des lignes de transmission, des transports, de l'électrocution des oiseaux et d'autres impacts potentiels.

2. Phase de gestion environnementale :

- Surveillance des modes d'utilisation des terres, de la dégradation des sols, des impacts sur le paysage, de l'empiétement forestier, des risques d'incendie, de la végétation, de la faune terrestre et de la réinstallation.

3. Suivi de la réinstallation et paiements d'indemnisation :

- Suivi pour assurer la mise en œuvre efficace des activités de compensation et de réinstallation.
- Examine l'avancement du projet avant et après l'arpentage et la construction.
- Des audits indépendants pour évaluer l'adéquation des paiements d'indemnisation et l'efficacité de la réinstallation.

Dans l'ensemble, le PGES vise à garantir que le projet est mis en œuvre de manière à minimiser les impacts environnementaux et sociaux négatifs tout en gérant et en atténuant efficacement les effets inévitables.

DÉVELOPPEMENT DES CAPACITÉS ET FORMATION

Le PGES présente un plan global visant à renforcer les institutions locales et à assurer la mise en œuvre efficace des initiatives de réinstallation et de développement.

Le plan se concentre sur le renforcement des capacités en matière de ressources humaines (effectif et formation) et de ressources physiques et logistiques. Il recruterá un personnel limité en raison de l'ampleur du projet et donnerá la priorité au personnel chargé du développement des moyens de subsistance et de la vulgarisation pour le Groupe de travail sur la réinstallation (GTR). Le projet fournira également des équipements et améliorera la mobilité.

La formation est un élément clé, visant à améliorer les processus de planification, la gestion de la réinstallation et la prestation de services. Le PGES décrit les phases de formation et les budgets des différentes unités. Le GTR jouera un rôle clé et la formation se concentrera sur la compréhension des politiques de réinstallation, l'élaboration du PAR, l'organisation des activités de réinstallation et la gestion des tâches et des fonds.

Le renforcement des capacités institutionnelles au niveau du district est essentiel pour une mise en œuvre réussie de la réinstallation. Le PGES répond à ce besoin à travers un plan complet de développement des capacités et de formation adapté aux besoins spécifiques des institutions locales.

COÛTS ET BUDGET

Un budget détaillé de 425,000 USD a été estimé pour la planification de la gestion environnementale et qui comprend la surveillance, la formation et les dépenses imprévues, afin de garantir des capacités complètes de gestion et de réponse. Les coûts liés au PAR sont calculés séparément dans le rapport du plan d'action de réinstallation.

ACRONYMS

EMF	Electro-Magnetic Fields
EPA	Environmental Protection Agency
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESIS	Environmental and Social Impact Statement
ESMP	Environmental and Social Management Plan
GRIDCo	National Power Company of Ghana
GRM	Grievance Redress Mechanism
IEC	Information, Education and Communication
kV	Kilovolt
LFMP	Labour Force Management Plan
MSDS	Material Data Safety Sheet
MW	Megawatts
PIU	Project Implementation Unit
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
RoW	Right of Way
RWG	Resettlement Working Group
SEP	Stakeholder Engagement Plan
WHO	World Health Organisation

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1 INTRODUCTION

1.1 Background

Ghana Grid Company (GRIDCo) will carry out the construction and operation of the Ghana section of the high voltage interconnection line from Bibianiha (SW of Dunkwa-on-Ofin) in the Central Region of Ghana to the capital of Côte d'Ivoire with associated high voltage substations at Akoupé Zeudji (NW Abidjan) and Bibianiha in Ghana.

This project, which will greatly facilitate power exchanges amongst the countries in the West African subregion. It is known as the "Dunkwa 2 (Ghana) – Akoupé Zeudji (Ivory Coast) Interconnection Project" and it is one of many others planned as a result of the establishment of the West African Power Pool (WAPP) Projects. The objective of the WAPP is to establish a regional electricity market in West Africa through the judicious development and realisation of key priority infrastructures that will permit accessibility to economic energy resources to all member states of the ECOWAS.

The Environmental Assessment Regulations (LI 1652 of 1999) indicate that an Environmental and Social Impact Assessment (ESIA) and an Environmental and Management Plan (EMP) are required for new undertakings, the EMP being required after one year of operation. However, to obtain the Environmental Permit from the Environmental Protection Agency (EPA) a provisional Environmental and Social Management Plan (ESMP) has been submitted along with the ESIA.

1.2 Objectives of the Environmental and Social Management Plan

The aim of this Environmental and Social Management Plan (ESMP) is therefore to provide guidelines to the Project Owner to ensure that the measures identified in the ESIA are implemented during the different phases of the interconnection project. The purpose of the ESMP in general is to:

- Ensure continuous improvement of environmental and social performances.
- Ensure systematic management of environmental and social impacts
- Create awareness among all employees on environmental management.
- Meet specific environmental regulatory requirement (s) and compliance with the funding agencies requirements.

This ESMP therefore provides a summary of activities, their related potential impacts and the recommended mitigations or offsets to be carried out during the pre-construction, construction, operational and maintenance phases of the project. It details out remedial and mitigation measures to be continuously carried out to prevent, minimize or offset impacts on the physical, biological and socioeconomic/socio-cultural environments as well as to promote occupational safety and health of employees. It also seeks to identify the various institutional responsibilities to manage the environmental aspects of the project as well as the cost involved.

2 PROJECT DESCRIPTION AND LOCATION

2.1 Overall project description

2.1.1 Location of the proposed project

The construction and operational activities of the three proposed transmission lines and the Dunkwa 2 substation will be carried out in five districts of the Western North, Central and Western Regions. These districts are:

- Aowin Municipal (Western North Region),
- Wassa Amenfi West Municipal Assembly (Western Region),
- Wassa Amenfi Central District (Western Region)
- Wassa Amenfi East Municipal Assembly (Western Region),
- Upper Denkyira East Municipal Assembly (Central Region).

The transmission lines shall be constructed within a narrow corridor of 40 meters that will cross the districts named above (and some of their communities) over a distance of 125 kilometers. The project is to be regarded as a linear one.



Figure 1: Administrative map of study area

2.1.2 Project components

The project consists in the construction of a 330 kV transmission line over a distance of 125 km from Bibianiha near Dunkwa-on-Ofin in the Central Region of Ghana to a place in the proximity of Omanpe on the border with Ivory Coast. This project entails the construction of an associated 330/161 kV substation

called Dunkwa 2 at Bibianiha, a locality situated South-West of Dunkwa-on-Ofin. Figure below shows the location of the project within the high tension electricity network of SW Ghana.

The project will in particular involve the installation of steel transmission towers along the selected route. The height of the towers will be such as to provide a minimum of 8 m clearance between the conductors and open ground and 8.5 m clearance above roads. The towers will be about 40 m high and located at 400 m inter-distance.

The line will be fitted with an optic fiber ground wire (OPGW) which will be used for power system protection, control and communication purposes.

Activities considered in this ESMP include pre-constructional, constructional and operational activities.

These are described in more detail in the following chapter.

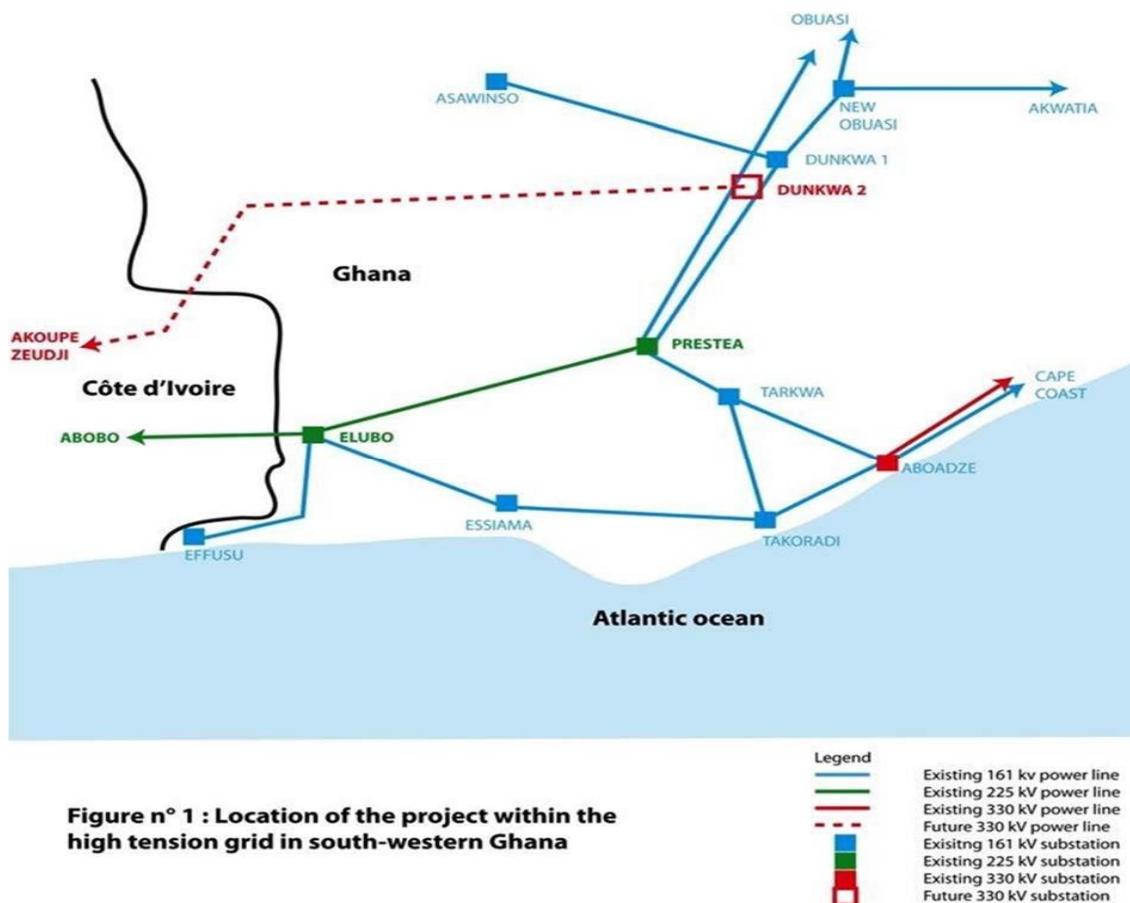


Figure 2: Project location within the high-tension electricity network in SW Ghana

2.2 Pre-construction Activities

Studies were already carried out during the pre-construction stage for the Scoping Report, the Line Route Study and the Environmental and Social Impact Assessment. From then on, the activities are under the responsibility of the Project Owner, GRIDCo, and include the following topics:

2.2.1 Acquisition of the right-of-way (ROW)

Based on the issuance of an environmental permit from EPA, the Project owner will acquire the Right-of Way in compliance with all laws, regulations, operational directives and guidelines. The mode of acquisition of the RoW is as set out below:

The 1992 Constitution of Ghana by Article 20 prescribes that fair and adequate compensation should be paid to all persons affected by state acquisitions. The procedures used by GRIDCo to ensure that all persons affected by the transmission line project are catered for are outlined below:

- Referencing of all properties, land, crops and buildings, by officers of the Land Valuation Board (LVB) to be monitored by Estate Surveyors from the Estate Department of GRIDCo.
- Assessment of the compensable values by the Land Valuation Board and the valuation advice forwarded to GRIDCo.
- Verification of the report and corrections where necessary to ensure that the amounts are accurate and fair to both claimants and the Authority.
 - Offers to be made to the claimants on the basis of the LVB's advice.
 - Claimants dissatisfied with the offer have a right to petition for reconsideration.
 - In this regard, such claimants are required to submit counter proposals supported by a valuation prepared by private valuers of their choice. The private reports are considered by GRIDCo in conjunction with the LVB to ensure that claimants are treated fairly.
 - Where necessary, dissatisfied victims are invited to negotiate in order to arrive at an acceptable compromise.
 - Project affected persons may resort to legal action in order to have their grievances addressed.

2.2.2 Tower spotting

Tower spotting is the determination of the individual sites for the installation of the towers (or pylons). Tower spotting takes place over the whole length of the transmission line.

Activities that go along with tower spotting include land surveying and soil investigation. These activities necessitate access to the line route and some clearing of vegetation, leading to possible destruction of crops. Topographical surveys and tower spotting identify the optimum foundation and design for each tower. At this stage minor adjustments may be made to the final tower location in accordance with the vertical profile of the transmission line corridor, so as to avoid buildings that may have been constructed subsequent to the collection of baseline data in the proposed RoW. Such adjustments will be limited to a few meters in any direction.

2.2.3 Installation of base camps

The locations of the site offices will be studied and validated before construction starts. Their location will be decided upon analysis of technical, practical, environmental and social aspects. Their construction will involve extensive vegetation clearance. The camp will be constructed:

- at least 0.5 km from natural water courses and marshlands
- at least 1 km from settlements and on relatively level ground.
- Away from cultural properties, and from forest reserves. It will also be so located as to avoid the destruction of crops and buildings.

2.3 Construction phase activities

2.3.1 Construction of access and tower corridor tracts

A maintenance track of 4 m width shall be constructed along the entire length of the wayleave.

Wherever possible, existing access tracks shall be used to gain access to the proposed line route. Where there are no such tracks available, new access tracks will be constructed from the closest public road to the RoW. The access track as well as the maintenance track in the RoW, which will be constructed during the construction phase, will be retained for the operational phase. The tracks will be used for the transportation of workers and material to the line route as well as for the installation of towers and conductors.

The tracks will uproot and clear off tree stumps, shrubs and other vegetation likely to obstruct the transport of construction machinery, equipment and maintenance staff to the tower corridor.

2.3.2 Clearing of right-of-way

The construction and operation of the proposed line will require a Right-of-Way of 20 m width on each side of the transmission line. This 40 m wide RoW, which will run the total length of the transmission line, shall be cleared of vegetation to a height of about 1.25 m above ground level, except in areas crossing forest galleries along rivers of great ecological interest in particularly for rare ombrophilous species which could be adversely affected by habitat fragmentation of the forest cover. In this case the vegetation will be kept and maintained up to a height of 8m by use of raised pylons overhanging the forest gallery.

Trees considered being potentially capable of threatening the proposed transmission line beyond the 40 m width will be cut down or pruned as appropriate. These concern trees which could damage the transmission line if falling over or those whose branches may grow so big as to foul the lines.

2.3.3 Clearing and excavation of tower base and foundation

The proposed tower base areas will also be totally cleared and all roots removed. With a total of about 300 pylons to be constructed in Ghana, a total tower base area of about 15 000 m² will be cleared and all roots removed for the purpose of the construction of the transmission line. The area to be cleared for a single tower will be made up of the dimensions of the tower base (for ex. 5m x 5 m depending on tower design) with an additional buffer of 2m on the periphery of the base (in total 7m x 7m).

Tower foundations will vary according to the prevailing geology. A majority of them will however have footings of the pad and chimney type, which will be excavated mechanically. By this method, a concrete

pad will be constructed at the bottom of the excavation, and each foot of the tower erected within its own 'chimney' of steel reinforced concrete. After about two days, the formwork will be removed and the excavation will then be backfilled to original ground level and consolidated.

The ground surfaces of the tower sites will be so graded as to gently provide drainage away from the tower legs and to avoid the collection of water (leading to the creation of stagnant pools) at the tower bases. Where necessary, (particularly on hillsides), terracing, cribbing or riprap may be used to provide protection for tower foundations.

In areas prone to flooding (swampy areas) a raft foundation for the transmission line towers may be used. The raft foundation is similar in concept to the pad and chimney foundation except all four feet of each tower will be set on a single raft of concrete.

2.3.4 Clearing of tower track

A track of about 4 m width will be cleared and maintained under sections of the proposed line. This track will be uprooted and cleared of all obstructing tree stumps in order to allow the unimpeded movement of light maintenance vehicles for patrolling and for the transportation of tools and maintenance crew during the constructional and operational phases of the transmission line.

2.3.5 Storage and transportation of equipment and materials

Almost all the materials to be used in the construction of the transmission line will be imported.

Such components include tower steel and its components in broken down form, conductors, insulators, transformers, switchgear, etc. Materials that will be procured locally will include aggregates, cement, sand, stone and other miscellaneous supplies and services. The imported components will be delivered by ship to either the Tema or Takoradi ports. After clearance from the ports, the materials shall be stored at the Contractor's storage site. It must be noted that the materials for the towers will not be bulky and unwieldy. They will therefore not require any specialized vehicles.

During construction, the materials will be trucked to the site via public roads and access tracks. Vehicle movements will be minimal since the site offices will be put close to the proposed line route.

2.3.6 Erection of towers and stringing of transmission lines

After transporting the steelwork and its components to the construction yards the transmission towers will be erected. Typically for a 330 kV power line, the average span between towers will be about 400 m giving a total number of towers for this project in Ghana of about 300 pylons. The towers will have concrete footings with foundation depths of 1.6 m or more depending on the nature of soils at the selected tower spots. Once the towers are erected, the conductors and shield wires will be strung and appropriately 'tensioned' to provide the minimum clearance (8 m) between ground level and the lowest conductor.

The proposed line is expected to cross overhead electricity distribution lines, rivers and streams, on the Ghana side the major rivers being Boin (frontier), Disue, Tano, Ahuro, Mamire, Yaya and Merechu. In

general, in crossing overhead electrical distribution or transmission lines as well as communication lines and roads, guard structures are used when installing the conductors to ensure that the power line does not cause hazards and nuisances to other networks and infrastructures.

Once the towers have been erected and the lines strung, tests and measurements shall be carried out to ensure that the line performs as expected. Minimum distances such as clearances between the lines and the ground level shall be checked and the lines shall be 'tensioned' as per specification. After the construction of the line, the soil conditions along the right-of-way will be assessed for such problems as compaction and erosion. Areas of bare soil are expected to be re- colonized spontaneously by native cover plants which will stabilize the soil and reduce erosion. It must be pointed out here that no chemicals will be used for the control of vegetation and that all vegetation control measures shall be done manually (by use of chain saws) or mechanically (by use of heavy-duty wood chippers).

The line will be fitted with an optic fiber cable (OPGW), which will be used for system protection, control and communication purposes.

2.3.7 Road crossings

The proposed transmission line will cross 2 roads with asphalt surfacing. The road crossings to be encountered by the proposed transmission line are shown in Table 1.

Table 1: Road crossings

Highway	Road description
Bawdie – Asankrangwa	Asphalt road
Bogoso – Dunkwa-on-Ofin	Only minor sections asphalted

2.4 Operational activities

The operational phase of the project will involve the commissioning of the power line as well as well as maintenance of the RoW and of all high tension equipment (pylons, conductors, and substation).

The operation and maintenance of the transmission line will be based on accepted international standards, such as those of the International Electro-technical Commission (IEC).

The main activities to be carried out during the operating life cycle of the transmission line include surveillance of the condition of the conductors, towers and RoW; routine & emergency maintenance and repairs as well as vegetation control in the RoW.

2.4.1 Routine running maintenance

This consists of routine maintenance carried out to ensure the integrity and safety of the lines. The maintenance activities carried out here include:

- Aerial surveillance by helicopter. This is done to ensure that potentially hazardous defects are pre-empted and the integrity of the line is maintained and sustained. This is done on an annual basis.
- Foot patrol. The Line Maintenance Team carries out routine physical examination of the transmission line and its component parts to ensure the safety, security and integrity of the line. Such activities are carried out yearly.
- Security patrol. This is done to check on segments of the line close to populated areas for signs of vandalism, theft of bolts and nuts, tampering, and general security of the lines. It is to ensure an early detection and rapid response to acts of vandalism and to rectify such situations as promptly as possible.
- Tower auditing and repairs. This provides a mean of assessing the ageing process of towers. It starts one year after the commissioning of a line section and it follows a one-year cycle. In a cycle of tower auditing, 10% of all suspension towers and all dead-end towers are thoroughly examined. As the line ages, it is subjected to wear and fatigue which may not be noticeable by a distant visual inspection. Detection and tightening of loose bolts on support and hardware can reduce premature wear and indicate the need for replacement of worn components before failure.
- In the course of operation, all identified defects are repaired. Such defects may include the replacement of defective conductors, flashed over insulators, broken dampers, vandalized components, and maintenance of access tracks and RoW.

2.4.2 Major maintenance

These are scheduled maintenance programmes that are carried out on the transmission line as a result of the ageing of towers, the conductors and other equipment in the substation. The repairs may also arise out of the running maintenance activities. These maintenance programmes usually become necessary as a result of the lines running through aggressive environments (mining sites, industrial areas and coastal zones). Some of the activities to be carried out under the major maintenance programme include:

- Re-insulation of sections of the transmission line
- Treatment of rust and re-painting of tower components
- Replacement of corroded towers and transmission line components
- Replacement of conventional bolts and nuts with anti-theft fasteners, • Rehabilitation of access roads and tracks.

2.4.3 Emergency maintenance

These are activities relating to correction of sustained line faults. These may span a whole spectrum of minor faults (e.g. insulator failure) to such major defects as tower failures. Some of the activities carried out under this programme include the construction of a temporary by-pass line to replace collapsed sections, reconstruction of the collapsed section as well as aerial and ground patrols to locate sustained line faults.

2.5 Schedule

The life cycle phases are synthesised in the Table 2

Table 2: Life cycle phases of the project

Project Phase	Activity description	Duration	Timeframe
Pre-construction	Acquisition of RoW, tower spotting, Preparation of base camps	2 months	After validation of line route
Construction	Clearing of tower tracks, excavation of tower base, erection and stringing of power line. Substation: construction, equipment & interconnection	20 months	Upon receipt of environmental permit
Operational	Vegetation management	70 years	Every 4 years
	Maintenance check of equipment	70 years	Yearly
Decommissioning	Removal of power line and substation. All equipment to be recycled.	1 year	

2.6 Stakeholders

The main stakeholders involved in the planning and the implementation of the project in Ghana are in particular:

- The project's proponent which will be responsible for the project's construction and operation: GRIDCo;
- The Ivorian pendant of GRIDCo: CI-Energies;
- The Construction Company that will be awarded the construction contract in Ghana, referred to as the Contractor;
- The Ministry of Energy and Petroleum of Ghana;
- Governmental technical services in charge of environmental issues:
 - Ministry of Environment, Science, Technology and Innovation (MESTI);
 - Ministry of Lands and Natural Resources (MLNR);
 - Ministry of Food & Agriculture
 - Ministries of Local Government and Rural Development (MLGRD);
 - The Environmental Protection Agency (EPA);
- Government, economic and health bodies in charge of social aspects:
 - Ministry of Trade and Industry;

- Ministry of Tourism, Culture and Creative Arts;
- Local authorities;
- Local actors: NGOs, groups and associations, Community Based Organisations and Communities.

3 REGULATORY CONTEXT

3.1 Institutional Framework

The relevant agencies, departments and organisations, to be considered in the implementation of the project include:

The Environmental Protection Agency, 1994, (Act 490) (EPA)

The Environmental Protection Agency (EPA) Act, 1994 (Act 490) grants the Agency enforcement, standards setting powers and power to ensure compliance with such standards and guidelines. It also mandates EPA to ensure compliance with the Ghana EA requirements and procedures for proposed as well as existing "undertakings".

The other bodies that will be involved in the follow up of this project are:

- Wildlife Division of the Forestry Commission,
- Forestry Commission itself,
- Ghana National Commission on Culture,
- Energy Commission,
- Land Valuation Division of Lands Commission,

3.2 Legal Framework

Various environmental legislations and regulatory requirement are to be adhered to in the implementation of this ESMP.

3.2.1 The Constitution Of The Republic Of Ghana

The Constitution of the Republic of Ghana (1992) upholds the principle of private ownership of lands. Adequate safeguards from deprivation of private property rights have been provided for in the 1992 Constitution. Article 20 of the constitution prescribes that under no circumstance should private properties be compulsorily taken unless there are weighty and justifiable grounds for such acquisition, which invariable must be in the public interest. In the event of compulsory acquisition, clause 2(a) provides that "sufficient provision must be made for the prompt payment of fair and adequate compensation".

3.2.2 Environmental Assessment Regulations, 1999 (Li 1652)

The Environmental Assessment (EA) Regulations combine both an environmental assessment and environmental management systems. The regulations prohibit beginning and "undertaking" (including transmission line projects, investments, etc.) without prior registration and procurement of an environmental permit.

Undertakings are grouped into schedules to enable registration and securing an environmental permit from the EPA through the EA system. The schedules include undertakings requiring registration and an

Environmental Permit (Schedule 1), ESIA mandatory undertakings (Schedule 2), as well as Schedule 5 – relevant undertakings (located in Environmentally Sensitive Areas) in Ghana.

This project is categorized as a Schedule 2 project, for which an ESIA is mandatory.

3.2.3 Lands Statutory Wayleaves Act 1963 (Act 186)

The land Statutory Wayleaves Act 1963 (Act 186) was enacted to facilitate the entry on any land for the purposes of construction, installation and maintenance of public utility works and the creation of rights of way and other similar rights for such works. Works for which rights of way may be created are "highways or works for purposes of, or in connection with any public utility works".

The Act and its accompanying Regulation, the Lands Statutory Wayleave Regulation 1964 (LI 334) provide the modalities and procedures for the acquisition of the statutory rights of way. Thus, the mechanism for entry for survey works and construction has been spelt out in detail. Provision has also been made for restoration of affected lands where that is possible.

The Land Act, 2020 (Act 1036) became effective in Ghana. The Act revises and consolidates previous enactments¹ on land into a single law and is the manifestation of reforms in the land sector that began with the implementation of the 1999 National Land Policy (NLP).

The Act's stated object is to ensure sustainable land administration and management, and effective and efficient land tenure and it seeks to achieve this by, *inter alia*, establishing a broad-based framework for registering land rights and interests, a customary land rights framework and enhancing transparency and accountability in land governance institutions.

3.2.4 The Energy Commission Act, 1997 (Act 541)

The Act which sets up the Energy Commission places the responsibility of regulation, management, development and utilisation of energy resources in Ghana on the Energy Commission. Rules, standards and procedures governing the transmission, wholesale supply, distribution and sale of electricity in the sector fall under the ambit of the Commission. Thus, approval for this project is required from the Commission before the beginning of a project in the country.

3.2.5 Draft Gridco Transmission Line Protection Regulations, 1967 (Li 542)

This Legal Instrument (LI) provides security for electricity transmission lines belonging to GRIDCo. Under this legal instrument certain development activities, such as the construction of buildings, farming, etc., are not permitted in the Right of Way (RoW to the benefit of public health and safety).

3.2.6 Specificities On Water Quality Standards

Within the project area, there is the Tano river as well as Ankobra over 1.5 km² in surface area which are used crop irrigation and drinking water for livestock and domestic purposes. In the event that the project requires drawing water from any of these water courses, there shall be the need to monitor the water

quality for quality assurance and reference purposes. Table 3 below outlines the relevant parameters which are to be monitored if the project draws water from these water bodies for constructional activities.

Table 3: Water Quality Parameters for Monitoring & Maximum Permissible Levels

Parameter	Maximum Permissible Level	Parameter	Maximum Permissible Level
Color (TCU)	200	Phosphate P04-P (mg/L)	2.0
Ph (mg/L)	6 – 9	Nitrate N03-N (mg/L)	0.1
Turbidity (NTU)	75	Temperature (Mean) o C	< 3 o C above ambient
Solids Tot. Dissolved (mg/L)	50	Ammonia as N (mg/L)	1.5
Solids Suspended (mg/L)	50	Sulphate (mg/L)	< 400
Conductivity (µS/cm)	750	Chemical Oxygen Demand	250 mg/L
E. Coliiforms (MPN/100ml)	0	Biological Oxygen Demand	50 mg/L
Ammonia as N (mg/L)	1.5	Oil & Grease (mg/L)	1

3.2.7 Additional Requirements

Moreover, the following requirements have also to be adhered to:

- Volta River Development Act, (1961) Act 46 which mandates GRIDCo to construct and operate a transmission system for the distribution of the electrical power generated from the Volta dams.
- GRIDCo (Transmission Line Protection) (Amendment) Regulation, 2004 (LI 1737) which provides for the right of way distances for 69 kV, 161 kV, 225 kV, 330 kV transmission lines.
- Forestry Commission Act (1999), Act 571 which confirms the constitutional position of the Forestry Commission and reaffirms it as the sole implementing agency of government policy in the forestry sector.
- Labor Act (2003) Act 651 which among others provides for occupational health and safety.
- National Museums Decree (1969) NLCD 387 which provides for the care of any archaeological finds.

3.3 International guidelines

3.3.1 The World Bank ESF - Environmental and Social Standards

The World Bank Environmental and Social Framework sets out the World Bank's commitment to sustainable development, through a Bank Policy and a set of Environmental and Social Standards (ESSs) designed to support Borrowers' projects, with the aim of ending extreme poverty and promoting shared prosperity.

The Environmental and Social Standards to be complied with include:

- Environmental and Social Standard 1. Assessment and Management of Environmental and Social Risks and Impacts
- Environmental and Social Standard 2. Labor and Working Conditions
- Environmental and Social Standard 3. Resource Efficiency and Pollution Prevention and Management
- Environmental and Social Standard 5. Land Acquisition, Restrictions on Land Use and Involuntary Resettlement
- Environmental and Social Standard 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Environmental and Social Standard 7. Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities
- Environmental and Social Standard 8. Cultural Heritage
- Environmental and Social Standard 9. Financial Intermediaries
- Environmental and Social Standard 10. Stakeholder Engagement and Information Disclosure

In particular the following standards are of direct relevance:

ESS 1: ASSESSMENT AND MANAGEMENT OF ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS

ESS1 sets out the Borrower's responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through Investment Project Financing, in order to achieve environmental and social outcomes consistent with the Environmental and Social Standards (ESSs)

In terms of Management, the project will require:

- Use of borrower's environmental and social framework ;
- Environmental and social Assessment;
- Environmental and Social Commitment Plan (ESCP);
- Project monitoring and reporting;
- Stakeholder engagement and information disclosure;

Taking into account the findings of the environmental and social assessment and the outcomes of the consultation with affected individuals, communities and other relevant stakeholders, the promoter will develop and implement an environmental and social management plan (ESMP) that, in sum, will describe the mitigation of environmental and social impacts and risks, the performance improvement as well as the opportunities.

ESS 2 EMPLOYMENT AND WORKING CONDITIONS

employment creation and income generation are essential to reduce poverty and to grow economically.

The workers in the project must be treated fairly and work in a safe and healthy environment.

The guidelines of the standard are:

- Working conditions and management of worker relationships
- Protecting the work force
- Grievance mechanism
- occupational Health and Safety (OHS)
- Contracted workers
- Community workers
- Primary supply workers

The LMP will develop and implement written labor management procedures applicable to the project. The procedures will set out the way in which project workers will be managed, in accordance with the requirements of the ESS2. Relations between workers and managers are promoted with the aim of fostering project development by treating workers fairly and providing safe and healthy working conditions.

ESS 3: RESOURCE EFFICIENCY AND POLLUTION PREVENTION AND MANAGEMENT

ESS3 recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. The current and projected atmospheric concentration of greenhouse gases (GHG) threatens the welfare of current and future generations. At the same time, more efficient and effective resource use, pollution prevention and GHG emission avoidance, and mitigation technologies and practices have become more accessible and achievable.

The WB has developed guidelines for:

- Resource efficiency (Energy Use, Water Use, Raw materials use);
- Management of air pollution;
- Management of hazardous and non-hazardous wastes;
- Management of chemicals and hazardous materials;

- Preparedness and Response;
- Management of pesticides

ESS 4: HEALTH AND SAFETY OF POPULATIONS

WB recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration or intensification of impacts due to project activities.

The health, safety, and security risk and impacts on -affected communities should be evaluated and the corresponding measures to minimize them, with particular attention to people who may be vulnerable.

ESS 5: LAND ACQUISITION, RESTRICTIONS ON LAND USE AND INVOLUNTARY RESETTLEMENT

The WB recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons. Project-related land acquisition or restrictions on land use may cause physical displacement (relocation, loss of residential land or loss of shelter), economic displacement (loss of land, assets or access to assets, leading to loss of income sources or other means of livelihood), or both. The term "involuntary resettlement" refers to these impacts. Resettlement is considered involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in displacement.

The ESS5 sets requirements for:

- Eligibility classification
- Project design
- Compensation and benefits for affected persons
- Community engagement
- Grievance Mechanisms;
- Planning and implementation
- Displacement

This standard applies in particular for the definition of the Resettlement Action Plan (RAP).

ESS 6 : BIODIVERSITY CONSERVATION AND SUSTAINABLE MANAGEMENT OF BIOLOGICAL NATURAL RESOURCES

Protection and conservation of biodiversity and sustainably management living natural resources are fundamental to sustainable development. Biodiversity is defined as the variability among living organisms

from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems. Biodiversity often underpins ecosystem services valued by humans. Impacts on biodiversity can therefore often adversely affect the delivery of ecosystem services.

The Biodiversity management plans meet the World Bank ESF ESS6 and international best practice for biodiversity conservation.

ESS 8: CULTURAL HERITAGE

WB recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. People identify with cultural heritage as a reflection and expression of their constantly evolving values, beliefs, knowledge and traditions. Cultural heritage, in its many manifestations, is important as a source of valuable scientific and historical information, as an economic and social asset for development, and as an integral part of people's cultural identity and practice. ESS8 sets out measures designed to protect cultural heritage throughout the project life cycle.

This standard includes in particular guidelines to be applied on:

- Stakeholder consultation and identification of cultural heritage
- Legally protected cultural heritage areas
- Provisions for specific types of cultural heritage
- Commercial use of cultural heritage

The Cultural Heritage Management Plans (CHMP) will identify all cultural heritage likely to be affected by the project and define procedures to avoid or mitigate likely impacts on such cultural heritage, in accordance with the requirements of ESS8.

3.3.2 WHO guidelines for electric and magnetic fields

Limits for electric and magnetic fields have been published by a number of authorities including the World Health Organisation (WHO), the International Commission on Non Ionizing Radiation Protection (ICNIRP) and the National Radiological Protection Board of the UK (NRPB-UK). The two most frequently used guidelines are those produced by ICNIRP (supported by the WHO) and the NRPB-UK. These limits are detailed in Table 4. The current advice from the NRPB-UK is that, apart from standard safety clearances, no special precautions near to power lines are necessary to guard against EMF.

Table 4: NRPB-UK and ICNIRP thresholds for Electro-Magnetic fields

	NRPB-UK		ICNIRP	
	Electric (V/m)	Magnetic (μ T)	Electric (V/m)	Magnetic (μ T)
Public	12 000	1 600	5 000	100
Occupational	12 000	1 600	10 000	500

4 KEY IMPACTS AND MITIGATION MEASURES

4.1 Predictive and Quantitative Standards of Impacts

4.1.1 General

The management plan of the mitigation measures identifies feasible and cost-effective measures that may reduce potentially significant adverse environmental impacts to acceptable levels. The plan includes compensatory measures if mitigation measures are not feasible, cost-effective, or sufficient.

Specifically, the EMP:

- identifies and summarises all anticipated significant adverse environmental impacts (including those involving involuntary resettlement);
- describes the mitigation measure;
- estimates any potential environmental and social impacts of these measures; and
- provides linkage with any other mitigation plans.

The environmental and social impacts of the project on natural resources, human beings and the ecosystems are identified through the direct survey and the information collected through the consultations.

Methods applied to the impact identification and the criteria used in evaluating the levels of impacts significance of the proposed dam construction works are assessed and commented. Detailed qualitative and quantitative analysis of the anticipated changes to the baseline to determine the direct, indirect and cumulative impacts of the project, in each key phase of the project execution are undertaken.

The impacts analysis is focused on both positive and negative impacts and in order to state whether the impacts are positive or negative, direct or indirect, short term or long term, reversible or irreversible. The assessment focuses on the potential for negative environmental and social impacts caused by clearing of lands, increased pressure on fuel wood and water resources, social disruptions and conflicts, threats to woodlands and wildlife species composition and habitats and others.

On the basis of the Terms of Reference, the potential impacts determined by the proposed project have been divided in five different categories based on the type and the chronology of the event:

- Construction stage;
- Operation phase;
- Environmental management plans;
- Resettlement stage; and
- Livelihood restoration stage.

The assessment of the impacts are listed and described in detail taking into consideration the national and international environmental standards, legislation, treaties, and conventions that may affect the significance of the identified impacts.

4.1.2 Significance of the impact

The environmental and social impacts are defined and identified as key issues involving directly the environment of the impacted area, related with immediate or long-term impact on the local populations.

The main key issues are listed and shortly described here after.

Four factors will be considered when assessing the significance of all the social impacts, namely: Relationship of the impact to temporal scales (relating to measured time). The temporary scale defines the significance of the impact at various time scales, as an indication of the duration of the impact. Relationship of the impact to spatial scales (relating to space). The spatial scale defines the physical extent of the impact.

The severity/beneficial scale (state or extent of badness or benefit). The severity of the impact is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party.

The likelihood (degree of probability) of the impact occurring. The likelihood of impacts taking place as a result of project actions differs between potential impacts.

Each criterion is ranked with scores assigned as presented in the ranking table to determine the overall significance of an activity. The criterion is then considered in two categories, effect of the activity and the likelihood of the impact. The total scores recorded for the effect and likelihood are then read off the matrix presented in the following table to determine the overall significance of the impact. The overall significance is either negative or positive. Table 5 shows the ranking of evaluation criteria used. The score is inserted in the significance matrix for the magnitude calculation of the impacts based on likelihood and effect. In Table 6 the significance matrix is shown.

Table 5:Ranking of Evaluation Criteria

EFFECT	Temporal Scale		Score
	Short Term	Less than 5 years	1
	Medium Term	Between 5 and 20 years	2
	Long Term	Between 20 and 40 years	3
	Permanent	Over 40 years and resulting in a permanent and lasting change that will always be there	4
	Spatial Scale		
	Localised	At Localised Scale and a few hectares in extent	1
	Study Area	Proposed Site and its immediate environment	2
	Regional	District and Provincial level	3
	National	Country level	4
LIKELIHOOD	*	Severity	Benefit
	Slight /Slight Beneficial	Slight impact(s) on the affected system(s) or party(ies)	Slight beneficial to the affected system(s) or party(ies)
	Moderate /Moderate Beneficial	Moderate impact(s) on the affected system(s) or party(ies)	Moderate beneficial to the affected system(s) or party(ies)
	Severe /Beneficial	Severe impact(s) on the affected system(s) or party(ies)	Substantially beneficial to the affected system(s) or party(ies)
	Very Severe/Very Beneficial	Very Severe impact(s) on the affected system(s) or party(ies)	Very beneficial to the affected system(s) or party(ies)
	Likelihood		
	Unlikely	The likelihood of these impacts occurring is slight	1
	May Occur	The likelihood of these impacts occurring is possible	2
	Probable	The likelihood of these impacts occurring is probable	3
	Certain	The likelihood is that this impact will definitely occur	4

Table 6: Significance matrix of the impacts based on likelihood and effect

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

The **impact significance** scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society. The following Table 7 shows the significance ratings of the impacts.

The evaluation of the impacts, as described above is used to prioritize which impacts require mitigation measures. Negative impacts that are ranked as being of "**VERY HIGH**" and "**HIGH**" significance should be investigated further to determine how the impact can be minimized or what alternative activities or mitigation measures can be implemented. These impacts may also assist decision makers i.e. lots of **HIGH** negative impacts may bring about a negative decision.

For impacts identified as having a negative impact of "**MODERATE**" significance, it is standard practice to investigate alternate activities and/or mitigation measures. The most effective and practical mitigations measures will then be proposed. Impacts ranked as "**LOW**" significance, will have no or minor mitigation measures and slight alternatives could be considered. Such measures will ensure that the impacts remain of low significance.

Table 7: Description of Significance Ratings

Significance Rating	Description	Score Range
Low	An acceptable impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in either positive or negative medium to short term effects on the social and/or natural environment.	4 - 7
Moderate	An important impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in either a positive or negative medium to long-term effect on the social and/or natural environment.	8 - 10
High	A serious impact, if not mitigated, may prevent the implementation of the project (if it is a negative impact). These impacts would be considered by society as constituting a major and usually a long-term change to the (natural &/or social) environment and result in severe effects or beneficial effects.	11 - 13
Very High	A very serious impact which, if negative, may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are unmitigatable and usually result in very severe effects, or very beneficial effects.	14 - 17

4.2 Construction phase impacts

4.2.1 Solid waste management

Impact features

This Waste Management plan is designed for temporary waste handling and disposal and provides a set of general guidelines for the field personnel and technical staff involved in planning and implementing in order to guarantee the basic safety measures and to eliminate where possible and/or mitigate the social and environmental impacts. The plan deals with the various types of wastes to be generated and preferred/alternative treatments and disposal methods for each waste.

The following issues are developed in the comprehensive section of solid waste management:

1. Waste management;

2. Chemical and used oils and lubricant waste management;
3. Hazardous materials; and
4. Spoil disposal and management.

The general approach is based on the reduction of waste production and the minimisation or exclusion of unnecessary hazardous wastes, such as certain chemicals and substances having reasonable and efficacious alternatives.

Expected waste generation

Specific guidelines have been developed for the expected waste generation. Each waste specific guideline contains:

- a. A definition of the waste type, typical waste examples, and sources of waste generation;
- b. Safety considerations that are specific to the waste;
- c. Waste minimisation options, and
- d. Preferred waste management methods.

The selection of waste management options to be used at a specific site will depend on the site conditions and availability of the facilities (landfill, incinerator, etc.). The most probably wastes that will be generated during the working operations can be divided as follows:

1 Solid wastes

- Domestic Waste/Trash;
- Tires;
- Scrap Metal;
- Glass; and
- Plastic and Rubber

2 Hazardous wastes

- a. Batteries; and
- b. Medical Waste/Trash

3 Oils

- a. Lube Oil /Motor Oil (Used); and
- b. Oil Filters and Oil Filter Sludge

4 Fluid Hazardous wastes

- a. Acid/Caustic Solutions;
- b. Completion and Work-over Fluids;
- c. Paint (and Other Coating) Waste;

- d. Solvents; and
- e. Unused, Spent, Expired, and Waste Chemicals and Additives.

5 Solid-Hazardous wastes

- a. Ash;
- b. Barrels, Drums, Containers and Gas Cylinders (Empty); and
- c. Scrubber Wastes.

6 Spoil wastes

- a. Construction Debris;
- b. Cement, Concrete, Cement-soil Wastes; and
- c. Vegetation Debris.

7 Fluid wastes

- a. Water Treatment Sludge; and
- b. Drum Rinse.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Short term (1)
- Spatial scale: Localised (1)
- Severity: Severe (2)
- Likelihood: Probable (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Moderate (8)**

Mitigation measures

The listed wastes that will be generated, totally or in part, have to be stored or dumped in suitable waste facilities within the project area, so as to avoid a further accumulation of waste on site except for hazardous waste. Hazardous waste will be stored in suitable storage areas. This waste will either be incinerated or collected, registered as hazardous waste, and handed by dedicated companies for suitable disposal.

The district authorities will approve the waste management facilities to be used for all the types of wastes generated during the project components construction. The approved facilities will be re-assessed periodically by district authorities or DoE to evaluate whether the facility still meets the criteria for approval.

The frequency of assessments may vary depending on the type of facility and/or the types and volumes of waste sent to the facility. A target frequency will meet the project work-plan.

In addition to the periodic assessment, if conditions at an external facility change (e.g. a change in management occurs), or a potential problem has been identified, then the facility may be reassessed.

Disposal of materials in project-controlled waste management sites is preferred over the use of third party facilities. However, where dictated by logistics or construction schedule, the district authority approved waste treatment and disposal facilities can be used.

The actual locations of the project waste management facilities will be identified during the phase of Detailed Project and sufficient information concerning prospective site locations sent to DoE and the appropriate local authority. Security provisions for each facility will be commensurate with the level of protection necessary to preserve the integrity of the site and its operations.

Waste landfilling

Landfills are engineered facilities for the burial of wastes, mainly with high solids contents. Typically, landfills should be designed and operated to limit the waste leaking. At a minimum, landfills are typically constructed with a compacted soil at the bottom which acts as a geo-membrane.

Wastes with high oil, salt, or metal content could be of concern in case of a subsurface migration potential to nearby surface or groundwater sources. The Project landfills will be constructed at strategic locations to provide for the disposal of hazardous and non-hazardous wastes generated by the various project related activities.

Waste incinerator

A temporary waste incinerator system has to be used during the project construction and removed upon completion of the works. The system will be located outdoors near the work site to guarantee a nil or negligible risk of contamination of the most sensitive working areas and the future zone of impoundment. The costs for the set-up of waste landfilling and waste incinerator are expected to be inserted in the contract documents for the project implementation and will be charged to the contractor.

Other than the creation of facilities for waste disposal, the following mitigations measures will be employed on site:

- The proponent should ensure that all waste is removed from site and transported by a licensed waste carrier for proper disposal;
- Biodegradable and non-biodegradable wastes will be properly segregated during collection;

- All organic waste generated at labour campsites such as food stuffs shall be collected and transported by the contractor to designated landfills/composting sites within the project area;
- All plastic waste generated at campsites and in the course of undertaking works such as mineral water bottles, polythene bags, jerry cans, should be collected in mobile vans and adequately disposed of and some reused were possible;
- All waste generated from erecting structures should be sorted (biodegradable, non-biodegradable, Metals, Glasses) by the contractor and disposed of appropriately at designated waste disposal sites;
- Anti-vermin safeguards (such as covering bins with lids) will be put in place; and
- During activities, the first priority will be to reduce, re-use and recycle waste in preference to disposal.

The cost of the operation should be supported by the contractor.

4.2.2 Emissions and dust

During the project construction phase, the predominant emissions into air will be mainly dust originating from the heavy traffic, excavation, blasting and crushing activities. There will also be combustion gas emissions from the construction machinery and vehicles.

During the operation phase, emissions into air are expected to be minimal. When a relatively large particle (say 30 µm) is inhaled, it is usually deposited in the nose or upper airways. Finer particles may reach the gas-exchange region in the depths of the lungs, where removal mechanisms are less efficient. Certain substances, if deposited in this region, can cause serious diseases, for example, free crystalline silica dust can cause silicosis. The smaller is the aerodynamic diameter, the greater is the probability that a particle will penetrate deep into the respiratory tract.

Works involving machinery, such as road construction works, can generate substantial amounts of dust, which are generally gross particulate emissions.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Short term (1)
- Spatial scale: Localised (1)
- Severity: Moderate (2)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	17

Significance rating: **Moderate (8)**

Mitigation measures.

Most dust particles range between 0.005 and 100 micrometres (μm) in size. However, dust whose particle diameter is lower than 10 μm (known as PM10) is the most dangerous if inhalable as it penetrates into the tracheobronchial area of the respiratory tract. Respirable particulates of 2-3 pm or less (PM2.5), however, can reach the lungs distal portion. Attention should be paid in implementing proposed measures and revise them if they prove to be insufficient.

Dirt roads used for transit of material and personnel, construction and mining sites where excavation, blasting and crushing activities take place will be considered hotspots and regular watering of access roads, the use of respiratory protective equipment by workers closely involved in excavations, blasting and crushing activities will be a common practice.

Therefore, precise mitigation measures are as follows:

- Efforts will be made to use fuel-efficient and low emissions machinery and vehicles, which will be serviced regularly and in accordance to the manufacturers' specifications to maintain efficiency;
- All emission-producing equipment will be operated only when necessary and unnecessary idling of equipment will be avoided;
- Journey management will be undertaken in order to ensure that only the necessary trips required for the construction activities are made;
- All haul roads will be continuously watered by watering trucks or constant misting, so that surfaces remain damp at all times when in use during construction. The Contractor will make provisions to have adequate amount of water and appropriate equipment to disperse water onsite at all times;
 - Gravel cover shall be applied to unpaved surfaces which are regularly used;
- All truck loads that enter or leave the site will be covered and if required, rumble grids will be installed at site exit points to minimise dust along community roads;
- Clearing of land will be carried out systematically - with clearing restricted to only the required areas so as to minimise disturbed and exposed areas;
- Stockpiles of construction materials will be shielded from wind using bins and monitored daily during the construction phase. In addition, they will be located away from camps and villages;
- All vehicle movements will be subject to risk assessment and all drivers will be inducted in health,

- safety and social and environmental issues;
- A speed limit of 40km/h for light vehicles and 30km/h for heavy vehicles will be maintained on routes used to access the construction sites;
- Community awareness and sensitisation about the proposed project will be created prior to construction activities so that community members become more vigilant and are aware of what to expect in terms of potential nuisances; and
- A grievance mechanism will be put in place to address grievances from local communities.

The cost of the operation should be supported by the contractor.

4.2.3 Noise

Within the construction areas, different locations such as the crushing plants, the quarries will be indicated as hotspots for the generation of high noise levels.

The crusher sites will be located in close proximity to construction sites in order to reduce the radius for the noise pollution sources. Further to these two major sources, the movement of traffic on access roads to various construction and excavation sites outside the dam and crusher areas must also be taken into account.

Noise at high levels is harmful to humans and other animals as it can cause hearing loss. Noise is generally defined as any acoustic energy capable of altering the physical or psychological well-being of individuals. The measurement most often used is the average equivalent sound pressure level (Leq) per unit time (e.g. 24 hours). A logarithmic decibel scale is used for this measurement; in other words, the noise intensity doubles with any increase of 3 decibels (dB).

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Short term (1)
- Spatial scale: Localised (1)
- Severity: Moderate (2)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	17

Significance rating: **Moderate (8)**

Mitigation measures.

For heavy truck drivers, exposure to prolonged high amplitude engine noise (>80 dBA) and/or low frequency, can result in early (severe headache) or delayed (e.g., hearing loss) detrimental effects.

For the public, excessive exposure to noise can lead to sleep interference, communication difficulties, effects on the performance and behaviour of students and a feeling of annoyance that undermines quality of life.

The following mitigations have been proposed:

- Prior notice will be given to the local community members to keep them informed of what will take place. Where necessary, they will be advised to avoid some sections at certain times during the construction phase for safety reasons;
- Noise events will be scheduled for appropriate times of the day to avoid disturbance of any programmed community gatherings;
- Construction activities will be limited to only day time hours (between 06:00 hrs and 18:00 hrs);
- Community awareness of the project activities and schedules will be created to enable community members plan accordingly;
- Unnecessary noise from the construction crew (such as loud vocalisations and music) will be prohibited;
- Adherence to WHO recommended noise levels will be enforced (The WHO recommends an outdoor noise limit of 55 dBA Leq during daytime and 45 dBA Leq at night. A nuisance sound level above 55 dBA in a residential area is deemed as seriously annoying. However, in industrial areas or work environments, a level of 75 dBA Leq [8 hours] is considered acceptable with protection).
- Noise monitoring will be undertaken within the area and at nearby sensitive receptor sites during construction;
- Use of well-maintained and serviced equipment that generates low noise levels;
- Prohibit idling of machinery including vehicles, unless necessary;
- Prohibit off-road driving unless necessary;
- The use of horns should be reserved for safety considerations, and not used as a common communication method;
- Acoustic insulation (e.g. screens or bunds) will be deployed when necessary, especially on compressors, when possible. Equipment will be operated with all noise-reducing components (hoods, screens) in correct positions;
- Noisy equipment will be sited away from sensitive receptors whenever possible;
- In order to mitigate the noise produced during construction, the crushing plant should be located at least one kilometre from human agglomerations;
- The exposed workers will be issued with hearing protection equipment; and

- A grievance mechanism will be established to enable local people express their concerns.

The cost of the operation should be supported by the contractor.

4.2.4 Use of explosive material

During the excavation of the tunnels and the provision of construction materials in the quarry, a large amount of explosive material will be used. Risks are mainly due to human safety, damage to infrastructures and properties and the natural environment involvement.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Short term (1)
- Spatial scale: Localised (1)
- Severity: Moderate (2)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Moderate (9)**

Mitigation measures.

Rules for explosive storage, all health and safety procedures have to follow the National Laws and Regulations.

The cost of the operation should be supported by the contractor.

4.2.5 Vegetation clearing

The clearance operations in the area must be performed with the supervision of an expert by the Forestry Department.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (4)
- Spatial scale: Study area (2)
- Severity: High (2)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	17

Significance rating: **High (12)**

Mitigation measures.

The mitigation measures of the damage created by the clearing of the TL components sites, corridors and the opening of access roads are assessed through the analysis of the satellite images and verified on the ground during site visits.

For the opening of access roads, the community has to be informed in time before work commences in order to avoid the damage of ploughed fields which could be caused by earth moving machinery or during the storage of construction material. If private areas must be used for access roads, they will be compensated for the whole time of using and for the potential loss of harvesting and for the income usually realised for the use of damaged areas.

Specific mitigation measures are as follows:

- After the construction phase, the affected areas will be restored, and only indigenous vegetation replanted. Intentional restoration using exotic plant species will be avoided;
- Prevent vegetation trampling by restricting access to sites along designated routes. Movement of equipment (vehicles, contractors and the entire construction crew) will be limited to the designated access roads. Off-road driving will be prohibited;
- The site clearing exercise will be controlled and limited only to those areas required for the project components. Workers will be prohibited from removing vegetation outside the proposed sites;
- The contractor will avoid locating temporary project infrastructure such as, access roads, quarries, construction camps, storage areas, in sensitive ecosystems (e.g. the riverine forest at the weir). Sensitive areas will be clearly delineated with stakes or flagging to prevent unintentional impacts on these ecosystems;
- Carry out a pre-ground-break survey at the start of construction works to ensure that environmental conditions have remained the same as the baseline conditions presented in this ESIA report. Allowance will be made for the translocation of sensitive species or the realignment of the working area to avoid causing disturbance to sensitive micro-habitats encountered during the earth moving;

- Areas for biodiversity offsets should be identified. New vegetation as to be planted to replace the one that will be lost because of the works. This includes supporting afforestation activities within the project area and beyond;
- Movement of equipment (vehicles, contractors and the entire construction crew) must follow designated pathways or agreed upon access routes: and
- During the clearance, GRIDCo will request the authorities for competent personnel to guide contractor in the clearance of endemic species possibly present in the clearing area.

The Government through the Ministry of Forestry will clear the procedures for replanting these endemic trees in a close area as offset where applicable. Royalties must be paid to the Government based on the volume of the felling trees.

4.2.6 Health concern

The major health concerns related to the project are the outbreaks of diseases linked with the concentration of workers in one single camp, and a potential increase in the spread of HIV/AIDS and other sexually transmitted infections (STIs) among the workers and the local population. Local programmes related to mother and child nutrition, community health awareness, HIV/AIDS awareness, hygiene and immunisation, vector control measures should be identified. Due to the nature of project activities, several health and safety aspects will be related to workshop and earth moving activities and safety, noise, air quality and contamination.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Short term (1)
- Spatial scale: Study area (2)
- Severity: Moderate (2)
- Likelihood: Probable (3)
-

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Moderate (8)**

Mitigation measures.

Some of the specific measures to be employed in addressing the challenges of health are:

- The project will have a health program in place biased to community protection. This will include sensitization of the local community members and encouraging them to use mosquito nets.
- Special specifications in the contract documents should stipulate the need for HIV/AIDS Awareness and sensitization campaigns;
- Ensure that the workers' camp and construction areas are open only to formal employees;
- Provide the workforce with access to primary health care onsite, insecticide-treated mosquito nets, prescriptions, condoms, and basic testing for TB, STDs and HIV/AIDS;
- Inform relevant government ministries to prepare community institutions for any influx of immigrants;
- Provide support to existing or new local programs such as mother and child nutrition, community health awareness, HIV/AIDS awareness, hygiene and immunization, vector control measures (indoor spraying of insecticides, personal protection measures, and control of mosquito larvae), and local Voluntary Counselling and Testing (VCT) programs. The Proponent and its contractors will put in place an STI and HIV/AIDS awareness campaign and services for the construction crew to promote safe sex practices and other control measures in order to reduce this anticipated negative outcome;
- Workers with the exception of local workers who will return to their homes, will be housed in the workers' camp and will have access to health services like HIV/AIDs counselling; and
- All workers will be inducted in relevant codes of conduct that minimize exposure to risky life styles including unsafe sex practices.

4.2.7 Working close existing lines

The planned 330 kV transmission line will intersect an existing line. During the construction phase the application of safety measures working close existing lines could cause the interruption of the power supply along the interfered lines.

The impact will be negative and of low significance due to the loss of energy within the main electric grid. Temporary cumulative impacts will be seen in the loss of income due to the stop of different activities, while long term cumulative effects will manifest in the increment of the noise parameters, and in the effects of the duplicate electromagnetism.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Short term (1)
- Spatial scale: Study area (1)
- Severity: Moderate (1)
- Likelihood: Probable (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	17

Significance rating: **Moderate (7)**

Mitigation measures.

Once the crossing area is identified, a detailed survey will be necessary, in order to minimize the interference actions. Current technology entails that construction techniques can utilize new methodologies of execution in the aim to set up conductors without stopping the power along the closer lines. Nevertheless, for security reasons, power supply will be switched off on the other lines. The monitoring will be performed along the works, recording as indicators no-work time for the loss of electricity.

The cost of the operation should be supported by the contractor.

4.2.8 Fire hazard

Within the future area, the secondary vegetation will be eliminated through the practice of slash and burning. The burning of the vegetation is needed to avoid the production of CH4 during the decomposition of the organic matter. The risk during this process is the propagation of fire to close areas.

The significance rating is Low.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Short term (1)
- Spatial scale: Localized (2)
- Severity: Moderate (2)
- Likelihood: May occur (2)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	17

Significance rating: **Low (7)**

Mitigation measures.

- Fire extinguishers should be installed and maintained on site and placed wherever there is a potential fire hazard;
- Fire surveys will be conducted frequently on site to assess the fire load, type of prevention, and fighting plan required;
- All used flammable liquid containers should be collected and removed from clearing site;
- Packaging materials should be removed on the same day from site, whenever removed from a consignment;
- Training on to extinguish the fire shall be conducted to all workers employed in the clearing areas; Fire-breaks will be created in places where there are potential fire hazards.

4.2.9 Influx of people

An influx of people to the area is expected at construction stage. The influx of people at construction stage will mainly be for seeking work on the project. This is likely to bring strain on the social infrastructure such as health centre and housing in the area. This could result in the development of stressed situations with the associated security and health risks.

Such a concentration of people induces public order issues. These mainly include:

- Property theft and personal insecurity,
- Multiplication of communicable diseases

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Medium term (2)
- Spatial scale: Study area (2)
- Severity: Moderate (2)
- Likelihood: Probable (3)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Moderate (9)**

Mitigation measures.

The management of the anticipated influx of employment seekers foresees the realisation of a temporary police station to be identified and developed immediately on the eastern part of the project area to manage the uncontrolled influx and to reduce the pressure on the villages. Decent facilities for basic needs will be set up, (including tents, water, sanitary facilities, etc). Interaction with local residents will take place through trade of foods and other supplies and could be facilitated by the erection of a temporary market place.

A series of support measures should be provided to local communities, in order to mitigate social, health and economic impacts. Some of these are:

- A local employment and sourcing policy to discourage in-migration, entailing a ban on the employment of casual migrants to the site, and the recruitment of labour through offices located away from the site;
- Inform local communities of employment and procurement opportunities;
- Spearhead the setting up of the police station or police post in the area to prevent crime;
- Inform relevant government ministries to prepare community institutions for any influx of migrants;
- When established as a business venture in the area, support community health programme such as mother and child health, nutrition, community health awareness, HIV/AIDS awareness, hygiene and immunisation, malaria control measures (indoor spraying of insecticides, personal protection measures, and control of mosquito larvae), campaigns to raise traffic awareness, and local Voluntary Counselling and Testing (VCT) programmes ;
- Engage NGO to prepare communities for out-migration of workers (eg by savings schemes, and helping businesses adapt).

4.2.10 Habitat loss, degradation and fragmentation

The project area is characterized by a hilly morphology with steep slopes and deep incisions due to temporary rivers. The building of the TL components will create a negative impact in the area altering the original habitat and ecosystem in the affected area.

The construction operations at area, along the corridor of the transmission line will cause the degradation and the fragmentation of the habitat creating edge effects of encroachment of animals around the settlements and collision with traffic especially at night time.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Short term (4)
- Spatial scale: Study Area (2)
- Severity: Moderate (3)
- Likelihood: Probable (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	

Impact Significance is **High (13)**

Mitigation measures.

The habitat will be directly affected by the removal of vegetation. Additional indirect effects on vegetation consist of dust deposition on plants, emissions from construction equipment and soil erosion. Access to the construction areas by vehicles and equipment will also cause more destruction of vegetation.

Minimisation of the movement around the construction areas along established access roads is therefore necessary. New access roads that are not needed anymore after completion of construction works will be closed and re-vegetated.

Specific measures are as follows:

- Controls over land use, new settlement, poaching, agricultural encroachment and burning;
- Support the Forestry Department in long-term wildlife and vegetation monitoring to document changes in flora and fauna in the surrounding lands and address any problems that may occur;
- Minimise riverbed and shoreline disturbance (eg restricting access of construction activities and workers to susceptible areas that could contribute to sediment loading);

- Implement education programmes for construction workers on, inter alia: respect for wildlife and vegetation avoidance of fires and accidental damage and generally minimising the footprint of the construction camp and work areas;
- Prohibit development of unnecessary roads off the main access roads in order to limit land degradation and habitat disturbance;
- Develop "good construction environmental management" protocols to reduce effects on vegetation and wildlife by covering site working practices, noise management, avoidance of spills, maintenance of pollution control measures such as oil separators and dust management plan; and
- Replant or take measures to encourage recolonisation by native vegetation in disturbed or denuded areas immediately following construction.
- The cost is associated with the rehabilitation of heavily damaged areas together with a suitable reforestation by means indigenous species.

4.2.11 Greenhouse gases

Greenhouse gases (GHG) absorb infrared light reflected or produced by the earth. The consequent retention of heat in the atmosphere is referred to as greenhouse effect. The major greenhouse gases are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), Hydrofluorocarbons (HFC), Perfluorocarbons (PFC), Sulfur hexafluoride (SF₆).

Land clearing for the transmission line and the new substation, material transport and disposal will be responsible for the emissions.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Short term (1)
- Spatial scale: Study area (2)
- Severity: Slight (1)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Moderate (8)**

Mitigation measures.

As a **compensatory** measure, it is proposed to reforest the same area that was deforested for the opening of the line path, the wooded area of the substation and the access tracks, i.e. a total area of:

Transmission Line	359 ha
Wooded part of the post	5 ha
Access points	4 ha
Total areas to be reforested	368 ha

Added to this reforestation of 368 ha is compensation for the 62,897 TCO2eq .

77,916 TCO2eq GHGs are emitted by the work minus the 15,019 TCO2eq GHGs due to the recycling of metals at the end of their life . If we maintain the principle of one hectare of reforestation for one deforested ha (**368 ha** for a lack of GHG sequestration of 178,001 TCO2q, or 557.47 TCO₂ per hectare), reforestation compensation for construction activities is estimated at: 62,897 TCO2eq: 557.47 TCO2eq /ha, or **113 ha** to be reforested to compensate for the GHGs emitted by construction work.

In total, it is therefore proposed to reforest 368 ha + 113 ha = 481 ha(= 4.81 km²).

This reforestation program will respect the following principles promulgated by specialized international agencies such as the IPCC (or IPCC) and the BioCarbon Fund of the World Bank::

- Respect for the interaction between biodiversity conservation, sustainable development and climate protection so that reforested plots can shelter species displaced by the project and support the local agroforestry economy by planting a mixture of indigenous forest species, shade trees for extensive traditional crops (cocoa trees, coffee trees) and utility or fruit trees.
- Integration of the reforestation program to ensure that local residents accept it and cooperate,
- The creation of local nurseries employing local residents,
- The use of a mixture of native species while taking into account local soil and topographical conditions,
- The removal of exotic species and potentially invasive species, thus ensuring ecological integration through the rehabilitation of the original phyto-sociological communities,
- The banning of monospecific plantations of the same age that are unsuitable for local ecological conditions and could harm the succession of natural vegetation and faunal populations,
- Improving biological connectivity along watercourses and on hillsides to minimize the fragmentation of natural habitats and genetic loss.
- To facilitate this reforestation option, an own reforestation plan should be drawn up in close consultation with the local authorities.

4.3 Operation phase impacts

4.3.1 Transmission line emissions

An electric field occurs when an electric charge or voltage is present and is a product of the force which electric charges exert on each other. Magnetic fields are produced by the flow of the electric current and are the basis of electromagnets and electric motors. Consequently, electric and magnetic fields (EMF) arise from anything which produces, carries or is powered by electricity. The strength of an electric field varies with the voltage of the transmission line, whereas that of the magnetic field relates to the current flowing in the conductor.

Typical values of the electromagnetic field for a 330 kV lines are:

- magnetic induction field (B) 12 μ T
- electric field (E) 2kV/m

Such values refer to the fields' intensities measured at 1.5m above ground and conductor at minimum clearance to ground of about 6-7m.

Electromagnetic fields and the effect of differing kinds of radiation on humans are matters of mounting concern. The focal health outcome is naturally cancer and a fairly copious literature has emerged. Associated writing probes the effect of EMF on livestock, with obvious implications for rural property valuations near power lines. Still further studies have investigated impacts on plants, insects and wildlife.

Indirect impacts are seen in the influx of electric and magnetic field on human beings and nature and the resulting side effects. The cumulative effects are considered the burden of the health facilities in charge of the cases, and the loss of income due to the transmission lines effects on the productive members of the affected families.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Short term (1)
- Spatial scale: Study Area (2)
- Severity: Moderate (2)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	17

Significance rating: **Moderate (9)**

Mitigation measures.

To avoid the electric field and the magnetic field, corridors are foreseen to be left free from any use by the people living in the project area; 44m wide for the 330 kV TL. Census of the people living along the proposed transmission lines will be conducted and documented in the Resettlement Action Plan for implementation. Other auditable measures are:

- Organise awareness creation workshops/ rallies (Education) regularly;
- Permanent residence not permitted in the high voltage RoW;
- Evaluate potential exposure to the public;
- Mount 24 hour surveillance through the substation control unit – to detect any anomalies and/or interruptions along the transmission line; and
- Enforce way leave requirements for transmission lines.

4.3.2 Risk of bird collision and electrocution

The impact of the construction phase will mean that terrestrial fauna living near transmission lines will be repelled during breeding, hunting and other activities related to the biological development of the species. For terrestrial fauna, the impact will be less severe than for terrestrial vegetation and a short adaptation period to the new environment out of the transmission line corridor is expected.

A particular level of impact is addressed to electrocution and collisions of large birds with transmission lines. Electrocution occurs when birds touch two cables or when they roll over a conductive pole (e.g. metal) and at the same time they touch a live cable.

Birds are the group of animals most affected by the Overhead Lines (OHL). The two main types of risks to birds from airlines are:

- Risk of electrocution; and
- Risk of collision.

Birds sitting on power poles and / or conductor cables are killed if they cause short circuits (short between live wires or short to ground). Electrocution can be largely avoided by proper design of poles, conductors and insulators.

During their flight, birds can collide with the cables of transmission lines because the cables are often difficult to see. In most cases, the impact of the collision results in immediate death or fatal injury and bird mutilation.

The risk of collision with birds depends on the arrangement of the conductor cables and the ground wire. The greatest risks are posed by these power lines, where the conductor cables are laid out at different levels or where the earth cables can be found above the conductor cables. The basic risks of bird collision

can be related to these constructions, which have all the conductor cables laid out at one height. Due to this aspect concerning avifauna, the impact can take on a level of medium importance.

The corridor of the main transmission line does not cross or touch areas of high ecological value such as protected areas or natural wetlands, but several species could use the line corridor for different reasons.

There is some risk to large birds like some water-related birds in the event of a collision with drivers. Electricity structures are an important nesting substrate for many birds. Large birds nesting above insulators can pollute insulating strings and cause flute-related faults. Some species use pieces of wire as part of their nesting material. These can cause flashovers when nests collapse and pieces of wire snag the air gap between the live conductor and the tower structure. This problem can be tackled as part of a nest management strategy involving relocation of nests coupled with appropriate pole management techniques.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (4)
- Spatial scale: Study area (3)
- Severity: Moderate (2)
- Likelihood: Probable (3)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **High (12)**

Mitigation measures.

Power poles with suspended insulators are quite safe, provided that the distance between the crossed arms and live parts (conductors) is at least 60 cm. The conductors must be spaced at least 140 cm apart. The conductor and the insulators of the pylons, if properly arranged, will prevent electrocution.

Various activities related to the construction and maintenance of overhead lines can impact humans and animals in the immediate vicinity of the easement and the impact can be mitigated by appropriate procedures.

Mitigation techniques have generally focused on:

- preventing an approach to the pole or climbing towers,
- controlling the height of trees along the corridor to keep their tops away from cables,

- o the possibility of making the overhead line more visible to birds by using markdown devices,
- o the use of danger signals near through roads or inhabited areas.

4.3.3 Insulation of energized parts where birds could nest

Interactions between wildlife and power lines are generally perceived as negative, with electrocutions and collisions creating conservation concerns, and power outages and arcing creating reliability and fire-risk concerns. Electrical pylons are frequently used by birds for perching, roosting, and nesting. These behaviors can lead to electrocutions, particularly when pylons are constructed of grounded concrete and steel crossarms and population declines for a number of raptor species have been attributed to electrocutions. Despite those concerns, power lines can also be beneficial for some species when pylons supporting the lines provide perching, roosting, and nesting opportunities for birds in landscapes that contain all the resources needed for survival and reproduction except a suitable nest substrate.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Long term (3)
- Spatial scale: Study area (3)
- Severity: Moderate (2)
- Likelihood: Probable (3)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **High (11)**

Mitigation measures.

Suitable nest boxes can be installed on the towers before the breeding season and must be within an insulated area. Each nest box should be constructed of untreated wood boards cut to create a box 50 cm long × 50 cm deep × 40 cm tall, with a sloped roof (10°). Nest boxes included a 30cm opening on one side, and a platform on that side to facilitate an entry with the opening faced away from prevailing winds, which varied across the corridor. The floor of each nest box with a mixture of soft sand and clay to mimic the floor texture of natural cavities, and to prevent eggs from rolling inside the nest box. The box installation will be in the upper area of the towers. The number of the boxes can vary depending from the landscape and the vegetation around the area.

4.4 Environmental management phase

4.4.1 Loss of habitat and biodiversity

Three major natural habitat types are identified in the study area:

- freshwater forest swamps and river galleries
- wet evergreen forests between the Lower Tano and Fum rivers,
- transitional moist evergreen forests with deciduous trees mainly between the upper Bia River valley and the upper Fum river valley.

Much of the area outside the protected zones has been deforested and replaced by cash crops plantations (cocoa, coffee, oil palm, coconut, rubber tree), a mosaic of traditional cultivations of food crops (banana, pineapple, cassava, plantain, groundnuts, vegetables and cocoyam), farm regrowth (fallows) and young secondary forests which permit some savannah species to penetrate the forest zone.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (3)
- Spatial scale: Study area (2)
- Severity: Moderate (3)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **High (12)**

Mitigation measures.

The habitats within the construction areas will be directly affected by removing plants, cutting down shrubs and felling trees. Additional indirect effects on vegetation are dust generation, emissions from construction equipment and soil degradation. Plants growing on areas set aside for storing building materials and dumping rubble will also be affected. Access to all the components by vehicles and equipment will cause more destruction of vegetation. If the soil is subsequently erodes, this destruction will be permanent.

Specific measures are as follows:

- Controls over land use, poaching, agricultural encroachment and burning;
- Support the relevant institutions in long-term wildlife and vegetation monitoring to document changes in flora and fauna in the surrounding lands and address any problems that may occur especially in sensible areas such as the Nadarivatu/Nadala Forest Reserve and the Mt. Tomanivi Nature Reserve that are not crossed by the line route but are in the nearby;
- Minimise riverbed and shoreline disturbance restricting access of construction activities and workers to susceptible areas that could contribute to sediment loading;
- Implement education programmes for construction workers on, inter alia: respect for wildlife and vegetation avoidance of fires and accidental damage and generally minimising the footprint of the construction camp and work areas;
- Prohibit development of unnecessary spur roads off main access roads, to limit land degradation and habitat disturbance; and
- Replant or take measures to encourage recolonisation of endangered or vulnerable' in disturbed or denuded areas immediately following construction.

The cost for the impact is associated with the rehabilitation of the access roads together with suitable reforestation.

4.4.2 Loss of animal corridors ensuring sustainability of habitat

The potential corridor will be affected by the presence of the new impounding.

The analysis of the library or the consultations with the local population on wildlife in the area do not indicate the presence of historical path potentially being impacted by the new transmission lines corridors.

Minor movements have anyway to be considered, also if the likelihood of this impact occurs is slight.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (1)
- Severity: Moderate (2)
- Likelihood: Certain (1)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **High (5)**

Mitigation measures.

Suitable mitigation measures are linked to potential minor wildlife movements in the area.

The main mitigation measures are:

- Locate all associated infrastructure, temporary and permanent related to construction such as construction camps, access roads and borrow pits in already disturbed habitat locations to minimise habitat loss and human/wildlife interactions;
- Minimise the width of construction of new or upgraded roads;
- The mitigation measures listed on fire hazards and vegetation apply to the minimisation of loss of animal corridors;
- Study of the animal movements records and planning of eventual new corridors.
-

4.4.3 Change in land use patterns

Because of the creation of the impounding and the construction of the project components, a natural change of the land use will occur. The land occupied by project and involved in the earth moving will be strongly impacted. Mismanagement of different land use areas and anthropic pressure on wildlife zone can affect the balance between wildlife and human population and the rural livelihood activities.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (2)
- Spatial scale: Study area (2)
- Severity: Moderate (2)
- Likelihood: Certain (3)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **High (9)**

Mitigation measures.

No sensible area is identified. The access roads to the TL would be carefully planned to restore the general landscape of the project area. However, if any private land is encroached on, mitigations will be achieved through the Resettlement Action Plan to be developed for the Project with its associated Livelihood Restoration Plan to be implemented in applicable circumstances.

Specific studies must be carried out close the components within sensible areas.

4.4.4 Erosion and soil degradation

All the cleared areas during the construction activities will be prone to erosion under heavy rainfall conditions. After the construction works, all the cleared areas along access roads will be prone to erosion under heavy rainfall conditions and this will result into land degradation making areas unsuitable for agricultural activities. Soil erosion may also be caused by poor design. The effect likely to be minimal, the resultant effect will be reflected on the local economy especially on the decrease in yield on crops and livestock.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (1)
- Severity: Moderate (2)
- Likelihood: Certain (2)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **High (6)**

Mitigation measures.

Access roads and construction sites in steeper areas will lead to permanent destruction of the soil and act as an agent for soil erosion. These effects will be mitigated by minimising the removal of the topsoil in construction areas and bringing back the topsoil during rehabilitation.

In steeper slopes, erosion control measures such as replanting of grass/ shrubs will be implemented. Access roads not needed anymore will be closed and areas rehabilitated and re-vegetated. Specific control measures are as follows:

- There will be controlled clearance of vegetation and this will be limited to only sections that are required for the access and installation of the project infrastructures to prevent soil erosion;
- Where possible, construction activities will not take place during heavy rains;
- Disturbed areas will be rehabilitated using suitable indigenous grass cover and tree species.
- As a long term strategy of mitigating project impacts resulting from vegetation clearance, mitigating climate change impacts and protecting and preserving the water catchment from excessive depletion and degradation, a long term tree planting program will institute along the most sensible zones.
- Storage of fuels and oils should be undertaken in a manner that does not allow leakage to the soil as the fuel can readily infiltrate the soils polluting the soils, ground and surface water;

4.4.5 Impact on landscape

The project site landscape will be compromised during the construction of TL (TL, roads, spoil areas, etc.), and the operation phase. The areas with greater landscape impact are likely to be:

- Those selected for spoil excavation and stockpiling of construction material;
- The nearby areas will be cleared to allow movement of vehicles and personnel involved.

SIGNIFICANCE OF THE IMPACT

• Temporal scale:	Permanent (4)
• Spatial scale:	Study area (2)
• Severity:	Moderate (3)
• Likelihood:	Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	17

Significance rating: **High (13)**

Mitigation measures.

The impact on the upstream zone landscape can be considered negligible in light of the future impounding, but the downstream area will have to be effectively controlled in order to re-establish the areas to baseline landscapes. Specific mitigation measures are:

- All areas used as access roads or for material stockpiling downstream will be re-shaped to mimic baseline landscape with extreme care to avoid soil erosion;
- Woody vegetation will be re-planted to offer suitable cover for the animals;
- Further landscaping and re-vegetation processes will be undertaken at the disturbed areas; and
- The topsoil stockpiled will be used to cover exposed rocks and substratum for immediate reforestation.

4.4.6 Forest encroaching and fire hazard

The opening of new access roads for the construction of the project components, potentially trig the colonization of areas for cultivation purpose or charcoal production. The clearing traditionally made burning the colonized land could affects surrounding areas including the riverine vegetation compromising the status of the rivers' ecosystems. Therefore, with the significant land take by the project in the area, fire hazard management assumes an important place amongst the risks to be considered in the area.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (2)
- Severity: Moderate (2)
- Likelihood: Certain (2)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Low (7)**

Mitigation measures.

- Fire surveys will be conducted frequently on site to assess the fire load, type of prevention, and formulate fighting plan required;
- Forest encroaching must be discouraged patrolling the access roads; an awareness program for local populations on habitat conservation must be planned

4.4.7 Impact on vegetation

The vegetation within the impounding area and close to the TL components will be cleared to allow the project set up. Vegetation of different types will be cleared affecting the surrounding environment directly (loss of plants and different species), and indirectly (negative aspects affecting the ecosystem and the local food chain).

The study on the flora in the area has revealed that all the proposed sites do not harbour any endangered species. However, extreme caution will be exercised during vegetation clearance to identify any missed protected species.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (4)
- Spatial scale: Study area (2)
- Severity: Moderate (2)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **High (12)**

Mitigation measures.

In spite of the high significance of the impact on the vegetation, the preservation of the endemic species should be instituted.

General guidelines proposed for the clearing of vegetation should be followed.

The construction workers involved in vegetation clearing around dam areas will be assisted by a biodiversity specialist in order to ensure that only areas needed for the project are cleared and unaffected areas are protected.

Mitigation measures are similar to those of vegetation clearing at construction stage. These are:

- Any affected areas will be restored to mimic baseline values and only indigenous vegetation will be used for re-vegetating affected areas. Intentional restoration using exotic plant species will be avoided;
- Prevent vegetation trampling by restricting access to sites along designated routes. Some access roads created at construction stage will be closed and rehabilitated. Off-road driving will be prohibited;
- The site clearing exercise will be controlled and limited only to those areas which are necessary for the project. Workers will be prohibited from removing vegetation outside the footprints of the TL project;
- Suitable nurseries will be created to preserve the endemic vegetation cleared;
- In case of critical areas, suitable zones destined to the biodiversity offsets should be identified and vegetation planted to replace the ones lost due to the implementation of the project. This includes supporting afforestation activities within the project area and beyond.

4.4.8 Impact on terrestrial fauna

The impact of the construction phase will involve the terrestrial fauna living within and close to the TL components which is likely to be pushed away during breeding, hunting and other activities linked with the biological development of the species. For the terrestrial fauna the impact will be less severe than for the terrestrial vegetation and a slow period of adaptation to the new environment more or less far from the project area is expected.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (4)
- Spatial scale: Study area (2)
- Severity: Moderate (2)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **High (12)**

Mitigation measures.

Due to the presence of conservation areas, it will be easy for the fauna present in the proposed impounding area to migrate and find new locations for settling. The small mammal species will be negatively impacted during the construction and forest clearing phase and will be more exposed to predators, while seeking alternative dens and tree holes and adapting to life in the surrounding habitats.

Therefore, the following mitigation measures will safeguard fauna in the area:

- Use well maintained and serviced equipment that generates low noise levels;
- Idling of vehicles and machinery will be prohibited unless necessary;
- Off-road driving will be prohibited. The use of vehicle horns will be reserved for safety considerations, and not used as a common communication method;
- Equipment will be operated with all noise-reducing components (hoods, screens) in the correct position;
- Habitat disturbance should be minimised by restricting the project activities to only the maximum area required;
- Unnecessary cutting of vegetation should be avoided;
- To minimise death of fauna, vegetation clearance should always be undertaken manually first, as this scares away most of the fauna, as opposed to direct use of graders to clear routes for access road construction, or direct dumping of construction materials and excavated soils; • Workers should be discouraged and sensitised not to harass the fauna • Monitor operation activities at the open headrace.

4.4.9 Cultural heritage

Cultural heritage is a reflection and expression of people constantly evolving values, beliefs, knowledge and traditions. It's a source of valuable scientific and historical information, as an economic and social asset for development, and as an integral part of cultural identity and practice.

The project could have impacts on cultural heritage sites, involving excavations and movement of earth, or other changes in the physical environment.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (4)
- Spatial scale: Study area (2)
- Severity: Moderate (2)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **High (12)**

Mitigation measures.

All cultural sites in the area (if present), have to be marked for identification.

A Cultural Site Management Plan for the identified sites will be formulated in collaboration with the authorities in charge of the national heritages to ensure sites are recorded for importance and conservation. Due to the potential risks and impacts of a project, the environmental and social assessment will involve the participation of cultural heritage experts.

The proposed mitigation measure that should be discussed into the Cultural Site Management Plan foresees the relocation of the identified with the following steps:

- Detailed survey,
- Photos and Film,
- Cataloging,
- Removal and relocation at higher level.
- If other cultural heritages are encountered during the construction or operation phases, these steps will be followed:
 - The heritage resource will be secured and all activities in the immediate vicinity ceased / suspended;
 - The person who discovers the chance-find should record the following information; excavation position (GPS coordinates), depth of find in a hole, digital image of the hole showing the vertical section and the digital image of the find;
 - The authorities should confirm that the discovered resource falls within the heritage resource description, to report for preservation and protection. Rescue excavation or in-situ conservation

will be proposed based on the disturbance likely to be caused by the project or in relation to cost or value of the heritage resource

4.5 Resettlement phase

Here in these paragraphs are described the foreseen impacts and suggested the related mitigation measures. The total cost of the measures is given in the Resettlement Action Plan Report.

4.5.1 Replacement of houses and structures

The expropriation of land within the project area will cause the replacement of houses and associated structures. Delay in planning could cause serious impacts to the households earmarked for resettled. Methods and timing are the two main parameters that can affect this issue due to the essential needs of the affected people to have adequate shelters before the commencement of the project. Sometimes people in the area live and work within their compounds. Therefore, if affected, their entire livelihood will be affected.

The impact is generally considered of high level, but because the irrelevant effects due to the lack of structure in the project area, such impact is considered low.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (1)
- Severity: Moderate (1)
- Likelihood: Certain (1)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Low (4)**

Mitigation measures.

In the project area there are not structures to be replaced.

4.5.2 Replacement of land

Agriculture and farming are the main activities performed in the project area, and the abandonment of the land means loss of territory and economic income. The lack of a detailed land use plan could critically disrupt the living conditions of the affected people increasing the conflicts amongst farmers and other land users.

The impact on land will involve the loss of harvest or possibility of grazing for the livestock. This impact is considered of moderate level.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (4)
- Spatial scale: Study area (2)
- Severity: Moderate (3)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	17

Significance rating: **High (13)**

Mitigation measures.

Land located within the footprint of the project must be replaced with equivalent portions in terms of area and soil quality or leased at market value. The eligibility criteria for the compensation are supplied by the national rules and regulations. The criteria must fulfil the requirements of the WB Bank in Environmental and Social Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement .

The following form the basis of eligibility criteria:

- The proponent espouses the principle of compensation and assistance in proportion to the extent of the impact. Specifically, the proponent will pay for land and assets taken permanently (for instance taken up by pylon footings, maintenance roads etc), will rent land or structures taken temporarily (e.g. construction roads, maintenance activities) and will pay fees for restricting use rights (e.g. waterway). In each case, the value will be established by Real Estate Valuator and negotiated with the proponent or its intermediary agent with the owner or occupier. Land and

assets taken permanently will be valued for the production foregone or market rental value, as applicable, for the period the land is required by the proponent;

- Further, the proponent will recognise formal and potential legal rights to land, including customary and traditional rights as defined in the Laws of Ghana. All such legal owners and titleholders of land will be eligible for prompt full compensation for the assets taken (e.g., structures, land, trees) and where necessary, support after displacement to restore income earning capabilities, in proportion to the extent of impact;
- Persons who have no recognisable legal rights or claim to the land they are occupying maybe provided with resettlement assistance in lieu of compensation for the land they occupy, and other assistance, as necessary, to achieve the objective of sustainable development. As a matter of principle and of practical necessity, to avoid opportunistic encroachment, the proponent will conduct a baseline census (and if required for economic rehabilitation, socio-economic census) to determine the number and tenure status of each displaced person in the area under consideration
- for either permanent or temporary acquisition. The date of cut-off for eligibility will be determined by the date of the census. the proponent may, at its discretion, issue identification cards to displaced persons in order to certify their status as affected people. Those persons without formal tenurial (including tenants) will not be entitled to assistance under the resettlement program;
- In that context, the proponent espouses the principle that compensation and assistance is proportion to the extent of the impact, taking into account the possible special needs of vulnerable people in the area. In other words, the company will pay open market value for all land taken permanently, pay appropriate rent for all land taken temporary (e.g. construction access road) and may pay appropriate fees for any restriction of use rights.

4.5.3 Damages to crops and other properties

Damage to crops and other minor assets could happen during the construction works in the area. Generally the damages are related to activities of the earth-moving machines on proposed sites and along access roads. This could affect crops and dwelling places.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (2)
- Severity: Moderate (1)
- Likelihood: Certain (2)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	17

Significance rating: **High (6)**

Mitigation measures.

In the event that there is property or crop damage, the following procedures will be followed:

- the proponent will contract, on the basis of least-cost bid, a real estate valuator to assess the value of structures and other immovable assets that have been damaged;
- To the undepreciated replacement value of property, the proponent will add an inconvenience premium to cover the disturbance due to the uncertainty of tenure created by notice. While every displaced person will receive an inconvenience premium, the amount will vary with a particular need of the individual in order to provide needed assistance to vulnerable groups; and
- Standing crops could also be destroyed during the construction of access roads and quarrying activities. In this case, valuation will be equivalent to the value of the produce (as if ready for harvest) that would be harvested from the area taken. The value of the produce or crop in turn, is set as the market value midway between peak market prices and seasonal low market prices; and
- For timber trees (natural or planted), the National Forestry Department will establish the value through the stumpage value assessment in the area. Other improvements (e.g., borehole, water tank) will be valued at undepreciated replacement rates and may be replaced.

The traditional leadership or local authorities will attend to disputes to guarantee the positive resolutions.

If not attainable, the dispute will be subjected to the established grievance redress mechanism.

4.5.4 Loss of trees

Loss of trees is generally considered one of the main issues in the resettlement action plan because of the loss of income. The mitigation measure in kind is not always the best way of compensation and the new areas for cultivation are sometimes unfertile for cultivation. The impact is considered of moderate significance.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (2)
- Spatial scale: Study area (2)
- Severity: Moderate (2)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	17

Significance rating: **Moderate (10)**

Mitigation measures.

- Affected trees will be assessed physically;
- Each tree will be separately valued in terms of specie, age or maturity and productive value;
- Updated national compensation rates established by the Ministry of Forestry and Agriculture will be used for valuation; and
- For timber trees (natural or planted), the Forestry Department will assist GRIDCo and Lands Commission in establishing the values of affected trees.

4.5.5 Loss of crops

During the design phase of the TL, a series of cultivated lands are likely to be affected. Land equivalent to that lost in terms of size and fertility will be given to the PAPs and funds released to cover the preparation of land for production.

During the construction period, the crops within and close to the proposed project area will be moderately affected by the earth-moving machinery and the movement of project vehicles. Moderate impact will be recognised in the breakdown of the traditional activities of the PAPs, and in the loss of basic income realised from crops.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (1)
- Severity: Moderate (2)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Moderate (8)**

Mitigation measures.

- A comprehensive crop impact survey should be conducted to capture all affected crops within the footprint of the project, their owners and the replacement costs. Valuation of such property should be conducted by experienced and registered independent valuers engaged by GRIDCo in conjunction Land Commission into RAP for the project.
- Standing crops will be valued equivalent to the value of the mature crops (as if ready for harvest) that would be harvested from the area taken. The value of the produce or crop should be set at the market value midway between peak market prices and seasonal low market prices;
- Prior to compensating the PAPs, adequate community sensitisation meetings should be carried out to ensure that the PAPs are aware of the entire program including visitation schedule per village and how each PAP will be contacted and approached for payment for the loss of crops;
- Prior to the compensation process, the PAPs should be individually notified about the compensation amount to be paid and the proposed form of compensation e.g. cash for crops, etc. The PAPs may accept or refuse the compensation proposed depending on their expectations and loss incurred; and

If compensation amounts are not accepted by some affected people, then grievance redress mechanism can be followed.

4.5.6 Resettlement disturbance

The disturbance during the resettlement phase is mainly through the loss of accommodation causing a general loss of organisation in the traditional way of life of the households.

This impact is judged to be low due to the number of affected dwelling places.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (1)
- Severity: Moderate (1)

- Likelihood: Certain (1)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	15	16
4	7	8	9	10	11	12	13	14	15	16	16	17

Significance rating: **Low (4)**

Mitigation measures.

The interruption of the economic and commercial activities due to the construction will cause loss of benefits during relocation time and should be quantified and compensated for. The main elements of mitigation measures are:

- Inform affected people of their options and rights concerning resettlement;
- Provide technically and economically feasible options for resettlement based on consultation with affected people and assessment of resettlement alternatives;
- Whether economical relocation is required or not, provide affected people with prompt and effective compensation at full replacement value for loss of assets due to project activities;
- Provide affected people with transitional financial support (such as short-term employment, subsistence support, or salary maintenance); and
- Where necessary, provide affected people with development assistance in addition to compensation for lost assets described above such as land preparation, agricultural inputs, and credit facilities for training and employment opportunities.

4.5.7 Protection of vulnerable categories

During the preliminary socio-economic assessment, the rough estimate and type of vulnerable people have been would be assessed in line with World Bank standards and contained in the RAP for the project.

Specific measures addressing the vulnerable people will be drawn in order to mitigate adverse impacts. Indirect impacts are recognised in the insecurity of such categories for an indeterminate period after the resettlement, and they have been considered during the implementation phase.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (1)
- Severity: Moderate (1)
- Likelihood: Certain (2)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Low (5)**

Mitigation measures.

- Vulnerable categories are identified in relation to their low capacity to handle or benefit from resettlement and their higher risk of falling into deeper impoverishment due to social factors (age, gender-aspects or social aspects such as loss of parents), disabilities and environmental factors;
- The resettlement process will be more precarious for those living alone, and extra care in handling their entitlements is required in this regard. Elderly and people with disabilities are presumed to be under the care of family members and therefore less at risk with regards to resettlement. The most immediate risk that the vulnerable categories will be exposed to is noted in relation to securing their entitlements. A concrete association of support and responsibilities has to be nurtured between the vulnerable people and the potential caretakers by helping them during the entire resettlement period; and
- Make recommendation to the department of Social Welfare to provide any additional support beyond those that will be offered under the project to the vulnerable persons who will be displaced.

4.5.8 Consultations and disclosure process

The consultation process is performed to allow public participation on the proposed project. It allows discussions related to the project, the stages reached, and the relation between benefits and risks. Through consultations, the stakeholders are engaged through public gatherings, focus group discussions and background information documents. Through these fora, information on the project is shared and

key environmental and social impacts are discussed. Subsequent consultations involve outlining strategies for collaborative community participation and information disclosure.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (2)
- Severity: Moderate (1)
- Likelihood: Certain (2)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Low (6)**

Mitigation measures.

Project stakeholders should be involved at every level in order to avoid misinformation about the project.

Some particular benefits of the consultations are:

- To prepare communities on potential emergency scenarios that could be caused by the project and can affect the communities in the area;
- To build a trusting relationship with the affected communities and other interested stakeholders based on a transparent and timely supply of information and open dialogue;
- To ensure effective engagement with local communities and other key stakeholders throughout all phases of the project; and
- To actively build and maintain productive working relationships, based on principles of transparency, accountability, accuracy, trust, respect and mutual interests with affected communities and other stakeholders.

4.5.9 Grievance Redress Mechanism

Grievances relating to any aspect of the project will be dealt with through the appropriate channels as laid down by local regulations. A procedure for the submission of grievances and how they will be managed has to be put in place. From past experience, it is envisaged that most of the expected grievances related to the project will be regarding entitlement to compensation.

Even when the project can ultimately claim successful resettlement, there may still be individuals and groups who may feel that they have been treated unfairly. Providing credible and accessible means for PAPs to pursue grievances allows the project to address genuine issues in a timely manner and decreases the chances of resistance to the project. The impact is considered of medium level.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (2)
- Severity: Moderate (2)
- Likelihood: Certain (2)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Low (7)**

Mitigation measures.

In compliance with the Environmental and Social Practices Handbook, the grievance mechanism must be clear from the beginning in order to avoid complaints due to misunderstanding.

GRIDCo shall set up and maintain a grievance mechanism that is independent, free and in line with the requirements set out in Standard 10 and that will allow prompt addressing of specific concerns about compensation and relocation from the affected people and host communities and other directly involved entities. The mechanism will be easily accessible, culturally appropriate, widely publicised, and well-integrated in the promoter's project management system. It would enable the GRIDCo to receive and resolve specific grievances related to compensation and relocation by affected persons or members of host communities and use the grievance log to monitor cases and improve the resettlement process.

4.5.10 Inter-agency coordination

Resettlement procedures require measures of assistance to the displaced persons to be implemented in accordance with the RAP for the project. Whenever there are activities requiring relocation or loss of shelter, different institutions and organisations will have a coordinated responsibility.

The risk to have lack of coordination amongst the different stakeholders of the project is high if a rational plan is not foreseen in advance and some relevant authorities are not recognised. The impact is considered negative and of low level.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (2)
- Severity: Moderate (1)
- Likelihood: Certain (3)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Low (7)**

Mitigation measures.

The GRIDCo remains the institution with the overall responsibility to ensure an effective and people sensitive process of resettlement. An inter-agency collaboration will involve the close collaboration among all stakeholders with varying but complementary jurisdictions over the TL. Government authorities whom by virtue of their mandate under their jurisdiction such as EPA, traditional leadership, Municipal/District Assemblies and Lands Commission will pursue all administrative and management related functions in coordination with the proponent regarding resettlement.

4.5.11 Support to PIU

A Project Implementation Unit will act as an advisory body during the whole implementation phase of the project including Resettlement Action Plan (RAP). The risk to face the action phase without a well-built organizational support could lead to unsuccessful implementation of the project mainly due to a number of grievances of opposition to the project.

The moderate impact can be found in the low quality of the economic and social resettlement issues, and a general dissatisfaction originating from social conflicts.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (1)
- Severity: Moderate (2)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	17

Significance rating: **Low (8)**

Mitigation measures.

A PIU must be set up in order to satisfy the complete panorama of the stakeholders and to have all the expertise required for the implementation phase. Together with the client, the PIU is expected to be present at all meetings with the authorities and other stakeholders including the PAPs representatives.

4.6 Livelihood restoration stage

4.6.1 Agriculture production

To compensate the loss of land and/or crop, at the time of the implementation phase a suitable assessment of the impact should be conducted thoroughly. This will be performed at the RAP stage. In case of any household affected by the project far from the original place, another portion of land will be allocated. The new land not cleared and worked on could affect indirectly the economic income of the concerned household. Prior to relocation, suitable land should be found and accepted by the affected people and the task of the PIU will be to improve the agricultural production mechanisms.

The impact is considered of low significance, mainly because loss of economic income from the selling of crops cultivated within the working area and where access roads have been opened is not significant.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (1)

- Severity: Moderate (1)
- Likelihood: Certain (2)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	
2	5	6	7	8	9	10	11	12	13	14	15	
3	6	7	8	9	10	11	12	13	14	15	16	
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Low (5)**

Mitigation measures.

Land take to pave way for the construction of the project will entail loss of agricultural fields and potential land for cropping. Therefore, it is foreseen that the agricultural yields for the households who utilise those areas will go down and alternative land should be found in order to maintain the status quo. The affected cultivated areas have been assessed through the satellite images and the magnitude of the loss of the agriculture production verified in the field.

The proposed fields not exploited by previous cultivations will be cleared of vegetation before they are made available for cultivation to the affected parties. Advice on soil quality and use, suitable cultivation practices, constraints and suggestions will be given by the PIU experts. Agricultural tools and useful fertilizer will be provided.

4.6.2 Health

Considering the no-displacement of the households within the TL project area, the health infrastructure accessed by the people in this zone will not be affected in any way by way of households increasing or reducing in the area. Although the improvement of such infrastructure will not be linked with the resettlement phase, it is inevitable that such infrastructures improve due to the anticipated influx of migrant workers seeking to work on the proposed project.

The major health concerns related to the project are the outbreaks of diseases linked with the concentration of workers in one single camp, and a potential increase in the spread of HIV/AIDS and other sexually transmitted infections (STIs) among the workers and the local population.

Due to the nature of project activities, several health and safety aspects will be related to height, noise, air quality and contamination.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (2)
- Severity: Moderate (1)
- Likelihood: Certain (2)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	

Significance rating: **Low (6)**

Mitigation measures.

Some of the specific measures to be employed in addressing the challenges of health are:

The project will have a health program in place biased to community protection. This will include sensitisation of the local community members and encouraging them to use mosquito nets and engage in protected sex especially with multiple partners. Where possible, the proponent could also assist in the provision of mosquito nets to the local people as part of Corporate Social Responsibility (CSR);

4.6.3 Employment

Along with the expected negative impacts, the project will produce a series of direct and indirect benefits, and a clear indirect impact will be the economic improvement of the people living in the project area. Local people will be offered employment for auxiliary work in the area (earthmoving, safety, transport, maintenance, etc.). This could increase the income of families in the area.

Income from the new occupation should generally be invested in livestock or agriculture, or used to improve the family's livelihood. Considering the possibility of improving living conditions, the impact is positive and moderate.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (2)
- Severity: Moderate (2)

- Likelihood: Certain (3)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	15	16
4	7	8	9	10	11	12	13	14	15	16	16	17

Significance rating: **Moderate (8)**

Mitigation measures.

The project is anticipated to create employment opportunities for both skilled and unskilled labour. Skilled personnel will be employed as Managers, Supervisors, Engineers, Architects, Surveyors, and in other technical positions whereas unskilled labourers will be employed as support staff and perform nontechnical tasks. During the construction, local people are expected to be recruited. In addition, most of the casual labourers will be hired from the local area and this will benefit the local communities greatly thus boosting their incomes. Therefore, specific measures are:

- the contractor(s) employment activities will be monitored on a regular basis throughout the construction phase, including number of jobs created by employment type (skilled/semi-skilled/unskilled), number of jobs by gender, employment type and geographical area; total man hours and wages paid, by employment type, gender and geographical area; and rate of employee turnover by gender and area;
- the contractor(s) will be encouraged to pay a "living wage" to all workers; and
- The participation of local community members will be maximised during the construction phase. Unskilled labour will be recruited exclusively from directly affected communities, and semi-skilled labour will be recruited preferentially from such communities, provided that they have the requisite skills, competence and desire to work.

Despite the evident benefits due to the formal jobs on the project, there's a remote chance that the traditional activities such as land cultivation could be abandoned by the household employed in the project.

4.6.4 Roads and transports

The public transport from the rural areas will be slightly affected by the new impounding. The new access roads will better connect the settlements in the area to the western area make easier the use of health centres and the provision of goods.

SIGNIFICANCE OF THE IMPACT

- Temporal scale: Permanent (1)
- Spatial scale: Study area (3)
- Severity: Moderate (2)
- Likelihood: Certain (4)

LIKELIHOOD		EFFECT										
		3	4	5	6	7	8	9	10	11	12	13
1	4	5	6	7	8	9	10	11	12	13	14	14
2	5	6	7	8	9	10	11	12	13	14	15	15
3	6	7	8	9	10	11	12	13	14	15	16	16
4	7	8	9	10	11	12	13	14	15	16	17	17

Significance rating: **Moderate (10)**

Mitigation measures.

The future construction and improvement of the roads related to the project will bring a moderate positive impact mitigating the transport difficulties faced up to now by the people in the area. The roads within the project area will be fully covered by the budget of the project, but small infrastructures to make the permanent roads safer (panels, pedestrian crossings, speed bollards, etc.), have to be planned and implemented.

4.7 Managing Impacts in Conflict-Sensitive Areas

WAPP and GRIDco promote the development and implementation of responsible business practices. The former company VRA, from which GRIDco was formed, is a member of the United Nations Global Compact and thus supports the promotion of human and labour rights, particularly in areas potentially affected by conflict.

This chapter describes the management of responsibilities and potential conflicts in relation to the standards established by the United Nations, in particular its programme concerning the principles of responsible investment, the "Global Compact" (UN Global Compact Office, 2010). This Global Compact, initiated in 1999 by Dr Kofi Annan, Secretary-General of the United Nations, calls on companies to adopt, support and apply within their sphere of influence a set of fundamental values in the areas of human rights, labour standards, the environment and the fight against corruption.

The guidelines cover administrative management practices, relations with government departments and local stakeholders, and compliance with social and environmental commitments.

According to the United Nations ("Guidance on responsible Business in conflict-affected and high risk areas"), the following 10 principles must be respected in the projects of Global Compact members:

Human rights

Principle 1: Support and respect the protection of international human rights law,

Principle 2: Refusal to be complicit in human rights abuses.

Labour law

Principle 3: Respect for freedom of association and recognition of the right to collective bargaining,

Principle 4: Elimination of all forms of forced or compulsory labour,

Principle 5: The effective abolition of child labour,

Principle 6: Elimination of discrimination in respect of employment and occupation.

Environment

Principle 7 : Application of the precautionary approach to environmental issues,

Principle 8 : Initiatives to promote greater environmental responsibility,

Principle 9: Development and dissemination of environmentally friendly technologies.

Anti-corruption

Principle 10: Action against corruption in all its forms, including extortion and bribery.

This United Nations program asks participating companies to communicate with their stakeholders (consumers, employees, trade unions, shareholders, media, public authorities, etc.), each year, on the progress made in integrating the Global Compact principles, using their annual report, sustainable development report or other public reports, their website or other means of communication.

5 CUMULATIVE IMPACT ASSESSMENT

5.1 Introduction

One of the biggest risk management challenges currently facing project developers is the appropriate assessment and management of cumulative impacts and risks.

Factors such as climate change and unpredictability of climate patterns, decline of species biodiversity, degradation of ecosystem services, and changing socio-economic circumstances all add complexity to risk assessment and management. Potential system-wide consequences resulting from the combination of individual effects of multiple actions overtime are particularly important.

The cumulative impacts are impacts resulting from incremental changes caused by other past, present, or reasonably foreseeable actions together with the project. Sometimes the total effect is larger than the sum of individual impacts because each project, as well as each impact, can interact with the others.

This shall involve identifying and analyzing the cumulative impacts in Ghana and planning measures to mitigate them. Indeed, with the regular and continuous supply of electricity to industries, electrification of communities and towns in the rural areas along the power line and around the substations, there shall be potential for new development in the areas which shall put pressure on the availability of material resources for construction, water supply, sanitation, solid waste management, housing and agricultural development, biodiversity, etc. In Ghana, it is important to also consider housing and agricultural development, urbanization and road development. There may also be other development activities, such as mineral resource extraction projects, municipal infrastructure development, etc. that are already underway and would contribute to cumulative impacts.

5.2 Cumulative impacts

5.2.1 Availability of Material Resources for Construction

The construction of a 400/330 kV transmission line can have several cumulative impacts on the availability of material resources for construction. Here are some potential impacts to consider:

1. Demand for Materials:

Increased Demand for Construction Materials: The construction of a transmission line requires various materials such as steel for towers, conductors, insulators, concrete for foundations, and access roads. This increased demand can strain local supplies and lead to shortages, price increases, or competition with other construction projects in the area.

2. Extraction of Raw Materials:

Mining and Extraction Pressure: Depending on the availability of local resources, there may be increased pressure to mine or extract raw materials such as steel, aluminum, copper, and concrete

aggregates to meet the demand for construction. This can lead to environmental impacts such as habitat destruction, soil erosion, and water pollution.

3. Transportation:

- **Transportation Constraints:** Transporting construction materials to the project site, especially for remote or difficult-to-access areas, can be challenging and may require significant logistical planning and infrastructure development. This can increase costs and contribute to traffic congestion, air pollution, and road degradation.

4. Environmental Impacts:

- **Habitat Disruption:** Clearing land for material extraction sites or transportation routes can disrupt natural habitats and ecosystems, leading to habitat loss and fragmentation, biodiversity loss, and soil erosion.
- **Water Usage:** Mining and extraction activities may require significant water usage, potentially impacting local water sources and ecosystems.
- **Air and Water Pollution:** Extractive industries and transportation activities associated with material production can generate air and water pollution, affecting air quality, water quality, and human health.
- **Social and Economic Impacts:**
- **Land Use Conflicts:** Competition for land between material extraction activities and other land uses (e.g., agriculture, conservation) may arise, leading to conflicts between stakeholders.
- **Economic Benefits vs. Costs:** While construction projects can bring economic benefits such as job creation and infrastructure development, the associated environmental and social costs should be carefully considered and mitigated.

Mitigation Measures:

- **Resource Efficiency:** Promoting resource-efficient construction practices, such as recycling and reuse of materials, can reduce the demand for new materials and minimize environmental impacts.
- **Sustainable Sourcing:** Prioritizing the use of sustainably sourced materials and conducting environmental and social impact assessments for material extraction activities can help mitigate negative impacts.
- **Community Engagement:** Engaging with local communities and stakeholders throughout the project lifecycle can help identify and address concerns related to material resource availability and ensure equitable distribution of benefits and costs.

5.2.2 Water Supply, Sanitation

The construction of a 330 kV transmission line can have several cumulative impacts on water supply and sanitation. Here are some potential impacts to consider:

1. Water Quality:

Contamination from Construction Activities: Construction activities such as excavation, grading, and land clearing can lead to sediment runoff, soil erosion, and pollution of nearby water bodies. This can degrade water quality, affecting both surface water and groundwater sources used for drinking water supply and sanitation.

2. Disruption of Water Sources:

Interference with Water Sources: The construction of transmission line infrastructure, including towers, access roads, and substations, may disrupt natural water flow patterns, affecting streams, rivers, wetlands, and aquifers. This disruption can impact water availability for communities, agriculture, and ecosystems downstream.

3. Infrastructure Development:

Pressure on Water Infrastructure: The construction of transmission lines may require the development of new infrastructure, such as access roads and staging areas, which could increase impervious surfaces and alter hydrological processes. This can lead to changes in stormwater runoff patterns, potentially overwhelming existing drainage systems and increasing the risk of flooding and erosion.

4. Operational Impacts:

Maintenance and Operation Activities: Routine maintenance and operation activities associated with the transmission line, such as vegetation management and equipment servicing, may involve the use of chemicals and hazardous materials that pose a risk of contamination to nearby water sources if not properly managed and controlled.

5. Social and Health Impacts:

- **Displacement of Communities:** Land acquisition for transmission line infrastructure and associated facilities may lead to the displacement of communities and disruption of traditional livelihoods, affecting access to water supply and sanitation services.
- **Health Risks:** Poor water quality resulting from construction-related pollution can pose health risks to nearby communities, including the spread of waterborne diseases and contamination of drinking water sources.

Mitigation Measures:

- **Environmental Impact Assessment (EIA):** Conducting a comprehensive EIA to identify potential water-related impacts and develop mitigation measures to minimize adverse effects on water supply and sanitation.
- **Sediment and Erosion Control:** Implementing erosion control measures such as sediment barriers, silt fences, and revegetation to minimize sediment runoff and protect water quality during construction.
- **Water Management Plans:** Developing water management plans to minimize water use, promote water conservation, and reduce the risk of contamination during construction and operation.
- **Community Engagement and Consultation:** Engaging with local communities and stakeholders to raise awareness of potential water-related impacts, address concerns, and incorporate local knowledge and preferences into project planning and implementation.

5.2.3 Solid Waste Management

The construction and operation of a 400/330 kV transmission line project can have several cumulative impacts on solid waste management as follows:

1. Construction Waste:

Generation of Construction Debris: The construction phase may generate significant amounts of waste materials such as packaging, discarded construction materials, and excavation debris. Without proper management, this can lead to the accumulation of waste along the project corridor and surrounding areas.

2. Operational Waste:

Maintenance and Operations Waste: Routine maintenance activities, such as vegetation management, equipment servicing, and facility operations, may generate waste materials such as used oils, lubricants, and equipment parts. Improper disposal of these wastes can lead to environmental contamination and public health risks.

3. Land Use Changes:

Infrastructure Development: The construction of transmission line infrastructure, including towers, substations, access roads, and staging areas, may require land clearing and site development. This can lead to habitat destruction, soil disturbance, and the generation of waste materials such as vegetation debris and soil.

4. Community Impacts:

Displacement of Communities: Land acquisition and resettlement activities associated with the transmission line project may lead to the displacement of communities and the loss of livelihoods.

Displaced populations may face challenges in managing their waste in new locations, leading to increased waste generation and inadequate waste management practices.

5. Health and Environmental Impacts:

- **Air and Soil Pollution:** Improper waste management practices, such as open burning or illegal dumping, can result in air and soil pollution, negatively impacting human health and environmental quality.
- **Water Contamination:** Solid waste disposal sites, if not properly designed and managed, can leach contaminants into nearby water bodies, posing risks to aquatic ecosystems and drinking water sources.
- **Mitigation Measures:**
- **Waste Minimization:** Implementing waste minimization strategies such as reducing packaging materials, recycling construction and demolition debris, and reusing materials where possible to minimize waste generation during construction and operation.
- **Waste Segregation and Recycling:** Establishing waste segregation and recycling programs to separate recyclable materials from non-recyclable waste and diverting waste from landfill disposal.
- **Proper Waste Disposal:** Ensuring proper disposal of waste materials through licensed waste management facilities, such as landfills, recycling centers, or hazardous waste disposal facilities, in accordance with local regulations.
- **Community Engagement:** Engaging with local communities and stakeholders to raise awareness of solid waste management issues, promote responsible waste disposal practices, and involve communities in waste management initiatives

5.2.4 Biodiversity

The construction and operation of a 330 kV transmission line project can have several cumulative impacts on biodiversity. These impacts can arise from habitat disruption, direct harm to species, and long-term changes in the ecosystem. Here are some key areas to consider:

1. Habitat Loss and Fragmentation:

- **Land Clearing:** The clearing of land for transmission towers, substations, and access roads can result in the loss of habitats for flora and fauna. This habitat destruction can lead to a decrease in biodiversity as species lose their homes and food sources.
- **Fragmentation:** The construction of a transmission line can fragment habitats, creating isolated patches of vegetation. This can disrupt wildlife movement and breeding patterns, leading to reduced genetic diversity and increased vulnerability to environmental changes.

2. Direct Mortality:

- **Construction Activities:** The construction process can directly harm wildlife, including crushing small animals and destroying nests or burrows. Machinery and increased human activity can also cause stress and displacement of wildlife.
- **Electrocution and Collision:** Birds and bats are particularly vulnerable to electrocution and collision with power lines. Species that fly at night or in low visibility conditions are at higher risk.

3. Disturbance and Displacement:

- **Noise and Light Pollution:** Construction noise and lights can disturb wildlife, leading to behavioral changes and displacement. Even after construction, maintenance activities can continue to disrupt local wildlife.
- **Human Activity:** Increased human presence and activity during both construction and operation can lead to further disturbance of wildlife and their habitats.

4. Changes in Ecosystem Dynamics:

- **Edge Effects:** The creation of edges where the cleared land meets intact vegetation can alter the local microclimate and soil conditions, affecting plant and animal communities.
- **Invasive Species:** Disturbed areas are often more susceptible to invasion by non-native species, which can outcompete and displace native species, further reducing biodiversity.
- **Water and Soil Impact:**
- **Runoff and Erosion:** Land clearing and construction can lead to increased soil erosion and runoff, which can degrade water quality in nearby streams and rivers, affecting aquatic ecosystems and species.

Mitigation Measures:

- **Environmental Impact Assessments (EIA):** Conduct thorough EIAs to identify sensitive areas and species, and plan construction activities to minimize impacts.
- **Habitat Restoration:** Restore and rehabilitate habitats after construction, including replanting native vegetation and creating wildlife corridors to connect fragmented habitats.
- **Wildlife Crossings:** Install wildlife crossings and flight diverters to reduce the risk of collisions and allow safe passage for animals across the transmission line corridor.
- **Construction Best Practices:** Implement best practices during construction, such as timing activities to avoid breeding seasons, using noise-reducing equipment, and creating buffer zones around sensitive habitats.
- **Monitoring and Adaptive Management:** Establish monitoring programs to track the impacts on biodiversity and adapt management practices based on the findings to mitigate ongoing impacts.

5.2.5 Housing and Agricultural Development

The construction and operation of a 330 kV transmission line project can have several cumulative impacts on housing and agricultural development. These impacts can arise from land acquisition, changes in land use, and socio-economic shifts in the affected areas:

1. Land Acquisition and Displacement:

- **Land Acquisition:** The need for land to construct transmission towers, substations, and access roads can lead to the acquisition of agricultural and residential land. This can displace homeowners and farmers, leading to loss of homes and livelihoods.
- **Resettlement:** Displaced populations may need to be resettled, which can create challenges in finding suitable land and providing adequate housing and infrastructure. The resettlement process can also cause social disruption and stress for affected families.

2. Changes in Land Use:

- **Restricted Land Use:** The presence of transmission lines can impose restrictions on land use within the right-of-way (ROW) corridors, limiting the types of activities that can be conducted. For example, certain agricultural practices, construction of buildings, and tree planting may be restricted.
- **Fragmentation of Agricultural Land:** The transmission line can fragment agricultural land, making it difficult for farmers to manage their fields efficiently. This can reduce agricultural productivity and lead to higher operational costs for farmers.

3. Socio-Economic Impacts:

- **Economic Displacement:** Farmers and landowners may experience economic losses due to reduced agricultural productivity and restricted land use. This can lead to a decline in income and economic stability for affected households.
- **Impact on Property Values:** The presence of transmission lines can affect property values, often leading to a decrease in the value of nearby residential and agricultural properties. This can impact homeowners' equity and investment potential.
- **Employment Opportunities:** While the construction phase may create temporary employment opportunities, the long-term operational phase typically requires fewer workers, leading to limited long-term employment benefits.

4. Health and Safety Concerns:

- **Electromagnetic Fields (EMFs):** There are public concerns about potential health effects from exposure to electromagnetic fields generated by high-voltage transmission lines. While scientific consensus suggests that EMFs from transmission lines are generally within safe limits, public perception can still influence housing and land use decisions.

- **Safety Risks:** The presence of high-voltage transmission lines poses safety risks, such as the potential for electrocution and fires, which can deter residential development and certain agricultural activities near the lines.

5. Impact on Local Infrastructure:

Infrastructure Development: The construction of transmission lines can lead to the development of supporting infrastructure, such as access roads, which may benefit local communities by improving transportation and accessibility. However, it can also put pressure on existing infrastructure and public services, particularly during the construction phase.

Mitigation Measures:

- **Comprehensive Planning:** Conduct thorough planning and community consultations to identify and mitigate impacts on housing and agriculture. This includes selecting transmission line routes that minimize displacement and land use conflicts.
- **Fair Compensation and Resettlement:** Provide fair compensation for land acquisition and ensure that resettlement plans are developed in consultation with affected communities to address their needs and preferences.
- **Land Use Management:** Implement land use management practices that allow for compatible agricultural activities within the ROW and promote the efficient use of fragmented agricultural lands.
- **Community Support Programs:** Develop support programs for affected farmers and residents, including financial assistance, training, and resources to adapt to changes in land use and maintain economic stability.
- **Public Awareness and Safety Programs:** Conduct public awareness campaigns to educate communities about EMFs and safety practices to reduce health and safety concerns.

5.2.6 Urbanization

The construction and operation of a 330 kV transmission line project can have several cumulative impacts on urbanization. These impacts can manifest through changes in land use, infrastructure development, socio-economic shifts, and environmental considerations:

1. Land Use and Urban Sprawl:

- **Land Availability:** The establishment of a transmission line corridor can restrict land use in urban areas, potentially limiting the availability of land for housing, commercial, and industrial development.
- **Urban Sprawl:** The transmission line may contribute to urban sprawl by pushing development away from the corridor. This can lead to increased travel distances, higher infrastructure costs, and greater environmental impact from dispersed development patterns.

2. Infrastructure Development:

- **Enhanced Infrastructure:** The presence of high-voltage transmission lines can necessitate the development of supporting infrastructure, such as access roads and maintenance facilities. These developments can improve connectivity and accessibility in urban fringe areas.
- **Utility Services:** Improved electrical infrastructure can attract new developments and investments in urban areas, leading to economic growth and increased urbanization.

3. Property Values and Housing Market:

- **Property Values:** The visual impact and perceived health risks of high-voltage transmission lines can lead to reduced property values in nearby areas. This can influence housing market dynamics and discourage residential development close to the lines.
- **Residential Development:** Developers may avoid constructing housing near transmission lines due to aesthetic concerns and potential health risks, which can shape urban development patterns.

4. Socio-Economic Impacts:

- **Economic Development:** Reliable and increased electricity supply can boost local economies by attracting businesses and industries, leading to job creation and urban growth.
- **Community Displacement:** The need for land to construct transmission infrastructure can lead to the displacement of existing urban communities, causing social disruption and necessitating resettlement programs.

5. Environmental Considerations:

- **Green Spaces:** The construction of transmission lines through urban areas can lead to the loss of green spaces and public parks, impacting urban biodiversity and residents' quality of life.
- **Air and Noise Pollution:** Construction and maintenance activities can increase air and noise pollution, affecting urban populations and potentially leading to health issues.

6. Planning and Zoning:

- **Zoning Regulations:** The presence of transmission lines can influence urban planning and zoning regulations, potentially leading to the designation of buffer zones and restrictions on building heights and types of permissible land use.
- **Future Development:** Urban planners may need to account for the transmission line corridor in future development plans, ensuring that it does not hinder strategic urban growth objectives.

Mitigation Measures:

Integrated Urban Planning

5.2.7 Municipal Infrastructure Development

The construction and operation of a 330 kV transmission line project can have various cumulative impacts on municipal infrastructure development. These impacts can be both positive and negative, influencing transportation networks, utilities, community services, and urban planning:

1. Transportation Networks:

- **Road Development and Maintenance:** The need to access transmission tower sites often leads to the development or improvement of access roads, which can benefit local transportation networks. However, construction activities can also cause road damage and increased traffic congestion.
- **Traffic Disruptions:** Construction and maintenance activities can lead to temporary road closures and traffic disruptions, affecting local transportation and commute times.

2. Utilities and Public Services:

- **Enhanced Power Supply:** Improved electrical infrastructure can lead to a more reliable power supply, which can support the development and expansion of other municipal services such as water treatment plants, schools, and hospitals.
- **Strain on Existing Utilities:** During construction, there can be increased demand for utilities such as water and sanitation services, potentially straining existing infrastructure.

3. Urban Planning and Land Use:

- **Land Use Restrictions:** The establishment of a transmission line corridor can impose land use restrictions, affecting the development potential of adjacent areas. This can influence municipal zoning and planning decisions.
- **Urban Sprawl and Fragmentation:** Transmission lines can contribute to urban sprawl by pushing development away from the corridor, leading to fragmented land use and higher infrastructure costs.

4. Environmental Infrastructure:

- **Green Spaces and Recreation Areas:** The presence of transmission lines can impact municipal plans for green spaces and recreation areas, potentially limiting their development or requiring redesigns to accommodate the infrastructure.
- **Stormwater Management:** Construction activities can alter natural drainage patterns and increase runoff, necessitating improvements to municipal stormwater management systems to prevent flooding and erosion.

5. Economic and Social Services:

- **Economic Growth:** Enhanced power supply can attract businesses and industries, fostering economic growth and increasing the demand for municipal services and infrastructure.

- **Community Displacement:** Land acquisition for transmission lines can lead to the displacement of communities, necessitating the development of new housing, schools, and healthcare facilities to accommodate relocated populations.

6. Health and Safety Infrastructure:

- **Emergency Services:** Construction and maintenance activities can necessitate the enhancement of emergency services to address potential accidents and health issues related to the project.
- **Public Health:** The potential health concerns related to electromagnetic fields (EMFs) from transmission lines may require public health monitoring and infrastructure to address community concerns.

Mitigation Measures:

- **Comprehensive Planning:** Collaborate with municipal planners to integrate the transmission line project into broader urban development plans, ensuring coordinated growth and infrastructure development.
- **Infrastructure Upgrades:** Invest in upgrading municipal infrastructure, such as roads, utilities, and stormwater systems, to accommodate the increased demands and mitigate potential negative impacts.
- **Public Consultation:** Engage with local communities and stakeholders to address concerns, provide information, and involve them in decision-making processes to ensure that the project aligns with community needs and priorities.
- **Land Use Management:** Implement land use management practices that allow for compatible developments near the transmission corridor, such as parks, green belts, and low-density residential areas.
- **Safety and Environmental Standards:** Adhere to strict safety and environmental standards during construction and operation to minimize health risks and environmental impacts.
- **Compensation and Support:** Provide fair compensation and support for displaced communities, including the development of new housing and essential services.

6 PROPOSER E&S MANAGEMENT PLANS

6.1 Introduction

The Proponent's ESMP describes the environmental and social mitigation programme which the Proponent is responsible for implementing during the construction and operation phase. It consists of several subplans, which will be implemented by the Environmental and Social Management Unit, or be outsourced to service providers, e.g. nongovernmental organisations (NGOs).

Each ESMP sub-plan sets out the obligatory mitigation measures based on the available information at the current stage of project preparation. It is expected that they be elaborated further by the Environmental and Social Management Unit, or be translated into Terms of Reference on which NGOs or other service providers can develop their project proposals. The detailed mitigation programme should be formulated into in a Proponent's Environmental and Social Action Plan.

In addition to the sub-plans described in the present Proponent's ESMP, the Proponent (or the Proponent's Engineer) will develop additional operation-phase management plans as required. For example, the Proponent will be expected to develop a Waste Management Plan, an Occupational Health and Safety Plan, an Employment and Human Resource Management Plan, etc. The details of such operation-phase plans will be developed at a later stage and be based on the relevant sections in the Construction Contractors' Environmental, Health and Safety Plan.

6.2 Resettlement Action Plan (RAP)

6.2.1 Land Acquisition And Involuntary Resettlement

The Project is expected to cause economic displacement or compensation in a minor magnitude and based on the detailed project design combined with a census and asset inventory.

A Resettlement Action Plan (RAP) has been prepared to be implemented prior to the start of the construction works. The planning and implementation of the RAP shall be guided by the ESS5 of the WB Environmental and Social Framework (2017), "Land Acquisition, Restrictions on Land Use and Involuntary Resettlement", and ESS1 "Assessment and Management of Environmental and Social Risks and Impacts", and the most common international standards.

The RAP has been prepared in a separate and standalone volume of the ESIA study.

6.3 Stakeholder Engagement Plan (SEP)

6.3.1 Background

This section presents the proposed public consultation and stakeholder engagement strategy for the transmission line Project. It outlines the processes and procedures to be used during the execution of the proposed project to ensure that all stakeholders are meaningfully involved and informed about the project activities, stakeholder opinions are received, incorporated and feedback is given promptly.

6.3.2 Regulations And Requirements

The Stakeholder Engagement Plan is developed as a result of the need to comply mainly with the Environment Management (EIA Process) Regulations (2007), the Agricultural Landlord and Tenant Act (ALTA), and the State Acquisition of Lands Act (SALA). International standards will be guided by the WB Environmental and Social Framework (2017), in particular the ESS10 "Stakeholder Engagement and Information Disclosure".

The Standard states that the stakeholder consultation must collect information to assess impacts and identify how users – including groups such as women, and vulnerable groups such as the elderly and those with different abilities - will be affected and use this information to develop and implement robust mitigation in all areas where impacts will be experienced.

The information will be disclosed in a manner that is accessible and culturally appropriate, taking into account any specific needs of groups that may be differentially or disproportionately affected by the project or groups of the population with specific information needs (such as, disability, literacy, gender, mobility, differences in language or accessibility).

These instruments unanimously advocate for meaningful involvement of project stakeholders in decisions that affect them, participatory planning and transparent grievance management mechanisms.

6.3.3 Project Stakeholders

The key stakeholders for this project were identified during the preparation of the ESIA. The detailed stakeholder list is as shown in the ESIA Report and in the volume Annexes.

6.3.4 Stakeholder Engagements Strategy

It is recommended that the stakeholder engagement activities be planned and scheduled at an early stage to ensure that they become effective and yield the desired results. Stakeholder engagement is expected to be a continuous process throughout the construction period and into the operation phase.

The Stakeholder Engagement Plan SEP shall be prepared according to requirements set out in World Bank ESF Environmental and Social Standard 10 Stakeholder Engagement and Information Disclosure (ESS10).

The process of stakeholder engagement will involve the following: stakeholder identification and analysis; planning how the engagement with stakeholders will take place; disclosure of information; consultation with stakeholders; addressing and responding to grievances; an reporting to stakeholders.

The SEP will focus on identifying direct and indirect stakeholders of the project, and will include a strategy for information disclosure, strategy for consultation, strategy to incorporate the view of vulnerable groups, resources that will be devoted to managing and implementing the SEP, and a monitoring and reporting mechanism. The stakeholders will comprise individuals, groups, local communities, women, youth and any vulnerable groups that may be directly or indirectly affected by the project, positively or negatively. It will identify specific vulnerable or disadvantaged individuals or groups, in the project intervention areas, and their limitations in participating and/or in understanding the project, and it will provide mechanisms to address these limitations. Such groups could include pastoralists, women, elderly, persons with disabilities, illiterate persons, informal land users and dwellers, children, and others. It will explain the opportunities for public consultation and provide a functioning grievance mechanism that includes provision to properly address complaints related to Sexual Exploitation, Abuse and Harassment (SEAH) and create a safe confidential and survivor- centered grievance mechanism, with multiple entry points, referral to medical-psychosocial services and safe and confidential handling and recordkeeping. It will also include a strategy for information disclosure.

The Consultant shall also conduct inclusive and accessible public consultations and develop and comply with a Stakeholder Engagement Plan (SEP).as per World Bank's Environmental and Social Standard 10. Determining the line route and shall ensure that these consultations are documented in signed Minutes of Meeting with verified lists of participants. All site visits by the Consultant shall have representations from the national utilities. However, it is the responsibility of the Consultant to ensure that all civil society, potential affected peoples and grassroots stakeholders are included in the process.

The Consultations undertaken with women shall be conducted in small focus groups/consultations animated by a women facilitator in a safe and ethical enabling environment, with care to not ask sensitive information which can cause adverse impacts on the safety and well-being of women in attendance. Risks of SEAH can be discussed focusing on trends and factors driving risks but shall never include questions about personal experience of violence or seek to interview survivors of GBV. Pictures shall not be taken of women focus groups. However, consultation notes for all consultations shall be included in summary form, succinctly summarizing issues and questions raised by community participants and answers provided by consultants. Names shall not be attributed to specific statements/comments in the consultation notes (this must also be communicated to the participants). Any photographs of community consultations can only be obtained with the expressed consent of the community, and they should be given the opportunity to decline or move to another area where pictures will not be taken.

These consultations shall include presentation and guidance for stakeholders on the use of an agreed grievance mechanism. These consultations should take place at various levels, national, regional, provincial, districts and communities crossed by the proposed line route and validated by stakeholders. All evidence of these consultations will be attached to the reports in a satisfactory manner. All the consultations shall be adequately documented in the form of signed Minutes of Meeting containing lists of participants, dates, pictures, discussion/minutes and other records of such consultations. All submitted reports shall contain scanned copies of the signed Minutes of Meeting.

6.4 Associated Studies And Plans

6.4.1 Introduction

Together with the updating of ESIA, ESMP and RAP reports, will be prepared a series of plans to integrate the ESIA study increasing the knowledge and the assessment capacity of the project. The plans requested in TOR are:

- Stakeholder Engagement Plan;
- Labour Management Procedures (LMP);
- Cultural Heritage Management Plans (CHMP);
- Biodiversity Management Plans (BMP);
- Environmental and Social Commitment Plans (ESCP);

6.4.2 Labour Management Procedures (LMP)

The LMP will develop and implement written labor management procedures applicable to the project. The procedures will set out the way in which project workers will be managed, in accordance with the requirements of the national law and ESS2. Additional provisions related to labor management could be found at ESS2 of the Environmental and Social Framework (WB, 2017). The World Bank recognises the importance of job creation and income generation to reduce poverty and promote economic growth. Relations between workers and managers are promoted with the aim of fostering project development by treating workers fairly and providing safe and healthy working conditions.

6.4.3 Environmental And Social Commitment Plans (ESCP)

The ESCP must be prepared using the template provided by the World Bank. The ESCP will describe the key measures and actions necessary for the project to comply with the requirements set out in the

Environmental and Social Standards (ESS) of the World Bank's Environmental and Social Framework (ESF). It will provide a summary of the significant measures and actions to be implemented to manage the potential environmental and social risks and impacts of the project according to the principle of the

mitigation hierarchy. All obligations will be clearly stated so that there is no ambiguity about the standards to be met, deadlines and follow-up actions.

The document will outline the organisational structure to be established for the implementation of the agreed actions. The ESCP will also summarise that the Borrowers undertake to perform the specific actions required by the plan, indicating the beneficiaries of such training.

6.4.4 Cultural Heritage Management Plans (CHMP)

The CHMP will develop and implement written cultural heritage management plans applicable to the project. The CHMP will identify all cultural heritage likely to be affected by the project and define procedures to avoid or mitigate likely impacts on such cultural heritage, in accordance with the requirements of national laws and ESS8. Further provisions to protect cultural heritage from the negative impacts of project activities and to support its preservation can be found in ESS8 of ESF.

6.4.5 Biodiversity Management Plans (BMP)

The Consultant will prepare Biodiversity management plans following the guidance provided in annex 8 for the project to meet the World Bank ESF ESS6 and international best practice for biodiversity conservation. Additional provisions to protect biodiversity from the adverse impacts of project activities and support its preservation could be found in the ESF.

6.4.6 Environmental And Social Management Frameworks (ESMFS)

An Environmental and Social Management Framework (ESMF) should be produced with the aim of providing an initial assessment of the environmental and social risks, issues and impacts of local electrification and will establish a dialogue between environmental and social experts and technical experts to optimise the design. This includes avoiding negative impacts as much as possible by ensuring that the technical variants studied integrate environmental and social concerns.

Based on existing documentation, field visits and meetings with key stakeholders, the summary impact study should provide an initial assessment of environmental and social risks and the main mitigation or compensation measures.

6.4.7 Resettlement Policy Framework (RPF)

A Resettlement Policy Framework must be drafted to provide an initial assessment of the risks associated with involuntary resettlement, physical or economic displacement, caused by the project.

Based on existing documentation, field visits, and meetings with key stakeholders affected by the project, the RPF should provide an initial assessment of the risks associated with involuntary resettlement, the main measures to be implemented, and the procedures to be followed to conduct due diligence on involuntary resettlement in the future.

7 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

7.1 Introduction

The monitoring plan should specify what shall be monitored (indicators), when, by whom and the cost implications (capital and recurrent costs).

It should include:

- The parameters to be monitored, e.g. air pollution, such as dust, noise, electromagnetic field, etc.; and the definition of responsibilities; The sampling sites.
- Frequency of measurements.
- The sampling and analysis method.
- Monitoring program.
- Appropriate and adequate record keeping.
- Locations where unauthorised persons are not allowed.
- Combined independent and internal environmental, social and occupational health and safety audits and review of the overall programme of activities to assess its compliance with contractual requirements and to ensure compliance with the requirements of EPAs and other stakeholders, including the general public.

7.1.1 Environmental and social clauses to be included in the construction company tender file

The Consultant shall present the technical and operational prescriptions compatible with the procedures in Ghana that shall enable the construction company to take into account in its activities the protection of the biophysical environment, the safety and health of its employees and of the local population as well as the hygiene conditions on the construction sites. The ESMP and the environmental and social clauses will be included in the Bidding documents.

They shall also guide the companies and the Consulting Engineer (Supervising Engineer) in organizing the implementation of environmental and social, quality, hygiene, safety and health measures attributable to their activities, in identifying the modalities, technical provisions and means of implementing the said measures (the Contractors prepare their own site specific Contractor ESMP, Gender, Crisis, Conflict and Emergency Management/Response Plan, Safety, Hygiene and Health Plan and other plans (waste management, water management, borrow pits management plan, transport management plan, compensation reforestation , communication, etc.) and recruit specialists with international experience for the preparation and implementation of these plans.)

7.1.2 Determination of compensation from acquisition of right-of-way

It is expected that the utilities or other appropriate agency in the various countries shall acquire the Right of-Way (ROW) in the project area for the smooth implementation and operation of the line.

The selection of and the acquisition of all rights-of-way shall take into consideration environmental and social factors and should be described in the ESIA/ESMP and RAP. The land acquisition procedures shall be carried out in accordance with national regulations and international best practices, especially the World Bank's Environmental and Social Standard 5 (ESS5) relating to land acquisition, restrictions on land use and involuntary resettlement (a gap analysis shall be carried out to compare national E&S laws, standards and procedures with the World Bank ESF and policies of other donors. The environmental and social impact of the project shall also be minimized through measures such as the inclusion of environmental and social impact considerations in the adequate selection of the ROW and in siting of the substations and the design of the facilities (i.e. type of towers, etc.), restricting right-of-way use by unauthorized persons, erosion and sediment control during and after construction, and use of low impact maintenance procedures.

Following consultations, the ESIA shall provide information regarding the potential acquisition of the right-of-way, their lengths, general locations, cut-off date and the local and national / international policies and requirements regarding acquisition of these right-of-way.

The programme should include:

- An internal review by GRIDCo implementing agency staff;
- An external 6 monthly Integrated Environmental, Social and Health and Safety audit by independent consultants organized and financed by GRIDCo during construction.
- A yearly Integrated Environmental, Social and Health and Safety audit by independent consultants organized and financed by GRIDCo during first 4 years of operations.

7.2 Scope of the EMMP

The management plan of the mitigation measures and monitoring identifies feasible and cost-effective measures that may reduce potentially significant adverse environmental impacts to acceptable levels. The plan includes compensatory measures if mitigation measures are not feasible, cost-effective, or sufficient. Specifically, the EMMP:

- identifies and summarises all anticipated significant adverse environmental impacts (including those related to involuntary resettlement);
- describes the mitigation measure;
- estimates any potential environmental and social impacts of these measures; and
- provides linkage with any other mitigation plans.

The environmental and social impacts are identified through the direct survey and the information collected through the consultations. Methods applied to the impact identification and the criteria used in evaluating the levels of impacts significance of the proposed dam construction works are assessed and commented. Detailed qualitative and quantitative analysis of the anticipated changes to the baseline to determine the impacts of the project, in each key phase of the project execution are undertaken. The impacts analysis is focused on both positive and negative impacts and to state whether the impacts are positive or negative, short term or long term, reversible or irreversible.

As assessed in the previous chapter, the potential impacts determined by the proposed project can be divided in five different categories based on the type and the chronology of the event:

- Construction stage;
- Operation phase;
- Environmental management plans;
- Resettlement stage; and
- Livelihood restoration stage.

The assessment of the impacts is described in detail taking into consideration the national and international environmental standards and legislation that may affect the significance of the identified impacts.

7.3 Mitigation approach

The Mitigation Hierarchy (Figure 3) has been applied when proposing prevention, compensation and mitigation measures within the ESMP:

Avoid/Prevent: Avoidance or prevention refers to the consideration of options in project location, siting, scale, layout, technology and phasing to avoid impacts on biodiversity, associated ecosystem services, and people. This is referred to as "the best option", but it is acknowledge that avoidance or prevention is not always possible.

Minimise: Minimisation refers to the consideration of alternatives in the project location, siting, scale, layout, technology and phasing that would minimise impacts on biodiversity, ecosystem services and people. Acceptable options to minimise will vary and include: abate, rectify, repair, and/or restore impacts, as appropriate.

Rehabilitate/Restore: Rehabilitation refers to the consideration of the rehabilitation of areas where impacts are unavoidable and measures are provided to return impacted areas to a near-natural state or an agreed land use.

Offset: Offsetting refers to the consideration of measures over and above rehabilitation to compensate for the residual negative effects on biodiversity and the ecosystem.

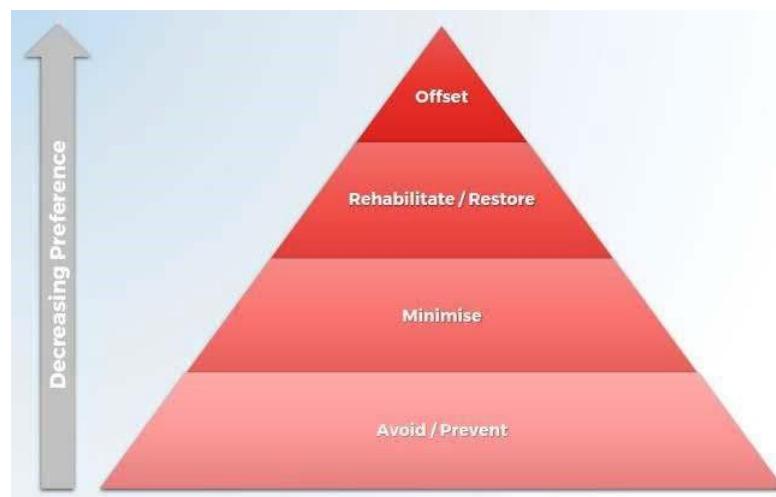


Figure 3: Impact Assessment Mitigation Hierarchy

8 MITIGATION MEASURES AND MONITORING MATRIX

The ESMP includes the following components:

8.1 Mitigation

The ESMP identifies feasible and cost-effective measures that may reduce potentially significant adverse environmental impacts to acceptable levels. The plan includes compensatory measures if mitigation measures are not feasible, cost-effective, or sufficient. Specifically, the ESMP

- identifies and summarizes all anticipated significant adverse environmental and social impacts.
- describes the mitigation measures.
- estimates any potential environmental impacts of these measures; and
- provides linkage with any other mitigation plans (e.g., for involuntary resettlement, indigenous peoples, or cultural property) required for the project.

8.2 Monitoring

Environmental and social monitoring during project implementation provides information about key environmental and social aspects of the project, particularly the environmental impacts of the project and the effectiveness of mitigation measures. Such information (column "Indicators" in the matrix) enables to evaluate the success of mitigation as part of project supervision and allows corrective action to be taken when needed.

Therefore, the ESMP identifies monitoring objectives and specifies the type of monitoring, with linkages to the impacts assessed in the ESIA report and the mitigation measures described in the ESMP.

8.3 Project phases and monitoring

8.3.1 Monitoring during the construction phase

In order to ensure that all requirements and measures stipulated in the ESMP are implemented and executed, a construction site audit shall be performed. In case of violations, proposals shall be elaborated on how to manage the recommended measures during project implementation.

It is recommended to perform such an audit three times a year during the construction period. It shall be done by an environmental/social consultant who shall prepare Audit Reports in which the status and progress of the ESMP measures is reported to the client.

Impact of construction camp.

The monitoring will be in charge to the competent authorities and based on the national rules and regulations on the matter.

Solid waste management.

The monitoring will be based on the national rules and regulations on the matter. The foreseen track system for the monitoring of the waste management will be studied and implemented by well trained and qualified personnel. The qualified personnel will monitor the system for the whole duration of the project.

Emissions and dust.

The level of emissions and dust from the construction camp and from other project facilities, will be monitored following the national parameters indicated. Health and Safety checklists including the use of trained health personnel from the competent authorities will be in charge of the periodic sampling and analysis.

Noise.

Similarly, the level noise from the construction camp and from other project facilities, will be monitored following the national parameters indicated.

Health and Safety checklists including the use of trained personnel will be in charge of the periodic sampling and analysis.

Vegetation Clearing.

The monitoring will be based on the national rules and regulations pertaining to permitted felling and type of trees to be felled, as well as the restoration of the endemic trees. Site visits by government entities, such as the Ministry of Environment and specialized personnel will be periodically carried out, both in the clearing phase, then during the re-plantation phase, taking both the periods of nursery and replantation.

Health.

The overall health of the workforce will be monitored through a robust health program involving regular testing, and health awareness sessions. These will be supported by Health and Safety checklists including the use of clinic records.

Fire Hazard.

Given the project's proximity to a National Park, training around fire hazard mitigation measures and frequent fire drills/prevention plans will be the core of the monitoring components.

Influx of People.

The project may experience an influx of job seekers to the site and appropriate monitoring measures will involve regulating access to the site and establishing transparent recruitment procedures in line with the national labour laws. The monitoring be based on the verification of the worker database and the number of people accessing the site.

Loss of Habitat and Ecosystems.

The monitoring will encompass the rehabilitation and protection of the loss habitat, support for amphibians, aquatic biota, birds, and reptiles.

Greenhouse gas emissions.

It is proposed to reforest the same area that was deforested for the opening of the line path, the wooded area of the substation and the access track and a new area for compensation for the GHGs emitted by construction work.

8.3.2 Monitoring during the operation phase

The monitoring program will involve many disciplines and areas of responsibilities relevant to the project. Multifarious organisations will therefore be involved both directly and indirectly (e.g. some ministries, government authorities, NGO, etc.). Some of the technical competencies required for the project are found with the relevant government institutions, others in public institutions such as universities, whilst for some it may be necessary to contract independent organisations or experts. The main monitoring phase difficulty is overall coordination.

The monitoring phase will be developed by the acquisition of reliable indicators distributed along the main zones of the project area. It is expected that the monitoring activities be carried out before and after construction and impounding, depending on the types of impacts.

During the commissioning phase, monitoring will be concentrated on the results of the mitigation measures adopted during the construction phase and those foreseen during the operational phase, all of them described in chapter 4 "Key impacts and mitigation measures".

Transmission lines emissions

Stated that the indirect impacts are the electric and magnetic field on human beings and nature and the resulting side effects, and the cumulative effects are considered the burden of the health facilities in charge of the cases, the monitoring will be addressed to the periodic measurement of the EMF and the census of the cases recorded by the health facilities.

Transports

The new access roads will better connect the settlements in the area to the western area make easier the use of health centres and the provision of goods.

Birds sitting on power poles and / or conductor cables.

Birds sitting on power poles and / or conductor cables are killed if they cause short circuits (short between live wires or short to ground). Electrocution can be largely avoided by proper design of poles, conductors

and insulators. This problem can be tackled as part of a nest management strategy involving relocation of nests coupled with appropriate pole management techniques.

8.3.3 Environmental management phase

Loss of animal corridors ensuring sustainability of habitats

The analysis of the library or the consultations with the local population on wildlife in the area do not indicate the presence of historical path potentially being impacted by the new transmission lines corridors.

Minor movements have anyway to be considered, also if the likelihood of this impact occurs is slight.

Periodic observations will be carried out by terrestrial fauna specialists.

Change in land use patterns

The land occupied by project and involved in the earth moving will be strongly impacted. Mismanagement of different land use areas and anthropic pressure on wildlife zone can affect the balance between wildlife and human population and the rural livelihood activities.

The planned land use in project area and surroundings will be accurately monitored.

Soil Degradation

The monitoring will involve ensuring works are conducted only in required areas, with competent personnel ensuring rehabilitation with endemic vegetation is completed.

Impacts on Landscape

The monitoring will be carried out through the assessment of the restoration phase based on the landscape rehabilitation plan indicated in the mitigation measure for such impact.

Forest encroaching and fire hazard

Fire surveys will be conducted frequently on site to assess the fire load, type of prevention, and formulate fighting plan required.

Impact on vegetation and reforestation

The monitoring by trained personnel will cover the number of growing plants and propagates in the project area. Reforestation and propagation facilities.

Impact on Terrestrial Fauna

Monitoring on this component will ensure impacts on terrestrial fauna are limited through noise depression, prohibition of vehicle use out of access roads, and the other identified measures. Trained personnel shall ensure records of accidents with wild fauna or poaching events.

8.3.4 Resettlement monitoring and compensation payments

The monitoring measures are designed to ensure the effective and timely implementation of compensation and resettlement activities. On similar projects, limitations have been observed on price setting mechanisms, timely compensation payments and prior information, consultation and participation of project affected people.

The monitoring sometimes is done as a follow up of complaints by PAPs. Normally, a consensus is reached through negotiations. In order to conform to international standards, it is recommended to have compensation procedures and payments monitored by an independent, international monitoring team familiar with the local context.

The monitoring activities should review the project progress in three steps:

- Before the start of the land survey
 - Communication and division of tasks between institutions on ministerial, national, district and local level involved in the compensation process;
 - Process of public information and consultation from district to village level directly with affected people;
 - Involvement of community based organisations;
 - Process of expropriation inventory and expropriation records including price setting and negotiation mechanisms; and
 - Criteria which determine necessity of resettlement.
- After land survey and before the start of the construction work (performance monitoring)
 - Timeliness of compensation payments to all affected persons;
 - Effectiveness of linkages with savings and investment program as well as revolving fund program in order to prevent increased vulnerability;
 - Existence and functioning of the grievance mechanism; and
 - Reactions of PAPs.
- After the completion of the construction work (Impact monitoring):
 - Effective implementation of resettlement activities (Resettlement Action Plan);
 - Effective implementation and results of the grievance mechanism;
 - Post-displacement livelihood situation; and
 - Effective implementation of livelihood improvement measures.

After the completion of the construction work, an independent audit should be carried out by an international auditor in order to check out the adequacy of the compensation payments and the effectiveness of the resettlement. If the livelihood of resettled people has not been restored, an additional program for livelihood restoration should be implemented.

The monitoring for the resettlement and livelihood restoration phases will be considered as an all-round action recording the development of:

- Replacement of Houses and Structures
- Replacement of Land
- Loss of Trees
- Loss of crops
- Resettlement disturbance
- Protection of vulnerable categories
- Consultations and disclosure process
- Grievance Redress Mechanism
- Interagency coordination
- Support to PMU
- Agriculture production
- Employment
- Maintaining of social network
- Health

To be concluded before the end of the resettlement action plan.

The budget is reported and described in the RAP Report.

8.4 Mitigation and Monitoring Matrix

Construction Phase

STAGE	KEY IMPACT	RISK	MANAGEMENT AND MITIGATION MEASURES	IMPLEMENTING ORGANIZATIONS	MONITORING SCHEDULE	INDICATORS
Construction phase	Solid waste	Wrong disposal of material at different level of hazard	Guidelines for waste management, procedures, methods and facilities	Contractor, Ministry of Health	Monthly	Tracking system, sampling, dam site pollution
Construction phase	Emission and dust	Emissions and dust from the heavy traffic, excavation, blasting and crushing activities	Dust control is performed through regular watering of access roads, use of respiratory protective equipment by workers closely involved in excavation, blasting and crushing activities.	Contractor, Ministry of Health	Randomly for all the construction period	Dust sampling (PM10 and PM2.5), clinic records for respiratory diseases
Construction phase	Noise	Noise and vibration over-exposures are prevalent in the construction trades	Excess of 100 decibels (dB), levels should preclude work durations with unprotected ears of more than a few minutes per day.	Contractor, Ministry of Health	Randomly for all the construction period	Noise measures, clinic records for hearing problems
Construction phase	Use of explosive materials	Risks are mainly due to human safety, damage to infrastructures and properties and the natural environment involvement	Rules for explosive storage, all health and safety procedures have to follow the National Laws and Regulations	Contractor, Ministry of Health	Randomly for all the construction period	Storage record, control quality reports
Construction phase	Vegetation clearing	Impoverishment of the environment, not necessary over-cutting with risk of erosion and channeling	Minimize the cutting leaving the trees having the breast height more than 10cm, and favour the re-vegetation of smaller trees	Contractor, Ministry of Forestry	Beginning, half time, end of clearing activity	Percentage of cleared area and saved trees > 10cm BH

Construction phase	Health concerns	Increase the spread of HIV/AIDS and other sexually transmitted infections (STIs) among the local population and the construction workers.	Education campaign on sexually transmitted infections among the local population, complemented by easy access to condoms at the workplace as well as to voluntary consulting and testing together with improved access to medical services	Ministry of Health	Quarterly	Record of voluntary counselling and testing, record of diagnosis and delivering of medicines
Construction phase	Intersection with existing lines	Stop of the distribution along the crossed linees	Planning and minimization of the working times. Compensation of the loss.	Contractor, Ministry of Health	During the job	Time/cost of the loss
Construction phase	Fire hazard	The pratic of the "slash and burning" for the land clearing could propagate the fire	The land use plan has to consider the safety of the surrounding environment	Forestry Department	Before any burning process	Number of burnt surface and accident events
Construction phase	Influx of people	Influx of people is likely to bring strain on the social infrastructure such as schools, health centre and housing in the area	A series of support measures should be provided to local communities, in order to mitigate social, health and economic impacts	Ghana Police Force	During the whole duration of construction	Number of new comers
Construction phase	Habitat degradation and fragmentation	The construction operations will cause the degradation and the fragmentation of the habitat	Creation of edge effects of encroachment of animals around the settlements and collision with traffic	Department of Environment	Quarterly	habitat hot spots and connections

Operation Phase

STAGE	KEY IMPACT	RISK	MANAGEMENT AND MITIGATION MEASURES	IMPLEMENTING ORGANIZATIONS	MONITORING SCHEDULE	INDICATORS
Operation phase	Transmission line emissions	Electric and magnetic fields produced by the flow of the electric current	a 20m wide corridor is foreseen to be left free from any construction used for human purpose	Local Authorities	Bimonthly	Measures of emissions along the line
Operation phase	Bird collision	Electrocution occurs when birds touch two cables or when they roll over a conductive pole (eg metal) and at the same time they touch a live cable.	Power poles with suspended insulators are quite safe, provided that the distance between the crossed arms and live parts (conductors) is sufficient.	Local NGO	Quarterly	Number of birds electrocuted

Environmental Management Phase

	STAGE	KEY IMPACT	RISK	MANAGEMENT AND MITIGATION MEASURES	IMPLEMENTING ORGANIZATIONS	MONITORING SCHEDULE	INDICATORS
1	Environmental management phase	Loss of habitat and biodiversity	Impoverishment of the biodiversity, and reduction of the incoming generated by the loss natural resources	Minimization of the opening of access roads and movements with heavy machinery around the corridor	MLNR, WWF	Bimonthly	Endemic species
2	Environmental management phase	Loss of corridors ensuring the sustainability of the habitats	Access roads used for construction purpose could trig wrong exploitation of wildlife habitat or new unplanned settlements.	Protection of the wildlife areas potentially used by wildlife, and control of livestock keeping and settlements	Contractor, WWF	Quarterly	Corridor locations (ESIA baseline data), number and type of migratory fauna
3	Environmental management phase	Change in land use pattern	Wrong assessment, unbalancing amongst different land use areas, anthropic pressure on wildlife zone	Assessment of data collected in ESIA, consultation with local communities, redirecting of land use plan	MLNR, WWF	Quarterly	Agriculture and livestock development, wildlife presence
4	Environmental management phase	Erosion and soil degradation	All the cleared areas will be prone to erosion under heavy rainfall conditions	Minimizing the removal of the topsoil (access roads, quarries, dump sites, etc.), bringing it back after having finished the construction phase	Contractor, MLNR	Quarterly	Numbers and magnitude of gullies, number of plants for linear km

							along the reservoir boundary
5	Environmental management phase	Impact on landscape	Disruption of the natural landscape and impact on the local tourism	Visual consideration of the poles set up and landscape optimization during the design phase	MLRN, Local authorities	Bimonthly	Records of the touristic incoming
6	Environmental management phase	Fire hazard	Involvement of wildlife or natural areas during the "slash and burning" for preparing the clearing of the corridor, or for purposes triggered by the opening of access roads.	The secondary access road to the transmission lines have to be covered with topsoil and replanted to avoid easy access to natural resources	MLRN, Local Authorities	Quarterly	Number and surface of new burnt areas
7	Environmental management phase	Impact on vegetation	Endemic species of different type will be cleared affecting the surrounding environment directly (loss of plants and different species), and indirectly (negative aspects affecting the ecosystem and the local food chain).	The endemic vegetation that could be preserved during the set up of the transmission line will be evidenced by a specialist	MSWR, WWF	Quarterly	Recording of new settlements, cultivations and livestock presence
8	Environmental management phase	Impact on terrestrial fauna	Mainly birds will be affected by the presence of the line because of risk of collision and electrocution	This risk is unavoidable and could only be reduced to a certain amount by using of bird diverters what would involve high costs with limited risk reduction	MSWR, WWF	Quarterly	Number and type of fauna visiting the new upreach area

Resettlement Stage

	STAGE	KEY IMPACT	RISK	MANAGEMENT AND MITIGATION MEASURES	IMPLEMENTING ORGANIZATIONS	MONITORING SCHEDULE	INDICATORS
1	Resettlement stage	Replacement of houses and structures	Loss of houses and facilities	Replacement of residential houses improving the quality of structures and materials		Monthly	Built houses vs census data
2	Resettlement stage	Replacement of land	loss of land close the abitual residence	Replacement of cultivable land	District and Local authorities, RWG, local communities	Monthly	Number of grievances rised
3	Resettlement stage	Damage to crops and other properties	Damage to crops and other minor assets	Definition of the replacement cost and full compensation value		Monthly	Damaged areas and compensation value
4	Resettlement stage	Loss of trees	Loss of assets and incoming from the selling of fruits	Re-plantation of trees and compensation for loss of incoming	District and Local authorities, RWG, local communities	Monthly	Number of trees replanted vs lost trees
5	Resettlement stage	Loss of crops	Loss of crop during the construction period	Compensation for loss of crop on the basis of the local market price	District and Local authorities, RWG, local communities	Monthly	Control of unit prices and n. of compensations
6	Resettlement stage	Resettlement disturbance	Disturbance, lack of transport, loss of profit	Update the market values, organize transports, consider the disturbance	District and Local authorities, RWG, local communities	Weekly	Number of grievances for different items

7	Resettlement stage	Protection of vulnerable categories	Strong negative impact on elderly and vulnerable people such as widows, alone women, disabled, etc.	Extra care in handling, and identification of next of kin/relative for supporting	District and Local authorities, RWG, local communities	Monthly	Record of tutors and performances
8	Resettlement stage	Consultations and disclosure process	Lack of involvement of PAP and stakeholders	Correct system of information and disclosure process	District and Local authorities, RWG, local communities	Monthly	Number of involved people and stakeholders
9	Resettlement stage	Grievance redress mechanism	Wrong management of the procedures or misunderstandings	Dealing with grievances through appropriate channels, use of transparent assessment and negotiation between the parties	District and Local authorities, RWG, local communities, DAWASA	Monthly	Complains during the redress mechanism
10	Resettlement stage	Interagency coordination	Poor coordination of action and funds	Consultation of the stakeholders and supervision by the client	DAWASA, National, Regional, District, Local Authorities	Monthly	Total number of stakeholders and number of actions
11	Resettlement stage	Support to the Project Management Unit	Poor implementation phase due to lack of logistic and expertise	Provision of adequate logistic in the project area, connection with authorities and recruitment of necessary expertise		Monthly	Total number of stakeholders and number of actions

Livelihood Restoration Stage

	STAGE	KEY IMPACT	RISK	MANAGEMENT AND MITIGATION MEASURES	IMPLEMENTING ORGANIZATIONS	MONITORING SCHEDULE	INDICATORS
1	Livelihood restoration stage	Agriculture production	Inadequate lands at resettlement site	Site selection, calculation of available areas, general assessment, survey, allocation of parcels	District and Local authorities, RWG, local communities	Quarterly	Record of complains on the new site selection
2	Livelihood restoration stage	Health	Health risks due to the concentration of people (resettlement and influx for construction activities)	Construction of health facilities, development of health program specifically addressed for modern mother and child health care and STIs	District and Local authorities, RWG, local communities	Monthly	Record of recoveries, specific health database
3	Livelihood restoration stage	Employment	Short term employment and extra incoming for the households. Possible abandonment of land and traditional activities	Hiring of local farmers for caring of the temporary abandoned lands	District and Local authorities	Monthly	N. of employees, n. of abandoned lands
4	Livelihood restoration stage	Roads transports and	The public transport from the rural areas will be affected by the new impounding	Small infrastructures will be implemented to make the permanent roads safer		Bimonthly	Status of the public transport and incoming

9 CAPACITY DEVELOPMENT AND TRAINING

9.1 General Features

9.1.1 Background

In the chapter development and training the various interventions for strengthening local institutions to adapt to the proposed development initiatives are described, with a focus on staff required for livelihood development. The capacity development will be strictly related to the impacts assessed and the mitigation measures adopted discussed in the previous chapters.

The activities include strengthening of facilities and the training of staff of key institutions that will be needed to implement the RAP such as the Resettlement Working Group (RWG) and other government officials from within the regional and district level administrations.

The issue of institutional capacity weakness, due to lack of capable manpower and resources is generally recognized in the environmental and social management plan phase, for any kind of project.

In the context of project implementation it is adopted that, on the basis of the implementation agencies indicated in the final matrix:

- i. relocation logistics and construction issues are the primary responsibility of institutional authorities and there is adequate consultant and personnel to hire as needed;
- ii. resettlement planning could request of engaging experts as required;
- iii. financial and procurement is the primary responsibility of the indicated IA and adequate consultants can be hired as needed;
- iv. participation and consultation is the responsibility of the client DAWASA, and its recent staffing and work in this sector suggest that it can adequately carry out these functions; v. the technical support function required at the District level (eg. Health, land use) is considered to be the main weakness.

9.1.2 Capacity

Capacity building relates to two general issues:

- human resource capacity (staffing and training)
- physical and logistical capacity.

On the basis of the magnitude of the Project, a very limited staff will have to be recruited.

The main requirement for staff should be for livelihood or extension development staff, working in the Resettlement Working Groups at district level, but considered the number of households involved and the moving of the structure, generally just out of the corridor, the increment of staffing can be considered negligible or even zero units.

Because of the rural electrification, an improvement of the economic activities and the livelihood is expected, together with a minor incoming in the area from more remote zones of the same wards.

The project should supply the necessary equipment for the existing facilities as well as to improve the mobility to enable the staff to work on the whole project area more effectively. The maintenance of the main road and the access roads to be built for maintenance purpose could play a role in the logistical capacity. Rural staff could be seasonally employed for maintenance purpose if trained on precise actions to be performed.

The Project could provide funds for an expansion of the present transport lines to facilities as bus stations, workshop, motorcycle garages and scattered facilities for storing goods and products. The mobility of the staff will be improved by the same increment of the buses and the better conditions of the road.

9.1.3 Training

Objective of the training is to improve their planning processes, their ability to manage the resettlement process and, in the longer term, to improve service delivery to all the resettled villagers. An improved capacity for resettlement will also benefit future development projects where there has been little institutional experience in managing mitigation measures on environmental aspects and resettlement plans.

Different phases of training have been described and budgeted along the Environmental and Social Management Plan. Different figures have been calling to support the phase of mitigation and monitoring, divided in specialized units, to be recruit to support the facilities foreseen in the new settlement area (education, health, management), and local units for short term (landscaping, reforestation, earthmoving, etc.) and long term (protected areas surveillance, plant nurseries, touristic staff, etc) periods.

During the resettlement process the RWG will play important roles. In order to strengthen the institutional capacity, a training program will be needed order to develop:

- A clear understanding of the resettlement policies for the entitlements of the affected people.
- Knowledge of steps and skills required in developing and implementing the RAP and the resettlement regulations.
- The basic capacity to organize to carry out the resettlement implementation activities.
- The management skills for allocating resettlement tasks and funds, and carrying out effective supervision and monitoring.

At present the institutional capacity at the district level is constrained by a combination of limited physical resources, manpower and skills. However, as the main actors in supporting the resettlement, the districts will be directly responsible for the conduct of the detailed implementation activities in the affected villages. Thus, it will be essential to carry out a training and capacity building program to ensure the success of the resettlement program as a whole.

The RWG work on specific objectives is discussed in the ESMP, and adequately funded.

10 COSTS AND BUDGET

The assumptions underlying this budget are as follows:

1. **Disclosure of Environmental & Social Impact Assessment Report (\$10,000.00):** This cost assumes the need for public disclosure and stakeholder engagement activities required to share the findings of the Environmental and Social Impact Assessment (ESIA) with affected communities and other stakeholders.
2. **Environmental Monitoring, (\$150,000.00):** This budget item is based on continuous monitoring of environmental parameters throughout the construction and operational phases to ensure compliance with environmental standards, medical care, psychological support, legal assistance and to mitigate potential impacts.
3. **Cost of Implementation of EIS, RAP, and ESMP (\$75,000.00):** This covers the costs associated with implementing the Environmental Impact Statement (EIS), Resettlement Action Plan (RAP), and Environmental and Social Management Plan (ESMP) over the project's life cycle, including monitoring and mitigation measures.
4. **Training of Environmental Management Team (\$50,000.00):** This allocation is for the training and capacity building of the environmental management team to ensure they are equipped with the skills and knowledge required to manage the project's environmental and social aspects effectively.
5. **Unforeseen Pacification Rites (\$20,000.00):** This budget item accounts for unexpected cultural or social rites that may need to be conducted to appease local communities or address unforeseen cultural issues that arise during the project.
6. **Decommissioning and Reclamation of Lay Down Areas (\$85,000.00):** This is for the restoration and reclamation of areas used as temporary laydown yards or construction sites at the end of the project, ensuring these areas are returned to their original condition or better.

The budget outlined in Table 8 covers the necessary environmental and social management activities for the project over the duration.

Table 8: Environmental management Plan budget estimate

Nº	ITEM	US \$
1.	Disclosure of Environmental & Social Impact Assessment Report	10,000.00
2.	Environmental Monitoring	150,000.00
3.	Cost of implementation of EIS and ESMP	75,000.00
4.	Training of environmental management team	50,000.00
5.	Unforeseen pacification rites	20,000.00
6.	GBV Sensitization and Support Services	20,000.00
7.	Establishment and Maintenance of Grievance Redress System (including training of GRCs)	15,000.00
8.	Decommissioning and reclamation of lay down areas	85,000.00
	Total estimates for environmental issues	425,000.00