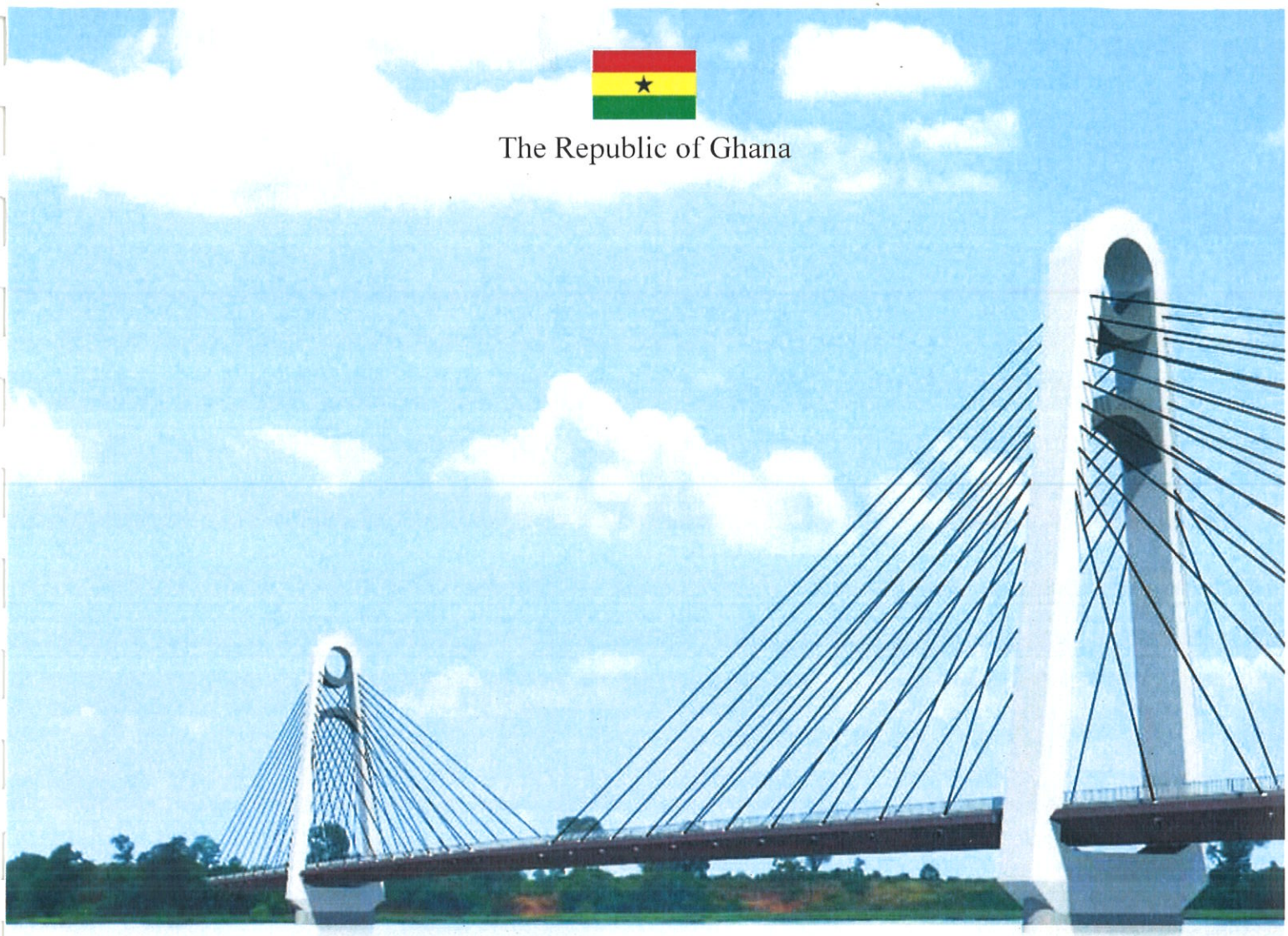
The Republic of Ghana



ENVIRONMENTAL SOCIAL MANAGEMENT PLAN (ESMP)

FOR
CONSULTING SERVICES FOR DESIGN REVIEW AND CONSTRUCTION SUPERVISION FOR CONSTRUCTION OF A NEW BRIDGE ACROSS THE VOLTA RIVER ON THE EASTERN CORRIDOR PROJECT

March 2020

Joint venture of :

CENTRAL CONSULTANT INC.,

ORIENTAL CONSULTANTS GLOBAL CO., LTD.

In Association with

HAG Consult Ltd. and Associated Consultants Ltd.

Loan No.: GH-P13

CONSULTING SERVICES FOR DESIGN REVIEW AND CONSTRUCTION SUPERVISION FOR THE CONSTRUCTION OF A NEW BRIDGE ACROSS THE VOLTA RIVER OF THE EASTERN CORRIDOR PROJECT (GH-P13)

GHANA HIGHWAY AUTHORITY

Environmental and Social Management Plan

March, 2020

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LIST OF ABBREVIATIONS

ABC	Accelerated Bridge Constructions Technique
AfDB	African Development Bank
DANIDA	Danish International Development Agency
ESO	Environmental and Safety Officer
EPA	Environmental Protection Agency
ESMP	Environmental and Social Management Plan
GHA	Ghana Highway Authority
GoG	Government of Ghana
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency syndrome
JICA	Japan International Cooperation Agency
NGOs	Non-Governmental Organisations
P_M	Particulate Matter
PAPs	Project Affected Persons
STEP	Special Terms for Economic Partnership
TSP	Total Suspended Particles
WHO	World Health Organisation
WRC	Water Resource Commission

1.0 GENERAL INTRODUCTION

The following briefly summaries the project profile:

Table 1: Summary the project profile

Project Title	**CONSULTING SERVICES FOR DESIGN REVIEW AND CONSTRUCTION SUPERVISION FOR THE CONSTRUCTION OF A NEW BRIDGE ACROSS THE VOLTA RIVER ON THE EASTERN CORRIDOR PROJECT (GH-P13)**
Year of Implementation	Design: 2015
	Design Review: 2019-2020
	Construction: 2020-2025
Project Duration	77 Months including Design Review and Tender (17 months), Construction (48 months) and Defect Notification Period (12 months)
Date of Operation	2025
Project Completion Date	2026

1.1 OBJECTIVES OF ESMP

The prime objective of the Environmental and Social Management Plan (ESMP) is to bring the project into compliance with applicable national environmental and social legal requirements as well as those of Japan International Cooperation Agency and the Guidelines for Environmental and Social considerations and other international standards.

The ESMP also defines and outlines the mitigation/enhancement, monitoring, consultative and institutional strengthening measures to be undertaken during project implementation and operation to prevent, minimize, mitigate or compensate for adverse environmental and social impacts. In addition, the ESMP seeks to enhance the project beneficial impacts. Taking the above principles into account, the ESMP for the Consultancy Services has been formulated to address the objectives, actions, strategies and activity costs of the management plan for all the project phases.

2.0 CONTEXT

2.1 Background

The trunk highway network in Ghana consists of three international corridors i.e. Central, Western and Eastern. The Eastern Corridor is the shortest route connecting the most important port of Ghana, Tema Port, and Burkina Faso, and development of this corridor will contribute to the development of less-developed areas along this corridor.

Hence, development of the Eastern Corridor has a high priority, and development plans have been carried out with financial assistance from some development partners, including Japan. The Japan International Cooperation Agency (JICA) has identified the importance of the Eastern Corridor in the cooperation policy for Ghana "Development of infrastructure to support economic growth", and conducted the "Preparatory Survey on the Eastern Corridor Development Project (Master plan and feasibility study: Field Studies) to assist the development of the Eastern Corridor, and proposed construction of 67 km of new road, including a new bridge across the Volta River, after comparing various alternatives.

Based on this proposal, the GoG has decided to develop this road section with financial assistance from the African Development Bank (AfDB). And the GoG requested the Government of Japan to execute a Yen Loan project to construct a new bridge across the Volta River by applying the Special Terms for Economic Partnership (STEP) scheme, in order to construct a high-quality, durable, and economically viable bridge by applying various Japanese technologies.

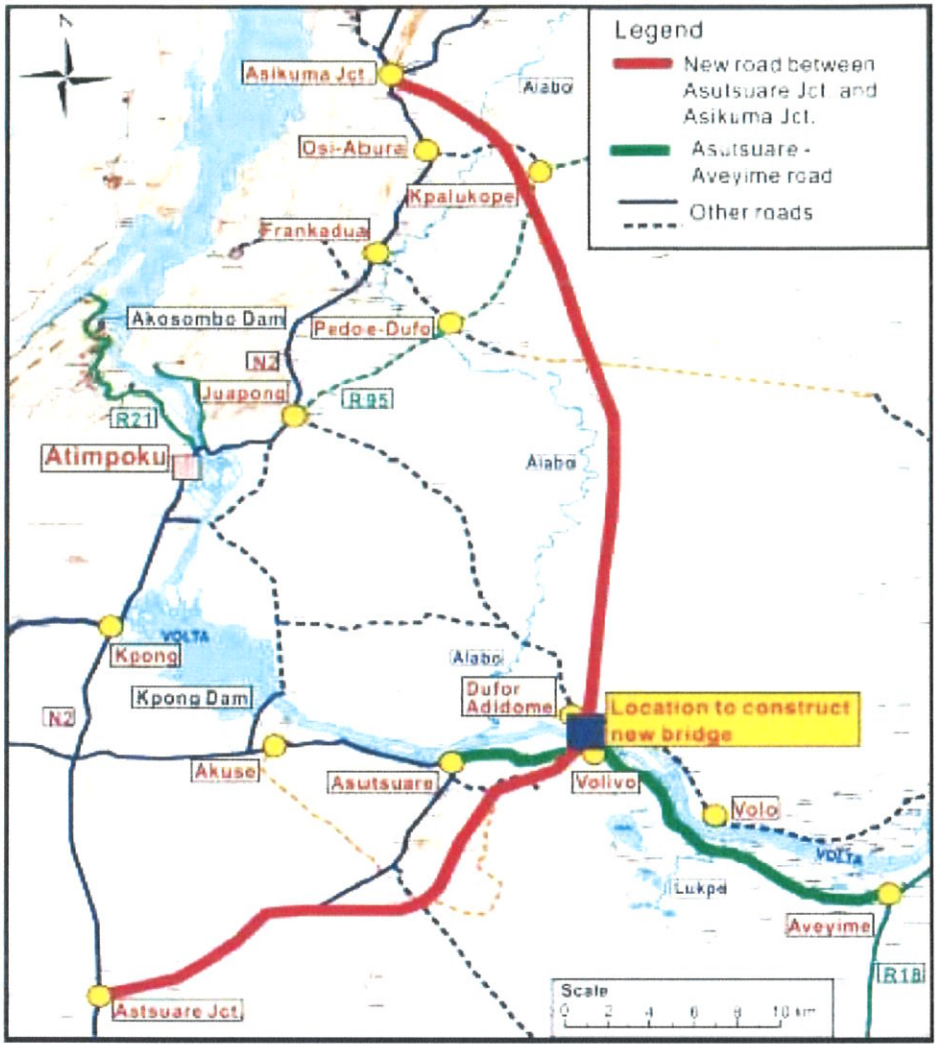

Figure 1: Map showing Project Layout – Feeder Roads Network

2.2 Project Objectives

The objective of the Study is to carry out detailed design and prepare draft bidding documents for the project to construct a new bridge across the Volta River and its approach road by using a Yen Loan and applying the STEP scheme.

2.3 Project Works

The Proposed Bridge will be located at Adidome Dufor on the southern bank and Volivo on the northern bank. The village of Adidome Dufor belongs to the North Tongu District Assembly while Volivo is under the Shai Osudoku District Assembly. The project site is located approximately 75 km north-east of Accra on the Eastern Corridor across the two districts.

2.4 Project Components

Major scope of the project is as follows:

- Construction of bridge substructure including double sheet pile cofferdam
- Construction of weathering steel bridge superstructure
- Erection of cable-stayed bridge with high precision
- Construction of approach road (565 m on the southern side of the river bank and 370 m on the northern side)
- Construction of rest/observatory area
- Construction of toll plaza facility
- Installation of axle load scale
- Construction of drainage structures
- Other ancillary works

Table 2: Summary of Project Scope

Work Type	Work Item	Sub Work Item
Bridge	Foundation for abutments	Piling foundations
	Foundation for piers	Spread foundation, excavation of groundwater rock layer with single steel pipe sheet pile cofferdam
	Abutments	Reverse T-type abutments
	Piers	Pier (main tower): Column type elliptical piers x 2 Pier (approach): Round column piers x 2
	Superstructure (Continuous cable-stayed bridge)	Main girders: Steel-deck edge girder Main towers: Reinforced concrete Bridge length: 540 m (34 m + 96 m + 280 m + 96 m + 34 m)
	Pavement	Asphalt pavement
	Typical cross section	Carriageway: 3.65 m × 2 Shoulder: 2.50 m × 2 Sidewalk: 2.00 m × 2 Railing: 0.40 m × 2 Total bridge width: 17.10 m
	Ancillary components	Bearings, expansion joints, inspection gondolas and paths, pavement markings, traffic signs, guard fences, road illumination, landscape illumination, navigation aids and aviation

		obstacle lights
Approach Roads	Length (Main road)	Right bank of Volta River (Volivo side): 565 m Left bank of Volta River (Dufor Adidome side): 370 m
	Earth works	Formation of sub-base
	Pavement	Asphalt concrete pavement
	Road drainage	Side ditches and cross culverts
	Ancillary works	Road illuminations, pavement markings, traffic signs, guard fences and road safety devices
	Typical cross section	Carriageway: 3.65 m × 2 Shoulder: 2.50 m × 2 Rounding: 1.00 m × 2 Total road width: 12.30 m
Other Facilities	Toll plaza	Two toll plazas (Volivo side and Dufor Adidome side) Toll booths and toll gates, administration office, temporary parking space for overloaded vehicles, axle load scale, interlocking pavement and road illumination
	Rest stop	One location (Dufor Adidome side) Commercial building, parking lots, access road, park and observation deck and illumination

2.4.1 Horizontal and Vertical Alignments

The horizontal and vertical alignments of the project have been designed to meet standard requirements and to improve safety.

2.4.2 Pedestrian Facilities

In view of pedestrians in the vicinity of the proposed bridge, facilities for pedestrians have been included in the design to cater for their needs. These facilities include provision of walkways parallel to the various roads.

2.4.3 Traffic Control Devices

Traffic control and road safety devices will be put in place in addition to other necessary road furniture when implementing the project.

2.4.4 Construction Materials

Within the Shai Osudoku and North Tongu areas and the adjoining municipalities, there are both new and existing borrow and quarry pits that can be sourced for the construction materials for this project.

2.4.5 Construction Camp Establishment

Appropriate land for construction camp sites will be sought for by the Contractor(s) to house the following:

I. Main Camp Sites
   a) Consultants' offices,
   b) Contractors' offices,
   c) Fuel farms
   d) Truck parking yards

II. Materials Holding and Batching plants

III. Pre-cast yards

2.4.6 Site Preparation

Construction process begins with the alignment surveying, pegging and clearing. This involves bush clearing, top soil stripping to be followed with earthworks. Bush clearing removes vegetation cover including grass, shrubs and trees. Tress will also be removed and the Contractor is expected to maintain a record of the number, species and characteristics of the trees removed for compensation through planting.

2.4.7 Earthworks

Earth moving is the removal of the overburden along the alignment to give way for filling with appropriate materials. This generates significant spoil earth materials to be disposed off or reused elsewhere. The activities will involve moving fill materials (gravel) to fill and development of the base on which the road surface will be formed.

2.4.8 Materials Sourcing and Extraction

Mobilisation of materials will be the main activities such as to include aggregate from the quarry sites, gravel from borrow areas and water from sources. Materials haulage, storage, batching and applications are major project activities.

2.4.9 Piling Activities

A deep foundation is required to support the bridge; therefore, piling for the foundation will also be major activity.

2.4.10 Road Surface Materials

The surface materials would be asphaltic concrete. The proposed project route is expected to be durable, having the capacity to bear substantial and diverse volumes of load with the expected increase in vehicular volume, a better, smoother riding ability, and a low noise generation characteristic.

2.5 Baseline Conditions

2.5.1 Climate

The Volivo part of the southeast coastal plain is one of the hottest and driest areas in the country whiles the climate Adidome is more tropical, influenced by the south-west monsoons from the south Atlantic and the dry harmattan winds from the Sahara. The mean temperature for the area is approximately 27°C, with a maximum temperature of around 33°C and minimum of 22°C. Though, it can reach peaks as high as 40°C in Volivo. Precipitation is generally low and erratic, normally receiving rainfall between September and November. The mean annual rainfall ranges from762.5 mm in the coastal area to 1,220 mm in other parts. Temperature and humidity vary little throughout the year. Average humidity is high at around 80%.

2.5.2 Topography

In the central part of Accra plain, the relief is gentle and undulating with altitude not exceeding 70 m above sea level. The plains are punctuated by a few prominent inselbergs, isolated hills, outliers and knolls scattered across the area. Prominent relief features include the Yongua inselberg (427 m) which has a conical shape with a number of outliers around the Asutsuare and Osuwem areas, the Krabote inselberg also to the North, and the Shai Hills (289m) towards the western part of the area. There are conspicuous large rock outcrops and boulders in the vicinity.

2.5.3 Geology and Soil Type

The project area forms part of the lower Volta flood plain. The repeated process of flooding and receding of the Volta River over the years has created fertile alluvial soil in the Volivo area and a coarser textured sample in the Adidome region. There is also the presence of a vast sedimentary stratum of oyster shells deposits and a number of inland lakes. Soils in the area are poorly drained pale-coloured sandy silt and underlying clay formed recently or in the contemporary Volta Alluvium making cultivation difficult. Nevertheless, they are suitable for rice and sugarcane cultivation under irrigation as they appear to be moderately well-supplied with nutrients in their natural condition, and are easily workable even with simple implements. They also provide raw materials for the pottery, brick and tile industries. The main mineral deposits in the area are clay, oyster shells, feldspar, nepheline gneiss, sand and granite.

2.5.4 Vegetation

The Project area lies in the Coastal Savanna Grassland/ Thicket Scrub vegetation zone. As part of the Accra Plains, it is an open tree savanna where the trees and shrubs occur in clumps formed on termite mounds that are scattered in the area. Some of the tree and shrub species that characterize the vegetation of the study area are *Securinega Virosa, Abutilon mauritianum, Grewia carpinifolia, Adansonia digitata* and *Zanthoxylum xanthoxyloides*. *Azadirachta indica*, an introduction, has spread widely in the area. *Leucaena leucocephala*, an Alien Invasive Species, is very abundant in the thickets in the Dorfor-Adidome section of the project area. The Dorfor-Adidome thicket Scrub is also abundant in the Gold Star climber species *Ritchiea reflexa*. The Gold Star rating implies the species is rear in the project area. Conservation action is required for this species to ensure that it is not completely removed and wiped from the area by the project. A large portion of the vegetation remains dry for most of the year particularly in the southern area with the exception of the short rainy season. In the Volta floodplain, tall swampy grass and tall savannah grass with isolated thickets and trees are the prevalent type of vegetation as well as farms and farm-regrowth. Some common grasses include *Andropogon gayanus, Hyparrhenia rufa, Chloris pilosa, heteropogon contortus* and *Sporobolus pyramidalis*. Along the Volta River, the vegetation is dense and the stream basins where mainly mango, oil palm, baobab, silk cotton, acacia and others are grown. Farther from the river, the vegetation is sparse, dominated by grassland interspersed with neem trees and guinea grass, digitaria decumbent and fan palms.

2.5.5 Animal Species

Generally, the species diversity and abundance of mammals within the proposed project site was very low with the giant rat (*Cricetomys gambianus)* being the dominant fauna. Though all species are partly protected under the Wildlife Conservation Regulations of Ghana, only four of the species encountered are categorized as Least Concern on the IUCN Red List of Threatened Species. Of the 39 species of birds recorded, none was of international conservation importance while 2 are of national conservation importance. These are namely the Cattle Egret (*Bubulcus ibis*) and the Yellow billed Kite (*Milvus aegyptius*). The two species are however widely spread throughout the project area and have wide range of habitat distribution in Ghana hence are not expected to be impacted significantly by the project.

The table below shows the fishes found the Volta Lake.

Table 3: Fishes found in the Volta Lake

	English Name	**Scientific Name**	**Local Name**
1	Nile Tilapia	Oreochromis niloticus	Koobi
2	Catfishes	*Clarias gariepinus*	Adwene
		Heterobrancus bidorsalis	

3	Bagrid catfish	*Chrysichthys nigrodigitatus*	Gblovi
4	African Bony tongue	Heterotis niloticus	Superku
5	West African Pygmy herrings	Sierrathrissa spp	One Mouth Thousand
6	Snakehead	Parachanna obscura	Koboo
7	Tiger fish	Hydrocynnus foskahlii	Akao/ Akawo
8	Electric fish, Africa knife	*Gymnarchus niloticus*	Aprukusu/ Eyor
9	Nile Perch	*Lates niloticus*	Akwaabi
10	*Puffer Fish*	*Tetraodontidae*	

Source: Fisheries Commission

2.5.6 Water Resources

Flowing over a fairly low terrain, streams have carved wide valleys yet they are dry for most of the year in the Volivo region. A number of artificial dams and ponds of varying size have been constructed in the district and are used for irrigation and watering of livestock. A total of 18 towns in Volivo have access to piped water with the remaining towns depending on wells, boreholes and other sources. Most of the people living in the villages, on the other hand, depend on borehole water, hand-dug well water, streams and rivers. An estimated 34% of the inhabitants in the 231 settlements in Volivo have no access to potable water. Ground water in the area is saline.

The Adidome area is however drained by the Alabo, Kolo, Aklakpa, Gblor, and Nyifla Rivers and their numerous tributaries into the Volta River. During the rainy season, these streams overflow their banks, causing damage to roads and farms. There are several ponds and dugouts/dams in the area, which serve as the main source of water for the inhabitants and livestock. Sources of water for domestic use and for those in the villages are pipe-borne, boreholes, streams, hand dug wells, streams and rivers with towns being the exception. Until 1994, most communities in Adidome had no access to potable water. But the Danish Government (Danish International Development Agency/DANIDA)-led water supply project provided piped water to Tedeafenui and other communities in the Adidome area. In addition, 26 communities have been provided with a total number of 89 shallow wells fitted with hand pumps. The Volta River offers an important source of water to the towns and villages nearby.

2.5.7 Water Quality

Water and air quality as well as noise levels in or near the project site were examined during the Field Studies. The results of the tests generally show values that are environmentally favourable than the EPA guideline values. The results of the water quality, air quality and noise level tests are presented in Tables below.

As the only water body within the immediate project zone, the physical, chemical and biological parameter of the Volta River was analyzed. Table 4 and 5 shows the results for the water samples taken from the two landing sites of the proposed bridge.

Table 4: Surface Water Quality of Volta River (Dufor Adidome landing site)

Parameter	EPA Method No.	Unit	Value	GS 175-1	WHO Guideline
Turbidity	3	NTU	<1.00		5
Colour (Apparent)	2	Hz	2.50-		15
Odour		-	-	Inoffensive	Inoffensive
pH	4	pH Units	6.42	6.5-8.5	6.5-8.5
Conductivity	1	µs/cm	68.4	-	-
Tot. Suspended Solids (SS)	5	mg/l	<1.00	0	-
Tot. Dissolved Solids (TDS)	6	mg/l	41.0	1000	1000
Sodium	30	mg/l	5.10	200	200
Potassium	29	mg/l	3.00	30	30
Calcium	23	mg/l	7.29	200	200
Magnesium	26	mg/l	0.817	150	150
Total Iron	31	mg/l	<0.010	0.3	0.3
Ammonia	13	mg/l	<0.001	0.00-1.5	0.00-1.5
Chloride	24	mg/l	2.28	250	250
Sulphate	19	mg/l	2.24	250	250
Phosphate	17	mg/l	0.048	-	-
Manganese	26	mg/l	0.012	0.4	0.4
Nitrite	14	mg/l	0.370	1.0	1.0
Nitrate	15	mg/l	<0.001	10	10
Total Hardness (CaCo3)	25	mg/l	21.0	500	500
Total Alkalinity (CaCo3)	22	mg/l	24.0	-	-
Calcium Hardness (as CaCo3)	23	mg/l	20.2	-	-
Mg Hardness (as CaCo3)	26	mg/l	0.760	-	-
Fluoride	20	mg/l	<0.005	1.5	1.5
Bicarbonate as CaCo3)	22	mg/l	29.2	-	-
Carbonate	22	mg/l	0.00	-	-

Table 5: Surface Water Quality of Volta River (Volivo landing site)

Parameter	EPA Method No.	Unit	Value	GS 175-1	WHO Guideline
Turbidity	3	NTU	1.41		5
Colour (Apparent)	2	Hz	2.50		15
Odour		-	-	Inoffensive	Inoffensive
pH	4	pH Units	6.66	6.5-8.5	6.5-8.5
Conductivity	1	µs/cm	66.3	-	-
Tot. Suspended Solids (SS)	5	mg/l	<1.00	0	-
Tot. Dissolved Solids (TDS)	6	mg/l	39.8	1000	1000
Sodium	30	mg/l	4.40	200	200
Potassium	29	mg/l	2.00	30	30
Calcium	23	mg/l	8.09	200	200
Magnesium	26	mg/l	0.185	150	150
Total Iron	31	mg/l	<0.010	0.3	0.3
Ammonia	13	mg/l	0.050	0.00-1.5	0.00-1.5
Chloride	24	mg/l	2.48	250	250
Sulphate	19	mg/l	2.51	250	250
Phosphate	17	mg/l	0.022	-	-
Manganese	26	mg/l	0.006	0.4	0.4
Nitrite	14	mg/l	0.382	1.0	1.0
Nitrate	15	mg/l	<0.001	10	10
Total Hardness (CaCo3)	25	mg/l	21.6	500	500
Total Alkalinity (CaCo3)	22	mg/l	30.0	-	-
Calcium Hardness (as CaCo3)	23	mg/l	18.2	-	-
Mg Hardness (as CaCo3)	26	mg/l	3.36	-	-
Fluoride	20	mg/l	<0.005	1.5	1.5
Bicarbonate as CaCo3)	22	mg/l	36.6	-	-
Carbonate	22	mg/l	0.00	-	-

2.5.8 Air Quality

Information on baseline air quality gives an indication of existing levels of ambient air quality parameters in order to evaluate the impact of additional emissions from the constructional and operational phases of the project on the environment. The levels will also be the reference for the continuous assessment of possible impacts of the project on the air quality of the receiving environment.

Table 6 shows ambient Particulate matter (PM) and Total Suspended Particles (TSP) within the project area while Table 8 shows the Nitrogen dioxide, Sulphur dioxide and Carbon Monoxide levels measured.

Table 6: Ambient PM10 and PM2.5 Measured on 17/12/2019

LOCATION	$PM_{2.5}(\mu g/m^3)$	$PM_{10}(\mu g/m^3)$	$TSP(\mu g/m^3)$
Volivo	13.8	21.8	37.7
Dufor Adidome	14.4	22.0	36.9
Ghana Standards for 24-hour Ambient air Quality for PM_{10} and $PM_{2.5}$	35	70	150

Table 7: Nitrogen Dioxide, Sulphur Dioxide, Carbon Monoxide levels measured on 17/12/2019

LOCATION	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
Volivo	0.3	<0.1	<2
Dufor Adidome	0.2	<0.1	<2
Ghana Standards for NO2, S02, CO	150	50	10

2.5.9 Noise

Ambient noise levels recorded were below the Ghana standards (Day) which is consistent with the residential and farming area.

Table 8: Daytime Ambient Noise levels (dBA) recorded on 17/12/2019

LOCATION	L_{AEQ}	L_{10}	L_{50}	L_{90}	L_{MAX}
Volivo	39.5	41.3	37.6	34.0	52.1
Dufor Adidome	36.1	38.7	33.9	31.4	50.4
Ghana Standard for Residential Daytime noise	55				

Table 9: Night time Ambient Noise levels (dBA) recorded on 17/12/2019

LOCATION	L_{AEQ}	L_{10}	L_{50}	L_{90}	L_{MAX}
Volivo	34.5	37.1	33.5	32.0	50.8

Dufor Adidome	32.1	35.8	31.9	30.6	46.9
Ghana Standard for Residential Daytime noise	48				

2.5.10 Population

The project catchment area falls within two main Districts: Shai Osudoku and North Tongu District. The total population for the two main districts is estimated at 151,909. This is made up of 62,131 people from Shai Osudoku and 89,777 from North Tongu district. Males form the majority (51.3%) in Shai Osudoku whiles females form the majority (52.7%) in the North Tongu district.

Population Sizes of Project Districts Area

Districts	Male	Female	Total
Shai Osudoku District *(2017 Projection)*	31,873 (51.3%)	30,253 (49.7%)	**62,131**
North Tongu *(2010 Population)*	42,492 (47.3%)	47,285 (52.7%)	**89,777**
Total			**151,909**

(Source: GSS)

On the other hand, the total population of the two communities is also estimated at 8,809 made up of 3000 people from Volivo and 5,809 from Dorfor Adidome. A detail of gender disaggregation distribution is shown in the table below:

Estimated Population Size of the Project Communities

Community	Male	Female	Total
Volivo	1659 (55.3%)	1341 (44.7%)	**3000**
Dorfor Adidome	2986 (51.4%)	2823 (48.6%)	**5809**
Total			**8809**

General Community Structure / Settlement

- **Volivo**

Volivo is surrounded by nine (9) main communities under the Dofor electoral area. These communities are Kewu, Atrobinya, Avakpo, Volivo-Lanor, Mafikoper, Chiefkoper, Amegbolor, Atabui and Duffor. Traditionally, the community is headed by the community chief and his elders whiles an elected Assembly member supported by a unit committee runs the political day-to-day administration of the community. The people of Volivo are mainly Dangmes with a few of the populace being Ewes. There are about 700 households with an average household size of 5

people per house in the community. Culturally, the person of Volivo celebrates "Jehayem" every May. Jahayem is celebrated to shame hunger.

- **Dorfor Adidome**

Dorfor Adidome is the largest among 12 communities under the electoral area. Unlike Volivo, Dorfor Adidome is made up of seven (7) main clans and the heads of these clans form the elders of the community. However, the clans are presided over by the main chief who controls the affairs traditionally in the community. All clans have their unique symbol but the community has the Baobab Tree as the universal symbol for the community. Politically, the Assembly member together with the unit committee members runs the political administration of the community. According to the community elders, the estimated average household size is five (5) people per house. The people of Dorfor Adidome are mainly Ewes with few Fulanis. The people culturally celebrate the "Ayimagonu" and "Dzrafedu-Za" festivals in November and March / April respectively. The festival is celebrated to remind community members of how their forefathers became victorious in the 1870 Global war.

2.5.11 Economic Activities

The economy is of the two communities is dominated by agriculture activities on subsistence basis in a labor-intensive manner. The most dominant crop under cultivation is Rice and this cultivated district wide. At Volivo, the rice farming is mainly done on irrigation basis. Water is usually drawn from irrigation facilities from Akuse and Asutsuare. Again, Volivo is also known for the production of fruits such as banana, mangoes, pineapple. Other major crops cultivated in both communities are cassava, maize, pepper, oil palm etc.

The agricultural land is farmed by its owners and there are no tenant farmers. This was confirmed by the assembly man of Dufor Adidome. Golden Exotic Estate has a plan of extending its 800 ha banana plantation to 3,000 ha and Tropo Farms has a 5 ha fish farm.
Another considerable farming activity undertaken in both communities is the fishing activity which is mainly done on the Volta river. The river is mainly known for the production of tilapia. Other traditional fishing communities include Bakpa, Mafi, Mepe, Battor and Volo in the catchment area. Also, livestock farming forms part of the farming activities undertaken by the communities. The Fulanis at Adidome are mainly noted for the rearing of cattle in the area.

Another area of interest that has gainfully engaged the youth and women in the area is Oyster Shell mining and processing. Oyster shells are naturally found on the grounds in both communities. The shells are processed by way of crushing by machine used for poultry feed. They are also processed for paints such as white wash paints, emulsion paints. There are also few artisans such as masons, welders, seamstress/tailors, electrician etc.

Oyster shell mining activities ongoing at Dorfor Adidome

2.5.12 Public Utilities

Approach roads are planned to cross existing electricity lines. Limited but additional social services may be introduced during the construction stage, possibly improving the situation.

3.0 BENEFICIAL AND ADVERSE IMPACTS

Table 12 summarizes the impacts of the project particularly during the construction phase by providing a description and an assessment of identified impacts.

Table 10: Summary of Environmental and Social Impacts

IMPACT	DESCRIPTION	ASSESSMENT
POSITIVE IMPACTS- CONSTRUCTIONAL PHASE		
Employment and Income	Job opportunities will be created for both skilled and unskilled labour	**Extent**: Local, District, regional, national **Duration**: Temporary and Short term **Magnitude**: High **Evaluation**: Major
Enhance skills for Local Artisans	The local artisans will have the opportunity to be trained by the contractor enhancing their skills on the job and pushing them to a higher level in their field or career.	**Extent:** Local, District, regional, national **Duration:** Long Term **Magnitude:** Medium **Evaluation:** Major
Increase revenue for the Municipal Assemblies	Revenue can be generated by the North Tongu and Shai Osudoku District Assemblies from traders who sell or trade around the project site to workers through ticketing. The new bridge could serve as a new land mark/tourist spot in the area.	**Extent:** District **Duration:** Long Term **Magnitude:** Medium **Evaluation:** Major
POSITIVE IMPACTS- OPERATIONAL PHASE		
Regional Economy	The Project would lead to an overall upgrading of the socioeconomic setting in the	**Extent:** Regional **Duration:** Long term

	area. Appreciation of land and property values in the road section and the immediate neighbourhoods will be enhanced	**Magnitude:** High **Evaluation:** Major
Vehicle Operating and Transportation Costs	By providing an alternate bridge route, tremendous savings will be made on general fuel consumption and reduction in vehicular emission pollution. The project has potential to benefit road users through reduced vehicle maintenance costs and delays.	**Extent:** Local, District and Regional **Duration:** Long term **Magnitude:** High **Evaluation:** Major
NEGATIVE IMPACTS- CONSTRUCTIONAL PHASE		
Water Quality	Spills of potential contaminating materials and other waste during construction could impact on the Volta River Dredging operation and disposal of dredged materials during piling activities will deteriorate water quality in the river especially local turbidity.	**Extent:** Local, District and Regional **Duration:** Temporary and Short term **Magnitude:** High **Evaluation:** Major
Air Quality	Dust will be generated during the construction activities. Emissions from construction vehicles and equipment.	**Extent:** Local, District and Regional **Duration:** Temporary and Short term **Magnitude:** High **Evaluation:** Major
Soil Erosion and Sedimentation	Road construction will intensify the effects of	**Extent:** Local

	natural soil erosion due to vegetation removal, soil disturbance, and exposure of bare soil surface	**Duration:** Temporary and Short term **Magnitude:** Medium **Evaluation**: Minor
Landscape Modification	Aesthetic and visual quality deteriorate due to material sourcing, excavations, stockpiling of materials, etc.	**Extent:** Local **Duration:** Temporary and Short term **Magnitude:** low **Evaluation:** Negligible
Land Acquisition and Relocation	Though there would be no involuntary resettlement for the project, a limited number of non-governmental plots of land would need to be acquired in areas where currently no road exists. In addition, there are two baobab trees standing in the middle of the planned approach road of religious importance in Dufor Adidome will be removed or relocated. Also, in Dufor Adidome the community cemetery is to be resituated.	**Extent:** Local **Duration:** Long term **Magnitude:** High **Evaluation:** Major
Noise and Vibration	Construction activities involving heavy duty machinery, vehicular movement, vehicle horns etc, may increase ambient noise levels and vibration beyond the immediate project area. Due to the 1km -7m distance from the main project area	**Extent:** Local **Duration:** Short Term **Magnitude:** Medium **Evaluation:** Minor

	and thick vegetation noise may however be within standard levels.	
Construction Camps	Improper construction of camps may destroy an area, leading to obvious consequences on soil erosion and water quality.	**Extent:** Local **Duration:** Short Term **Magnitude:** Medium **Evaluation:** Minor
Construction Waste Disposal	Large quantities of construction wastes would be generated whilst rehabilitating the road. Poor sanitation and solid waste disposal in construction camps and work sites are likely to have negative impacts on human health and the environment.	**Extent:** Local **Duration:** Short Term **Magnitude:** High **Evaluation:** Minor
Public Health and Safety	Stagnant water in pools near the road is a health hazard to nearby residents since they serve as breeding sites for vectors of disease such as malaria. Increase risk of spreading sexually transmitted infections (STIs) and AIDS to rural inhabitants. The safety of vehicular road users and pedestrians may be endangered by an increased risk of accidents resulting from collisions with construction vehicles and equipment or unsafe road conditions.	**Extent:** Local, District and Regional **Duration:** Long Term **Magnitude:** High **Evaluation:** Major

Public Utilities	Public utilities along the project road may include telecommunication lines and electricity cables could be relocated resulting in disruption of utility services. Overhead high-tension cables run along the road at sections of the project area.	**Extent:** Local **Duration:** Short Term **Magnitude:** Medium **Evaluation:** Major
Flora	Removal of vegetation within the Right of Way (ROW) including two Baobab trees and some Gold star specie (Ritchiea reflexa) of conservation importance. Soil compaction, Indirect impact from dust, particles; oil, fuel; Covering riverbed on riparian vegetation. Spoil material from road cutting can kill vegetation on disposal site	**Extent:** Local **Duration:** Short Term **Magnitude:** Medium **Evaluation:** Major
Fauna	There is the likelihood of poaching by construction workers in the project area.	**Extent:** Local **Duration:** Short Term **Magnitude:** Low **Evaluation:** Major
Aquatic Life	Piling and dredging activities will increase turbidity particulate matter, and suspended solids in the water column, which can interfere	**Extent:** Local **Duration:** Short Term **Magnitude:** Medium

	with the he photosynthetic ability of phytoplankton, feeding of fish and reduce availability of catch for fishermen.	**Evaluation:** Major
Cultural Heritage	Two baobab trees considered to be sacred by the Fetish group in Dufor Adidome need to be removed following proper religious and cultural procedures. Unmarked graves also need to be relocated as a result of the project.	**Extent:** Local **Duration:** Short Term **Magnitude:** Low **Evaluation:** Minor
NEGATIVE IMPACTS - OPERATIONAL PHASE		
Land Use Changes	Several land use changes may occur which may lead to the loss of the main objectives of easing traffic flow	**Extent:** Local, District **Duration:** Long Term **Magnitude:** High **Evaluation:** Major
Accidents/Health, Safety and Security	Health and safety risks could be elevated due to the "new road effect". The new bridge would allow for high traffic volumes with its consequent impacts; • elevated noise, • potential accidents, • demand on sanitary facilities • potential spread of diseases	**Extent:** Local, District and Regional **Duration:** Long Term **Magnitude:** High **Evaluation:** Major

4.0 MITIGATION MEASURES

The following mitigation measures have been considered as the most suitable to reduce the negative impacts that the project may result in.

Table 11: Mitigation Measures and Cost

IMPACT	PROPOSED MITIGATION
NEGATIVE IMPACTS- CONSTRUCTIONAL PHASE	
Water Quality	Preventing contamination of surface water bodies and ground water
	Proper disposal of all waste chemical substances away from the River
	Buffer zones of vegetation should be provided between work sites and water bodies
	Fuel trucks will be obliged to carry at all times, anti-spill trays and a supply of suitable material, such as sawdust, for absorption of minor spills
Air Quality	Periodic watering of exposed surfaces.
	Enforcing lower speed limits within the work zone
	Cover all trucks hauling materials
	Equipment and vehicles used are in good condition to ensure minimal emissions.
	Regular monitoring of PM, TSP, CO_x, NO_x, etc should be done during construction.
Soil Erosion	Plan and execute earthworks with due diligence to prevent soil erosion
Landscape Modification	Avoid cutting down of trees where possible
	The bridge and all other facilities will be landscaped
	Shrubs and grass will be planted in the median whilst trees are planted along the sides of the approach roads
	Borrow pits will be rehabilitated by re-vegetation of the site.
	Borrows and quarry that will be established in the project vicinity will be operated and closed in the context of contract

	agreement established prior to construction
Land Acquisition and Relocation	Proper and adequate compensation promptly paid to the land and property owners. Payment should take place before structures are taken over by the project.
Noise and Vibration	Maintain construction equipment regularly to control of noise.
	Plan and execute the works so that it does not become a nuisance to the general public where possible.
	Provision of appropriate safety gear for workers.
Construction Camps	Ensure that the construction camp is carefully sited and arranged to minimise their impact.
Construction Waste	Ensure proper disposal of construction waste
	Provide toilet facilities for workers
Public Health and Safety	Eliminating breeding sites of disease vectors.
	Occupational Health & Safety Plan
	HIV/AIDS Awareness programme/ Community Outreaches
	Post Traffic Signs and warnings
	Implement Speed limits at construction site
Public Utilities	Consult utility providers to plan and realign displaced utility services
Flora and Fauna	Conservation action is required for species of concern to ensure that they are not completely removed from the area by the project.
Aquatic Life	Dredging and piling works shall be planned to occur outside the known spawning and breeding season/period of the commonest fish species in the water body.
	The Accelerated Bridge Constructions (ABC) Technique will be employed to reduce the duration of impact on the water system and its associated species
	Monitor the water quality in the runoff from the site or areas affected by dredge plumes, and improve work practices as necessary.
	Protect water bodies from sediment loads by silt screen or bubble curtains or other barriers.

	Use environment friendly and non-toxic slurry during construction of piles to discharge into the lake.
NEGATIVE IMPACTS- OPERATIONAL PHASE	
Land Use Changes	The Shai Osudoku and North Tongu district Assemblies should enforce land use zoning regulations in their districts.
Health, Safety and Security	Road safety awareness campaigns should be organized to sensitize people on road safety and protection of the road signage and information Ensure improvement and protection of signage, guard rails and other features that contribute to road safety Strict monitoring compliance with traffic use and speed limits Enhanced Information and awareness of HIV/AIDS

4.1.1 Prevention of the Spread of Diseases

The spread of HIV/AIDS among project workers and communities during construction is one of the main health risks. The project design shall include sensitization programs of the dangers of HIV/AIDS through prevention and awareness campaigns; and through linkages with local NGOs and Health Authorities in the project area as well as creating the capacity for continuous prevention and awareness campaigns for road users.

4.1.2 Tree Planting

Trees are likely to be felled during the construction phase and as a compensatory measure the contractor is expected to plant four trees for every tree that will be felled.

5.0 ENVIRONMENTAL AND SOCIAL MONITORING PROGRAMME

Environmental monitoring ensures that the impacts have been accurately predicted and that mitigation measures are being implemented as planned and has the assumed effects. The monitoring exercise will ensure that the remedial actions recommended in the assessment are incorporated in the project and maintained throughout the operation life where appropriate. It will also identify additional remedial measures and corrective measures or redesign remedial measures if they are not sufficiently effective.

All major stakeholders in the project have a monitoring responsibility of some kind. However, only the Supervising Engineer, the Ghana Highway Authority Environmental Monitoring Unit, The EPA, the Forestry Services Division (The Forestry Commission), Water Resources Commission and the Contractor are allocated specific and formal monitoring obligations. Traffic Police, Health Authorities and other public authorities will automatically monitor some of the effects of the project during their daily work.

Periodic interviews with the beneficiaries of the projects will also be undertaken to assess their opinions about the effect of the implementation of the project.

Table 12: Summary of Monitoring Responsibilities and Output

Party Responsible	Parameters to be Monitored	Output
EPA	Enforce any actions that may be needed to ensure environmental quality standards are not breached and permit requirements are maintained	Regular monitoring to ensure compliance Instructions to Contractor and the Engineer
Forestry Services Division (The Forestry Commission)	▪ Implementing agency in charge of wetlands. ▪ Reforestation or land remediation program	Instructions to Contractor and the Engineer
Water Resources Commission	▪ Implementing agency in charge of water bodies ▪ Issue permits, Supervision, Monitoring of Piling and Cofferdam works	Instructions to Contractor and the Engineer
GHA (Environment Monitoring Unit)	• Overall Environmental Performance of the Project • Community relations • Payment of appropriate compensation	Quarterly Environmental reports

The Engineer	• Construction methods and materials • Environmental management of construction sites • Implementation of mitigation measures for air, water, soil, traffic, Occupational Health and Safety, etc. • Environmental management of construction camps • Contractors waste management Staged rehabilitation of impact areas • Community relations • Environmental performance of contractor's equipment • Accidents (traffic, spills etc.) • Environmental performance of mitigation measures	Monthly Environmental reports. Incident Reports as and when required (spills, accidents and the like)
The Contractor	• Environmental performance of equipment and plants • Implementation of interim and permanent mitigation measures • Waste Management plan • Occupational Health and Safety measures • Base Camp Management • Air and Water quality • Accidents of any kind	Maintenance records Accident Reports Mitigating actions e.g. sprinkling of water, traffic signs, safety barriers
Shai Osudoku and North Tongu District Assemblies	• Specific tasks assigned to various units	Reports and instruction to Contractor and GHA
Health Authorities	• Change of frequency of diseases • Occurrence of new diseases in the area	Health reports.
Local Communities	• Negative environmental impacts • Social disturbance	Complaints to Contractor and Supervising Engineer

6.0 PUBLIC CONSULTATIONS

Public consultations were undertaken at various levels with stakeholders at to elicit the perceptions of the different stakeholders with regard to the positive and negative impacts the project. The outcome of the consultation with the various stakeholders and beneficiaries of the project is summarized as follows:

Appreciation

- ✓ Improved road conditions
- ✓ Improved safety for users
- ✓ Reduction in occurrence of accidents;
- ✓ Enhance landscape and status of the municipality
- ✓ Creation of employment during the construction phase of the project.

Concerns

As much as stakeholders appreciate the project, they also had concerns which are listed below:

- Disruption of livelihood
- Prompt payment of adequate compensation;
- Employment opportunities for the locals should be ensured.
- Increased dust and noise pollution during the construction phase of the project;
- Non-motorized structures to enhance Safety of pedestrians and passengers;
- Appropriate provisions to control traffic congestion during construction.
- Road safety measures included in design.

During the preparation of the ESMP Report discussions were held with a number of stakeholders including GHA, EPA, Forestry department and the District Assemblies to discuss their monitoring responsibilities and institutional gaps. Overall there was broad support for the project. The stakeholders supported the proposed road development mostly to improve the traffic situation.

During the course of the ESMP implementation, GHA and Contractor will continuously consult key and important stakeholders to inform them about the implementation of the project as well the ESMP. These consultations will aim to: (i) Keep local communities updated on progress of project implementation of mitigation activities (where applicable); and (iv) Disseminate the ESMP content and its implementation procedure to them. Continuous public consultation will help to ensure that any grievances by the local community are addressed in time, and this can guarantee that the project will be supported by the local community.

In terms of public disclosure, copies of ESMP and its summary shall be shared with relevant stakeholders such as local communities, relevant government institutions and society organizations among others. The purpose will be to inform them about the project activities; negative environmental and social impacts expected from project and proposed mitigations.

7.0 RESPONSIBILITIES AND INSTITUTIONAL ARRANGEMENTS

The Engineer is expected to discuss and convey the contents of this management plan, recommended mitigation/interventions outlined under the impact, as well as the wishes of the affected stakeholders to the Contractor and construction workers for integration in the construction process. Stakeholders will need to be involved in the project monitoring framework through good relations between the contractor and the stakeholders and through timely information on the construction schedules, duration of construction works, potential interference with their daily activities and other issues arising. This will also help in resolving of problems related to construction and prevention of possible social conflicts associated with the project. Communication channels should always be open to ensure proper and timely responses to any complaints that may arise from the road project.

Specific responsibilities will be as follows:

7.1 Japan International Cooperation Agency (JICA)

JICA being the donor or funder of the project has the following responsibilities:

- To provide financial support to the project and ESMP
- To provide technical and supervisory support
- To review environmental and social impacts Report regularly

7.2 Engineer

Table 13: Environmental Management responsibility of the Engineer

PROJECT PHASE	No	ENGINEER'S RESPONSIBILITIES
Design	1	Design the project with the least negative environmental impact during the operational life of the road
	2	Design the project prescribing materials with the least negative environmental impact
	3	Incorporate any feasible traffic safety measures within the project design.
	4	Design environmentally friendly road drainage systems
	5	Incorporate all suitable clauses requiring the contractor to execute his work with due diligence and apply environmentally friendly methods. Such requirements must be accompanied by the necessary methods for monitoring and accompanied by the necessary methods for monitoring and enforcement. Clauses with principle contents as minimum requirement.

Implementation	6	The Engineer will supervise and enforce the Contractors performance on all environmental requirements included in the Contract Documents.
	7	The engineer will monitor the overall environmental impact of the projects and recommend additional mitigation measures for implementation when deemed necessary.

7.3 Contractor

Table 14: Environmental Management Responsibilities of Contractor

PROJECT PHASE	No	CONTRACTOR'S RESPONSIBILITIES
Mobilisation	1	Prepare a detailed Environmental Management Plan be approved by the Engineer and GHA as stated in the contracts
	2	Ensure that the management as well as site managers and foremen are well informed about all environmental issues of the project.
	3	Ensure that all site managers and foremen trained in environmentally friendly construction methods
	5	Ensure that all equipment mobilised fulfil the environmental requirements of the contracts
	6	Properly establish, operate and rehabilitate construction camp.
	7	Obtain necessary approvals for all borrow pits
	8	Establish a waste management plan covering all types of wastes.
Project Execution	9	Apply environmental requirement and construction methods.
	10	Ensure occupational health and safety of all workers and visitors to the site at all times.
	11	Fulfil all environmental requirements of the Contract Documents.
	12	Inform the Engineer if any unforeseen negative environmental impact should occur.
	13	Provide safe passage around or through the work site for all kinds of traffic.
	14	Ensure that all workers at his camp live responsibly with the communities along the road corridor
	15	Responsible for providing potable water to any community

		whose water source is made unwholesome due to the project activities until the water is made wholesome again.
	16	Responsible for management of all types of waste generated from construction activities, camps, quarries and borrow pits.
Demobilisation	17	Ensure that all affected project areas have been properly cleaned of waste, graded and re-vegetated.

7.4 Environmental and Social Officer

As part of the construction team of the contractor, an Environmental and Safety Officer (ESO) is also required. The ESO will be an employee of the Contractor appointed to monitor and review the on-site environmental and social management plan and implementation of the ESMP. The ESO shall be on site daily throughout the duration of the project construction. The ESO's responsibilities will include the following:

- Assist Contractor in ensuring that the necessary environmental authorizations and permits are obtained;
- Maintain open and direct lines of communication between the Employer, Contractor, Consultant and relevant institutions with regard to environmental matters;
- Undertake regular site inspections of all construction areas with regard to compliance with the ESMP.
- Monitor and verify adherence to the ESMP at all times and verifying that environmental impacts are kept to a minimum;
- Take appropriate action if the specifications are not followed;
- Assist the Contractor in finding environmentally responsible solutions to problems;
- Undertake and monitor environmental awareness training for all new personnel coming onto site;
- Ensure labour protection equipments are of good quality and are available on site at all the times;
- Advise on the removal of person(s) and/or equipment not complying with the specifications;
- Recommend the issuing of fines for transgressions of site rules and penalties for contraventions of the ESMP;
- Implement works permit system and ensure the permit conditions for work are followed strictly;
- Keep detailed records of all site activities that may pertain to the environment.
- Undertake a continual review of the ESMP and recommending additions; and
- Compile a final audit report regarding the ESMP and its implementation during the construction period, after completion of the contract and submitting this report to the Employer.

7.5 EPA

The EPA is responsible for coordinating environmental issues in Ghana. The Agency is expected to issue the necessary environmental permits and also to ensure that monitoring and reporting requirements (as required by the ESMP with EPA standards and guidelines) are met.

EPA has to enforce any actions that may be needed to ensure that environmental quality standards are not breached and that permit requirements are maintained.

7.6 GHA/Client

The overall implementation, project supervision and monitoring falls under the purview of the Environmental Monitoring Unit of the GHA. It will be in charge of overseeing the implementation of the ESMP. They also have to issue instructions and guidelines for the additional mitigation measures to be included during project execution. Additionally, they will also liaise with the local health, road/ traffic and educational Authorities to plan awareness raising campaigns.

7.7 Shai Osudoku and North Tongu District Assemblies

The Shai Osudoku and North Tongu district assemblies can be seen as the general administrator during the construction and operational phases of the project. The relevant departmental officers in the Municipal Assembly would be called upon where necessary during the project construction and operational phases to provide the necessary permits and advisory services to the project implementers. Some of the areas where they will be required include:

- Approving locations for establishing work camps;
- Involvement in relocation of project affected persons along the road;
- Liaising with the GHA in the project area to assist in the sensitization campaigns for HIV/AIDS and Road Safety Sensitization;
- Identifying locations for disposal of construction debris;
- Issuing permits or relevant documentation for health and safety monitoring in accordance with local health and safety legislation.

7.8 Water Resource Commission

The Water Resource Commission is responsible for management of water resources in Ghana. The Commission is expected to issue the necessary water permits for piling and cofferdams and also to ensure that monitoring and reporting requirements by the permitting conditions

7.9 The General Public

The general public has no specific tasks in the ESMP, but their role is however important. The public must express their concerns of the projects not only in the preliminary designs phase but also whenever they are aware of previously unforeseen impacts or when impacts take a different

order of magnitude than expected. The public have an unwritten obligation to inform the Engineer about such developments as early as possible. The public is also the target of awareness raising campaigns to mitigate the negative impacts of the project.

8.0 SUMMARY OF ESMP

The table below summarizes the costs of mitigation measures as well as the monitoring methods and periods and finally the parties responsible for monitoring.

Table 15: Environmental and Social Management Plan

IMPACT	PROPOSED MITIGATION	RESPONSIBLE PARTY	TARGETS TO ACHIEVE	MONITORING METHOD	COSTS	MONITORING PERIOD	MONITORING INDICATORS
NEGATIVE IMPACTS- CONSTRUCTIONAL PHASE							
Water Quality	Preventing contamination of surface water bodies and ground water	Contractor (ESO) Engineer	Compliance with drinking water standards	Sampling of physico-chemical parameters and microbiological parameters *EPA would also ensure compliance	For Contractor, no separate cost item for clauses in contract documents.	Water quality monitoring will be carried every three months from commencement of earthworks	Water quality trends Complaints from locals

Air Quality	Periodic watering of exposed surfaces. Enforcing lower speed limits within the work zone Cover all trucks hauling materials Equipment and vehicles used are in good condition to ensure minimal emissions.	Contractor (ESO)	Minimal dust levels during construction Low vehicular emissions pollution Compliance with Air Quality Standards	Visual observation of construction related dust levels and exhaust fumes from construction machineries. Regular monitoring of PM_{10}, TSP, CO_x, NO_x SO_x, *EPA would also ensure compliance	For Contractor, No separate cost item for clauses in contract documents	It will be carried every three months, from initiation to completion in active construction areas	Air quality trends Complaints from locals
Soil Erosion	Plan and execute earth works with due diligence to prevent soil erosion	Contractor (ESO)	To assess the effectiveness of environmental protection measures aimed to:	Erosion effects will be monitored by: Visual observation of landform and water turbidity	No separate cost item for clauses in contract documents.	Observation will be ongoing and reported where required TSS will be	Water quality State of potential areas of soil erosion.

			Minimize erosion; Maximize sediment retention in surface runoff through sediment traps Minimize suspended solid loads downstream of disturbed areas	Identification of areas of potential soil instability, soil erosion, and standing water. Reports on potential or existing problem areas. .		measured regularly as part of the water quality monitoring program.	
Land Acquisition and Relocation	Proper and adequate compensation promptly paid to the land and property owners. Payment should take place	GHA Shai Osudoku and North Tongu District Assemblies	Equitable and timely property compensation Resolution of grievances to prevent escalation into conflict	Continuous review of land acquisition/ compensation program Continuous review of grievance register to identify outstanding issues not resolved	An amount is estimated for the compensation based on Consultant's Property Impact assessment.	Quarterly review during pre-construction, extending into the construction stage as required	Grievances from PAPs ,

	before structures are taken over by the project.		Avoidance of unnecessary project delays				
Noise and Vibration	Maintain construction equipment regularly to control of noise. Plan and execute the works so that it does not become a nuisance to the general public where possible.	Contractor (ESO)	To ensure that adopted noise controls and management systems are effective. To ensure that noise levels do not exceed the applicable standards	The collection of representative noise measurements will be made during all working shifts on the day of sampling. The grievance register will be monitored for reports of human irritation. *EPA would also ensure compliance	For Contractor, No separate cost item for clauses in contract documents.	Regular measuring during the construction stage – from initiation to completion in active construction areas	Complaints received by local residents
Construction Camps	Ensure that the construction camps are carefully sited and arranged to minimize their impact on the environment	Contractor	Minimal disruption to residents, physical and biological environment	Periodic site inspections to be carried out by the contractor that site camps are kept clean and within the allocated area for siting.	For Contractor, No separate cost item for clauses in contract documents.	Throughout the Construction period	Inspection reports of camp sites

				*EPA would also ensure compliance			
Construction Waste	Ensure proper disposal of construction waste Provide toilet facilities for workers	Contractor (ESO)	Minimal disruption to physical and biological environmental quality as well as health of residents	Inspection of on-site temporal waste disposal bins and designated site for final collection and disposal by waste collection company. Inspection of sanitary and hygiene services by sanitary provision service providers. *EPA would also ensure compliance	For Contractor, No separate cost item for clauses in contract documents.	Throughout the Construction period	Frequency of waste collection from site Observation of use of waste bins and toilet facilities
Public Health and Safety	Eliminating breeding sites of disease vectors. HIV/AIDS Awareness programme/	Contractor (ESO) Health Services (Shai Osudoku and North Tongu District Assemblies)	To support The Health Sectors of Shai Osudoku and North Tongu District Assemblies	Conduct regular medical check-ups for employees, and compile statistic on employee health to enable year-to-year comparison.	For Contractor, No separate cost item for clauses in contract documents.	Data will be summarized annually during the construction stage and can be extended during operation stage	Trends in HIV/AIDS and malaria cases along the corridor Number of

	Community Outreaches Post Traffic Signs and warnings. Implement Speed limits at construction site Health & Safety Plan		prevent and to combat diseases. To ensure that the opportunity of disease transfer between the non-local workforce and local residents is kept to a minimum. Avoid any deterioration in public health and environmental sanitation as a result of the project. To avoid accidents that occur during construction	Quarterly consultation with municipal health service. Compilation of work injury statistics and monitoring to enable appropriate action to be taken *EPA would also ensure compliance		Throughout the construction period for safety	recorded accidents Complaints on health safety aspects related to the road construction activities.

			To ensure that workers are protected from work accidents/ occupational hazards				
Public Utilities	Consult utility providers to plan and realign displaced utility services	Contractor Engineer Utility Providers	Avoid disruption to provision of utility services	Monitoring reports/complaints from residents	Cost 0f USD to be included in contract documents	Throughout the construction and operation phases	Number of complaints from residents
NEGATIVE IMPACTS- OPERATIONAL PHASE							
IMPACT	**PROPOSED MITIGATION**	**RESPONSIBLE PARTY**	**TARGETS TO ACHIEVE**	**MONITORING METHOD**	**COSTS**	**MONITORING PERIOD**	**MONITORING INDICATOR**
Land Use Changes	DAs should enforce land use zoning regulations in the municipality.	Planning unit (Shai Osudoku and North Tongu District Assemblies)	To reduce the emergence of inappropriate land uses	Regular inspections of project corridors.	Cost for the Assemblies	Regular monitoring throughout operational period	Land use trends along the project corridors,
Health, Safety and Security	Ensure improvement and protection of signage,	GHA Health Services (Shai Osudoku	Effective information and signage to enhance safe	Compilation of statistics on numbers of accidents	Cost included in contract.	Regular Monitoring throughout operational	Complaints on health safety and road accidents

	guard rails and other features that contribute to road safety Strict monitoring compliance with traffic use and speed limits Enhanced Information and awareness of HIV/AIDS	and North Tongu District Assemblies)	movement and use of the road To avoid traffic accidents. Avoid the spread of disease between the non-local work force and local residents	Consultation with municipal health service.		period	

9.0 IMPLEMENTATION SCHEDULE AND REPORTING

GHA is the Executing Agency for the New Bridge project whereas the Ministry of Roads and Highways will provide overall policy direction to the GHA.

The GHA will prepare progress reports on a quarterly basis which will highlight the progress towards meeting the project's targets as will be reflected in the project result based logical framework and the progress in implementation of the ESMP. Apart from reports, monitoring and evaluation will also be undertaken through supervision visits. Quarterly supervision visits and review meetings by the Government and GHA will be essential to track implementation progress, challenges and strategically plan the way forward.

10.0 CONCLUSIONS

The findings from the Environmental and Social Impact Assessment show that although the proposed New Bridge project is expected to have a number of negative impacts most of these are anticipated to occur during the construction phases and are mitigated in the overall road designs.

The ESMP provides a set of guidelines for implementing and incorporating environmental management practices to minimize adverse environmental impacts associated with the construction of the bridge and approach roads. Its aim is to establish environmental management standard guidelines for all parties involved in undertaking their various tasks and responsibilities for the project.

The ESMP was also prepared taking into consideration stakeholder's desires and interests and be reviewed continuously for the benefit of acceptability by stakeholders.