

REPUBLIC OF LIBERIA

MINISTRY OF PUBLIC WORKS



FISH TOWN - HARPER ROAD PROJECT  
FISH TOWN-KELIPO KANWEAKEN

# ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

**COMPTON**

in association with

**NIRAS**

SEPTEMBER 2017

<b>Client Name</b>	<b>Ministry of Public Works</b>		
<b>Prepared by:</b>	<i>Comptran Engineering &amp; Planning Associates based on comments from MPW and a review by COMPTRAN of the design and the draft final report.</i>		
<b>Background of Report</b>	<i>Stanley Consultants in association with Associated Consultants was commissioned by the Ministry of Public Works, Liberia to conduct the environmental and social impact assessment (ESIA) study of the project road in 2013 from which a Resettlement Action Plan (RAP) was prepared. A draft RAP report was submitted in October 2013. - This final report is therefore a reproduction of Stanley Consultants' report of 2013</i>		
<b>Project Title</b>	<b>Updated Environmental &amp; Social Impact Assessment</b> <b>Mano River Union Road Development and Transport Facilitation Program (MRU/RDTP)</b> <i>Phase II: Paving of Fish Town to Kelipo Kanweaken – First 50-km of Lot 3, 118-km from Fish Town to Gbagbo Town</i> <b>ADF Loan No. 2100150032544</b> <b>ADF (TSF) Loan: No. 5900150000351</b>		
<b>Document Status</b>	<b>Draft</b>	<b>Issue No.</b>	<b>2</b>
<b>Issue Date</b>	<b>September 7, 2017</b>		
<b>Author</b>	Beageorge M. Cooper Socio-economist / Resettlement Specialist	<b>Signature &amp; Date</b>	
<b>Approved by:</b>	Kwesi Okyere COMPTRAN Authorized Representative	<b>Signature &amp; Date</b>	

**TABLE OF CONTENTS**

<b>0</b>	<b>EXECUTIVE SUMMARY.....</b>	<b>0-1</b>
0.1	BACKGROUND.....	0-1
0.2	PROJECT LOCATION .....	0-3
0.3	SCOPE OF THE ESIA.....	0-3
0.4	PROJECT GOALS AND OBJECTIVES.....	0-3
0.5	TERMS OF REFERENCE.....	0-3
0.6	PUBLIC CONSULTATION.....	0-3
0.7	POLICY, LEGAL & INSTITUTIONAL FRAMEWORK .....	0-3
0.8	PROJECT DESCRIPTION AND JUSTIFICATION.....	0-3
0.9	DESCRIPTION OF THE PROJECT ENVIRONMENT.....	0-5
0.10	ALTERNATIVES TO THE PROJECT.....	0-8
0.11	ECONOMIC EVALUATION.....	0-8
0.12	THE PREFERRED ALTERNATIVE .....	0-9
0.13	STAKEHOLDERS AND PUBLIC CONSULTATIONS.....	0-9
0.14	POTENTIAL IMPACTS AND MITIGATION MEASURES .....	0-9
0.15	ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN .....	0-10
0.16	CONCLUSION AND RECOMMENDATIONS .....	0-12
0.17	RECOMMENDATIONS.....	0-12
<b>1</b>	<b>INTRODUCTION.....</b>	<b>1-1</b>
1.1	BACKGROUND .....	1-1
1.2	PROJECT LOCATION.....	1-2
1.3	TERMS OF REFERENCE .....	1-4
1.4	ENVIRONMENTAL ASSESSMENT AND SUSTAINABILITY.....	1-4
1.5	ESIA STUDY METHODOLOGY .....	1-5
1.7.1	Environmental Impact Assessment.....	1-5
1.7.2	Social Impact Assessment.....	1-5
1.7.3	Stakeholder Consultations.....	1-5
1.7.4	Public Consultations .....	1-6
1.6	STRUCTURE OF THE REPORT .....	1-6
<b>2</b>	<b>POLICY, LEGAL &amp; INSTITUTIONAL FRAMEWORK.....</b>	<b>2-1</b>
2.1	POLICY FRAMEWORK.....	2-1
2.1.1	Land Right Policy of Liberia (2013).....	2-1
2.1.2	National Policies for Reconstruction and Development .....	2-1
2.1.3	National Environmental Policy (2003).....	2-1
2.1.4	The National Transport Policy and Strategy (NTPS).....	2-2
2.1.5	Integrated Water Resources Management Plan (IWRMP), 2009.....	2-2
2.1.6	National Forestry Policy, 2006.....	2-3
2.1.7	National Biodiversity Strategy and Action Plan, 2004 .....	2-3
2.1.8	African Development Bank Group’s Policy on the Environment .....	2-3

2.2	LEGAL FRAMEWORK .....	2-4
2.2.1	Liberian Constitution 1986 .....	2-4
2.2.2	Environmental Protection Agency Act (2002) .....	2-4
2.2.3	International Conventions and Agreements .....	2-4
2.3	INSTITUTIONAL FRAMEWORK .....	2-6
2.3.1	Environmental Protection Agency (EPA) .....	2-6
2.3.2	Ministry of Public Works .....	2-6
2.3.3	Ministry of Lands, Mines and Energy .....	2-6
2.3.4	Ministry of Health and Social Welfare .....	2-6
<b>3</b>	<b>PROJECT DESCRIPTION AND JUSTIFICATION .....</b>	<b>3-1</b>
3.1	EXISTING ROAD CONDITIONS .....	3-1
3.2	COMMUNITIES ALONG THE EXISTING ROADS .....	3-4
3.3	RIVER GEE COUNTY .....	3-4
3.4	PROJECT DESIGN AND ACTIVITIES .....	3-4
3.5.1	Brief Description of the Project Activities .....	3-4
3.5.2	Pre-Construction Phase .....	3-5
3.5.2.1	Road Inventory .....	3-5
3.5.3	Construction Phase .....	3-8
3.5.4	Post-Construction Phase .....	3-9
3.5	PROJECT JUSTIFICATION .....	3-9
<b>4</b>	<b>DESCRIPTION OF THE PROJECT ENVIRONMENT .....</b>	<b>4-1</b>
4.1	BASELINE OF THE PHYSICAL ENVIRONMENT .....	4-1
4.1.1	Geology .....	4-1
4.1.2	Soils .....	4-2
4.1.3	Topography .....	4-2
4.2	WATER RESOURCES AND DRAINAGE .....	4-3
4.3	CLIMATE .....	4-3
4.3.1	Rainfall .....	4-3
4.3.2	Humidity, Temperature, Wind, and Sunshine .....	4-4
4.4	BIOLOGICAL ENVIRONMENT .....	4-4
4.4.1	Fauna .....	4-4
4.4.2	Flora .....	4-5
4.5	HUMAN ENVIRONMENT – SOCIO-ECONOMIC BASELINE .....	4-5
4.5.1	Demographic Characteristics .....	4-5
<b>5</b>	<b>ALTERNATIVES TO THE PROJECT .....</b>	<b>5-1</b>
5.1	ALTERNATIVE MODE OF TRANSPORTATION .....	5-1
5.2	ALTERNATIVES CONSIDERED .....	5-1
5.3	DO NOTHING OPTION .....	5-1
5.4	ENGINEERING INTERVENTION OPTION .....	5-2
	General .....	5-2



Route Alignment Alternative .....	5-2
Material Acquisition.....	5-2
Technology Alternatives .....	5-2
Economic Evaluation .....	5-2
5.5 THE PREFERRED ALTERNATIVE .....	5-3
<b>6 STAKEHOLDERS AND PUBLIC CONSULTATIONS.....</b>	<b>6-1</b>
6.1 INTRODUCTION .....	6-1
6.2 THE CONSULTATION PROCESS.....	6-1
Stakeholders Consultations .....	6-1
6.2.1 Public Meetings .....	6-7
6.2.2 Benefits of the Proposed Upgrading of the Road to Asphalt Standards .....	6-7
6.2.4 Problems and Concerns cited on the Proposed Upgrading of the Road .....	6-8
6.3 PUBLIC DISCLOSURE .....	6-10
6.4 FUTURE CONSULTATIONS .....	6-10
<b>7 POTENTIAL IMPACTS AND MITIGATION MEASURES.....</b>	<b>7-1</b>
7.1 INTRODUCTION.....	7-1
7.2 SUMMARY OF POTENTIAL IMPACTS.....	7-2
7.3 POSITIVE IMPACTS .....	7-2
7.3.1 Employment Opportunities .....	7-2
7.3.2 Improved Local Socio-economy .....	7-3
7.3.3 Ease of Road Transport in the Project Area .....	7-3
7.3.4 Improved Living Standards.....	7-3
7.3.5 Increased Security .....	7-3
7.3.6 Education.....	7-3
7.3.7 Improved National Transport .....	7-4
7.3.8 Road Safety.....	7-4
7.3.9 Empowerment of Women .....	7-4
7.3.10 Improved Drainage .....	7-4
7.3.11 Improved Access to Social Services.....	7-4
7.3.12 Reversal of Rural Urban Migration.....	7-4
7.4 NEGATIVE IMPACTS.....	7-5
7.4.1 Impact on Topography.....	7-5
7.4.2 Impacts on Surface Water Drainage.....	7-5
7.4.3 Impact on Climate .....	7-5
7.4.4 Impacts on Soil Environment .....	7-5
7.4.5 Impacts on Water Resources Environment .....	7-7
7.4.6 Impacts on Air Environment .....	7-7
7.4.7 Impacts on Ambient Noise Level .....	7-8
7.4.8 Impacts on Fauna, Flora and Ecological Environment.....	7-8
7.4.9 Impacts on Human Use Values .....	7-9

7.4.10	Cultural Changes .....	7-10
7.4.11	Impacts on Cultural and Historical Resources .....	7-10
7.4.12	HIV/AIDS.....	7-10
7.4.13	Impact on Public Health.....	7-11
7.4.14	Occupational Health and Safety.....	7-11
7.4.15	Impacts During Decommissioning Phase.....	7-11
<b>8</b>	<b>ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN .....</b>	<b>8-1</b>
8.1	OBJECTIVES OF THE ESMP.....	8-1
8.2	RESPONSIBILITIES .....	8-1
8.2.1	The Ministry of Public Works/Infrastructure Implementation Unit.....	8-2
8.2.2	Ministry of Transport and Liberia National Police .....	8-2
8.2.3	Environmental Protection Agency of Liberia (EPA).....	8-2
8.2.4	The Supervising Consultant, Resident Engineers and Environmental and Social Officer .....	8-2
8.2.5	The Contractor.....	8-3
8.2.6	Local Authorities.....	8-3
8.3	ENVIRONMENTAL AND SOCIAL MANAGEMENT .....	8-3
8.3.1	Uncertainty in ESMP .....	8-16
8.3.2	ESMP Management Records.....	8-16
8.3.3	Auditing of the ESMP .....	8-16
8.3.4	Costs of Mitigation .....	8-17
8.4	ENVIRONMENTAL AND SOCIAL MONITORING .....	8-17
8.5	COSTS FOR MONITORING.....	8-18
8.6	ENVIRONMENTAL TRAINING AND AWARENESS .....	8-18
8.7	ENVIRONMENTAL RISK MANAGEMENT .....	8-18
8.8	EMERGENCY PROCEDURES .....	8-19
<b>9</b>	<b>CONCLUSION &amp; RECOMENDATIONS.....</b>	<b>9-1</b>
9.1	CONCLUSION .....	9-1
9.2	RECOMMENDATIONS.....	9-1
	<b>REFERENCES.....</b>	<b>A</b>
	<b>APPENDIX.....</b>	<b>B</b>

**LIST OF TABLES**

Table 0-1: Major Changes in Alignment .....	0-4
Table 2-1: International Conventions to which Liberia is signatory. ....	2-5
Table 3-1: Design Speed Criteria of the Proposed Road .....	3-5
Table 3-2: Sources of Construction Materials in County along the Project Corridors .....	3-6
Table 3-3: List of Drainage Structures .....	3-7
Table 4-1: Average Monthly Temperatures .....	4-4
Table 4-2: Population Distribution of Districts within the Project Area .....	4-5
Table 6-1: List of key informants interviewed during the ESIA study .....	6-1
Table 6-2: Comments from the key stakeholders .....	6-2
Table 6-3: Comments from the key stakeholders .....	6-7
Table 7-1: Impact identification matrix .....	7-2
Table 7-2: Potential Project Impacts and Mitigation .....	7-15
Table 8-1: Summary of Environmental and Social Management Plan .....	8-5
Table 8-2: Environmental Monitoring Plan .....	8-17

**LIST OF TABLES**

Figure 0-1: Project Location Map .....	0-2
Figure 1-1: Project Location Map .....	1-3
Figure 1-2: Sustainable development balance relationship .....	1-5
Figure 3-1: Sample of Proposed Realignment Design.....	3-2
Figure 3-2: Cross section of both Urban and Rural road designs.....	3-3
Figure 3-3: Aerial view of segment of road showing areas of realignment shaded in red. ....	3-8
Figure 4-1: Local geological map of the project area.....	4-1
Figure 4-2: Regional geological map of Liberia.....	4-1
Figure 4-3: Average Monthly Rainfall (Millimeters).....	4-3

### **LIST OF ACRONYMS**

AfDB	-	African Development Bank
BoQ	-	Bill of Quantities
CNDRA	-	Center for National Documents & Records Agency
EIA	-	Environmental Impact Assessment
EMPL	-	Environmental Protection & Management Law
EPA	-	Environmental Protection Agency
EPAA	-	Environmental Protection Agency Act
ESAP	-	Environmental and Social Assessment Procedures
ESIA	-	Environmental & Social Impact Assessment
ESMP	-	Environmental & Social Management Plan
ESO	-	Environmental & Social Officer
ESRS	-	Environmental & Social Review Summary
FDA	-	Forestry Development Authority
GAC	-	General Auditing Commission
GOL	-	Government of Liberia
IIU	-	Infrastructure Implementation Unit
IRP	-	Involuntary Resettlement Policy
IWRMP	-	Integrated Water Resources Management Plan
km	-	kilometer
LISGIS	-	Liberia Institute of Statistics & Geo-Information Services
LNP	-	Liberia National Police
LRRRC	-	Liberian Refugee Repatriation & Resettlement Commission
MLME	-	Ministry of Lands, Mines & Energy
MOF	-	Ministry of Finance
MOT	-	Ministry of Transport
MPEA	-	Ministry of Planning & Economic Affairs
MPW	-	Ministry of Lands, Mines & Energy
NEP	—	National Environmental Policy
NGO	-	Non-governmental Organization
NTPS	-	National Transport Policy & Strategy
OP	-	Operational Policy
ToR	-	Terms of Reference
PAHs	-	Project Affected Households
PAPs	-	Project Affected Persons
PRS	-	Poverty Reduction Strategy
PVO	-	Private Volunteer Organization
RAP	-	Resettlement Action Plan
RE	-	Resident Engineer
ROW	-	Right-of-Way
SES	-	Socio-Economic Survey
STD	-	Sexually Transmitted Diseases

## 0 EXECUTIVE SUMMARY

### 0.1 BACKGROUND

Adequate provision of basic infrastructure across Liberia has been a challenge since its independence – with only 657 km of all roads are paved while 9,943 km are unpaved. During the civil crisis, maintenance of the road network could not be undertaken due to lack of the financial capability and effective governance because various parts of the country were under siege by different war factions. Hence, most of the road network across the country deteriorated rapidly, making them unworthy for travelling thereon. At the end of the civil war and under a democratically led government, efforts have been made to improve road infrastructure across the country. However; the eight months of rain and the plight of overloaded trucks have led the further deterioration of the unpaved roads, with this situation particularly exacerbated in the southeastern region of the country, which is the farthest distance from the capital, Monrovia.

Most of the Ganta–Harper road (510km) remains unpaved and is generally in an extremely deplorable state. The Government of Liberia (GoL) requested assistance from the African Development Bank (AfDB) for the rehabilitation and paving of this strategic road which forms part of the Trans-African Highway corridors in West Africa. The road when paved, will not only make it adaptable to the adverse climatic conditions but also protect the current investment in addition to other socio-economic benefits associated with road improvement.

While the overall project is considering the 510-km road from Ganta, Nimba County, to Harper, Maryland, transecting Grand Gedeh and River Gee Counties, the road has been phased into LOTS.

- Lot 1, for which construction work is ongoing and 10km of which has been constructed to the asphalt binder course, consists of the reconstruction of the laterite road from Harper to Karloken in Maryland County. The 16km section from Harper Junction to Cavalla Customs border with Cote D'Ivoire is being constructed as part of Lot 1.
- Lot 2, which is also under construction, consists of the section of road from Karloken to Fish Town (80 km) in River Gee County.
- Lot 3, 118 km from Fish Town to Gbagbo Town – includes the -km corridor studied as part of this ESIA.

The project aims to reduce travel time and vehicle operating cost by improving the road alignment and pavement condition. The road project will also enhance the flow of regional and inter regional traffic and trade, and reduce road user costs, thereby strengthening regional economic integration. The road safety measures that would be put in place will enhance safety standards on the project road. In addition, the project will also facilitate easy access by farmers and traders to social services along the corridor expected to generate more income to augment the Government's effort in achieving economic development and poverty reduction.

Against this background, the services of Stanley Consultants/Earth Environmental Consultancy, Inc. was contracted to prepare the Environmental and Social Impact Assessment (ESIA) of the project Lot 3 in 2013. The study was intended to assess the environmental and social settings along the road, identify possible environmental, human and economic impacts, which may evolve from the proposed activity and determine the feasibility of the project. Finally, taking into consideration internationally acceptable standards, it proposes measures aimed at mitigating or preventing adverse outcomes.

The Ministry of Public Works and the African Development Bank are in discussions to construct the first 50-km of Lot 3 from Fish Town to Kelipo Kanweaken. Therefore; Comptran Engineering & Planning Associates (COMPTRAN) was contracted to review and adopt the ESIA report for Lot 3, prepared by Stanley Consultants Inc., to reflect information specific to the first 50-km. Given the time-lapse since the study was conducted in 2013, this adjusted report contains updated information gathered through a scoping assessment to reflect the current environmental and social conditions of the corridor and new information from the design review and road alignment.



Figure 0-1: Project Location Map

Source: COMPTRAN, 2017

## 0.2 PROJECT LOCATION

As mentioned previously, the Fish Town-Harper Road Project road has been phased into three lots from Harper to Gbagbo Town. The subject of this ESIA is the 50km from Fish Town to Kelipo Kanweaken.

## 0.3 SCOPE OF THE ESIA

The main objective of the environmental and social assessment is to identify significant potential impacts of the project on environmental, economic and social aspects, and formulate recommendations to ensure that the proposed project takes into consideration appropriate measures to mitigate any adverse impacts to the environment and people's health through all phases of its implementation; while also proposes measure to enhance positive impacts.

## 0.4 PROJECT GOALS AND OBJECTIVES

The overall goal of the project is to support Liberia's economic growth through development of transportation infrastructure that contributes to its post conflict agenda for transformation.

## 0.5 TERMS OF REFERENCE

The Terms of Reference for this assessment are based on the Environmental Protection and Management Law (EMPL) of 2002 and Environmental Impact Assessment Procedural Guidelines of 2006, as published by the Environmental Protection Agency (EPA) of Liberia.

## 0.6 PUBLIC CONSULTATION

The original assessment conducted consultations with residents in several major cities/towns in the project area. They were organized by Stanley Consultants Inc., with the support of the provincial administration and they were held at Fish Town, Sarbo Sweken and Kanweaken in River Gee County. This assisted in baseline data gathering by validating information from other sources.

## 0.7 POLICY, LEGAL & INSTITUTIONAL FRAMEWORK

This ESIA has been prepared based on existing policy, legal, regulatory and institutional frameworks within the context of Liberian Law. The report also draws on the policies and regulations of the African Development Bank and other international institutions, treaties and conventions.

## 0.8 PROJECT DESCRIPTION AND JUSTIFICATION

The existing laterite road is a primary two-lane highway as defined by MPW/IIU, which traverses mostly rural communities. The entire Ganta–Harper corridor is unpaved but has been engineered to good riding comfort, with some parts inaccessible mostly during the rainy season. The gravel surface road of the first 50-km of Lot 3 is graded with some camber to drain runoff from the carriageway. The average width of the carriageway is about 6m with shoulders on both sides having average width of 3m. The towns of Fish Town and Kanweaken have their roads protected by drains to carry runoff from the carriageway.

The horizontal and vertical alignments mostly follow the existing rolling terrain with occasional steep vertical grades within the corridor. However; as designed by Stanley Consultants Inc., there are multiple points identified for realignment for acquisition of temporary land take during construction.

### **Communities**

This project road passes through fourteen (14) communities along the corridor: Wanken, Gbeapo Pronoken, Sarbo Sweaken, Slobert Village, Gbeapo Kanweaken, Flewroken, Palm Wine Village, Doe Village, Juwah Village, Putuken, Sagba Village, Rock Crusher Village, Combat Gate Village and Kelopo Kanweaken.

### **Project Design and Activities**

The proposed 50-km project road consists of upgrading graveled surface from Fish Town to Kelipo Kanweaken to an asphalt paved road. The work will generally consist of clearing the topsoil, earthworks and excavation of longitudinal ditches, construction of culverts and several bridges, pavement construction, erosion control measures, drainage improvement, safety improvements including reflectorized paved markers, sidewalks, curb, gutter through urban areas and other ancillary works.

The project road will be a 2-lane facility (each lane will be 3.65 m wide) and will largely follow existing road with major alignment in several places. Alignment shifting may occur at river crossings to maintain the existing bridge open while new bridges are under construction.

The realigned sections are identified in Table 0-1.

*Table 0-1: Major Changes in Alignment*

Item	Road Section	Remarks
1	133+900 to 134+200	Realigned to improve geometry of existing curve
2	135+900 to 136+400	Realigned to improve geometry of existing curve
3	137+100 to 137+300	Realigned to improve geometry of existing straight
4	145+400 to 145+800	Realigned to improve geometry of existing curve in a settlement
5	165+000 to 165+900	Realigned to improve geometry of existing curve
6	171+140 to 171+600	Realigned to improve geometry of existing curve
7	171+810 to 172+100	Realigned to improve geometry of existing curve
8	179+100 to 179+400	Realigned to improve geometry of existing curve
9	181+400 to 181+800	Realigned to improve geometry of existing curve
10	182+800 to 183+000	Realigned to improve geometry of existing curve
11	183+400 to 183+700	Realigned to improve geometry of existing curve

Source: COMPTRAN 2017



### **Alignment Characteristics**

The proposed horizontal alignment will be based on the existing alignment and the design speed chosen for this project. Major alignments shifting are not contemplated to minimize right-of-way taking. Alignment shifting may occur at river crossings to maintain the existing bridge open while the new bridge is under construction.

### **Project Justification**

The functionality of current design and the intense wet climatic conditions in Liberia presents major challenges in the maintenance of unpaved roads which often come with high life cycle costs. In the absence of a suitable maintenance funding framework, such as a Road Fund, Liberia would increasingly find it difficult to maintain unpaved roads that require consistent technical and cost attention. Paving of the Fish Town to Kelipo Kanweaken road would ensure the road is compatible with the terrain and climatic conditions with lower life-cycle costs.

The project would improve access to transport services for the rural population in River Gee County with the rest of the country; improve farm to market linkages and improve quality of life of the people of the project area. The road corridor is situated in an area heavily endowed with mineral and agriculture resources such as rubber that could take the populace to greater socio-economic development.

## **0.9 DESCRIPTION OF THE PROJECT ENVIRONMENT**

This section describes the environmental and social conditions in the project corridor - Fish Town to Kelipo Kanweaken in River Gee County. Although the focus of this ESIA is the project corridor, reference will be made to information on the wider River Gee County. The Physical Environmental Baseline data was collated to facilitate impact studies on the hydrological and material investigations component of the project. The physical data collected included rainfall data, temperature data, water resource/drainage data and published geological/soil data. The Biological and Socio-Economic Baseline Data have also been collated to facilitate other impact assessment on the project.

---

## **Geology**

Geological investigations in Liberia have shown that nearly all terrain is underlain by Precambrian crystalline rocks which form part of the West Africa Shield. The country can be divided into three (3) geological regions, namely the Liberian Age province, the Eburnean Age Province and the Pan African Age Province. The Liberian Age province is underlain by rocks aged between 2.5 and 3.0 billion years, Eburnean Age Province aged between 2.0 and 2.5 billion years and the Pan African Age Province aged less than 500 million years. This is shown in Figure 4-2

The project site is located within the Eburnean Age Province, commencing at close to the Fish Town, the rock type is mostly leucocratic gneiss. There are also dark grey diabase dikes that cut across the region, where visible outcrops can be seen in several places.

## **Soil**

Specifically, to the project area, the soil type is generally silty reddish-brown with high content of clay which might result from the weathering of sedimentary rock. However; from a hydrological point of view, soils with high content of clay often result in high run-off due to its relatively impervious nature. There are also few areas with lateritic gravel.

## **Topography**

River Gee County generally has gently rolling hills with wide and shallow valleys and the following identified geographical belts: mangrove swamps and beaches along the coast, wooded hills and semi deciduous shrub lands along the immediate interior, low mountains in northeast, dense tropical forests and plateaus in the interior.

## **Water Resources and Drainage**

The project area is endowed with abundant water resources. Data from the rural water supply program indicate that the depth to the water table in wells can be less than 10 meter, especially during the rainy season. Drilled boreholes can be as deep as 100 or more meters. River Gee County have large rivers: the Cavalla, located in the East, the Dube River and Grand Cess River which runs across the project road in the northeast and south respectively, the Wro Creek in the east, and the Gee River, in the Southeast. The Gee River has several waterfalls, which flow and drain from the swamps and tributaries into the Ocean.

The project road crosses major rivers and streams as well as small tributary creeks. The major rivers and streams are perennial whilst most of the tributary creeks are ephemeral. These ephemeral creeks often run completely dry during the dry season, except some few localized depressions in the creek bed.

The project area lies in a predominantly undeveloped watershed and traverse largely through forest. The topography can best be described as undulating with few hilly and mountainous sections. The catchment is covered with thick forest of equatorial type with high tree canopy except at the towns and villages along the corridor where there are virtually no grass-cover.

## **Climate**

The climate of River Gee County is synonymous with the rest of Liberia. The climate is tropical with relatively small variations between day and night and between seasons. There are two seasons -the wet season from May to October and the dry season from November to April.

### **Humidity, Temperature, Wind, and Sunshine**

The mean monthly relative humidity varies between 70 and 90%. The mean daily bright sunshine hours vary in excess of 4.0 hours. The mean monthly temperatures of the project catchment vary from 24.50C to 27.50C. Wind speeds are generally light being on the order of 6 knots. Strong winds are usually associated with convective thunderstorm activity during the rainy season. Temperature, humidity and wind affect run-off; however, high temperatures, low relative humidity and strong winds result in higher evaporation and subsequently reduce runoff. The highest temperature recorded in the project area is 32°C and the minimum is 22°C.

### **Biological Environment**

Biological resources represent one of Liberia's most abundant raw material resources. Biodiversity contains ecological, economic, and socio-cultural values that justify the need for conservation and sustainable use. The range of biodiversity in Liberia includes forests, wildlife, mangroves, wetlands and swamps. Liberia biodiversity is under threat due to many factors such as ignorance, insufficient public education and awareness, shifting agriculture, unregulated logging, un planned roads in logging areas, unplanned human settlements, fuel wood gathering, charcoal production, population pressure and establishment of rubber plantations.

### **Human Environment – Socio-Economic Baseline**

This data has been compiled using secondary source from LISGIS and primary source from the social survey conducted by the Earth Environmental Consultancy Social Team in 2013 and COMPTRAN in 2017.

## 0.10 ALTERNATIVES TO THE PROJECT

### **Alternative Mode of Transportation**

There are no alternatives to this road that fulfill the functions of providing relatively fast, cheap land transportation. Air, rail, and water transport are unlikely to either complement or substitute for roads or highways in this region. There is no railroad link in or near the project area. Hence, rail is not considered as an option. There are no water bodies that can be used as a mode of transportation in the project area. Streams or river in and near the project area are neither connected nor navigable. The only possible means is air transport but, this is a rather expensive alternative and cannot be used as an alternative to the road.

### **Do Nothing Option**

This alternative implies that the selected road corridor in River Gee county will not be improved and that it would be left in its present state characterized by several defects and related impacts.

### **Engineering Intervention Option**

This option assumes that engineering measures will be provided to correct the problems highlighted to improve the safety, health and social conditions of the local communities. In considering the various alternative solutions to the present state of the roads, the project aim of making accessible the Southeast region of Liberia to increase productivity, reducing transportation costs for the agricultural target centers and improving critical social services, and road safety, have been considered.

### **Route Alignment Alternatives**

Factors such as engineering design standards and best practice, road safety, farming activities, existing and future mining activities, existing and future services, i.e. power lines, pipelines, and existing and future town developments were considered. Landowner needs were also considered, all within the norms of engineering, practicality and financial viability. All parties including project affected persons have agreed on the position of the alignment and the road reserve will be proclaimed and landowners and PAP will be paid compensation

### **Material Acquisition**

Construction material - borrow materials (laterite gravel), sand and rock deposits identified are all within an average haulage distance less than 3km offsets from the existing road alignments. Acquisition of these materials will be established with the contractor and the MLME and with the consent of land owners. Impacts of transport of materials to site will not be significant as the distances are short and the road corridor is not very populated.

## 0.11 ECONOMIC EVALUATION

The economic analysis conducted in the feasibility study used the HDM-4 economic analysis tool and evaluation of the Project road for the 20 years following the completion of the project.

## 0.12 THE PREFERRED ALTERNATIVE

The advantages to be derived from the road improvement alternative far outweigh the disadvantages of the “Do Nothing Option”. Although there are environmental implications associated with the improvement alternative, appropriate mitigation measures would be implemented to control them, thus justifying the case for implementing the project. Even though the initial cost of the paved road improvement program would be high, the accrued benefits to be derived from this option socially, environmentally, and economically, far supersede all other options. For reasons of life-cycle cost, safety, better, safer driving, environment, traffic volumes, and citizen interest, in the operational phase, an asphaltic concrete pavement surface consistent with the rest of the FTHRP corridor is recommended.

## 0.13 STAKEHOLDERS AND PUBLIC CONSULTATIONS

The purpose of public participation in this ESIA study was mainly to create awareness on the project, and involve those likely to be affected positively or negatively. Stakeholders were given the opportunity to raise their views, concerns, perceived impacts and recommendations. This is intended to create a sense of commitment in implementing the ESMP.

Generally, the local communities consulted were positive about the proposed project since they anticipate numerous benefits upon implementation of the project.

## 0.14 POTENTIAL IMPACTS AND MITIGATION MEASURES

The purpose of the environmental and social impact assessment (ESIA) of the road project is to improve decision making and to ensure that the project progresses in a sustainable way. The ESIA identifies ways of improving the project environmentally and socially by preventing, minimizing, mitigating, or compensating for adverse impacts. These measures will help to avoid potentially costly remedial measures.

The environmental impacts caused due to the development of the project road can be categorized as primary (direct) and secondary (indirect) impacts. Primary impacts are those which are induced directly by the project, whereas the secondary impacts are those which are indirectly induced and typically include the associated investment and changing patterns of social and economic activities due to the proposed action.

Potential direct and indirect impacts of the project during construction phase will be the following:

- Filling in low-lying areas for embankments of the road;
- Loss of vegetation due to the cutting of trees;
- Loss of topsoil due to clearing & grubbing of new alignment, borrow area and quarry operation, construction of camp, material stacking yard;
- Temporary impacts in terms of polluted environment on flora and fauna due to the construction activities;
- Impact on the drainage pattern due to raised embankment, introduction of new culverts and bridge constructions;
- Impact on Traffic Management System;
- Increased air pollution (including dust) during project road construction;
- Increased noise level due to the movement of vehicles and construction activities;

- Increased soil erosion;
- Spillage of oils and other hazardous materials;
- Pollution of surface and sub-surface water sources;
- Pollution due to generation of spoils and solid waste; and
- Loss of trees and construction activities and impacts on tranquility of material sites and quarries.

Potential direct and indirect impacts of the project during operation phase are:

- Increased noise pollution due to vehicular movement;
- Impact on natural drainage pattern of the project area; and
- Pollution of water bodies and impacts on its ecosystem due to hazardous chemical or oil spillage into streams and wetlands.

The positive impacts of the project will be:

- Reduced air pollution due to better service levels of the road;
- Improved safe and efficient connectivity in the project area;
- Generation of local employment during road construction; and
- Improvement of local economy and industry due to better infrastructure facilities.

#### 0.15 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental & Social Management Plan (ESMP) is the synthesis of all proposed mitigative and monitoring actions, set to a time-frame with specific responsibility assigned and follow-up actions defined. It contains all the information for the proponents, the contractors and the regulatory agencies to implement the project within a specified timeframe.

The ESMP is a plan of action for avoidance, mitigation and management of the negative impacts of the project. Environment Enhancement is also an important component of ESMP.

The ESMP refers to all implemental tasks at different stages of project, namely,

- Construction Phase, and
- Operation Phase

The objectives of the ESMP are:

- To bring the project into compliance with applicable national environmental and social legal requirements;
- To outline the mitigating/enhancing, monitoring, consultative and institutional measures required to prevent, minimize, mitigate or compensate for adverse environmental and social impacts, or to enhance the project beneficial impacts;
- To address capacity building requirements within the relevant Ministries if necessary.

### **Responsibilities**

To ensure the sound development and effective implementation of the ESMP, it will be necessary to identify and define the responsibilities and authority of the various persons and institutions that will be involved in the project.

The following entities will be involved on the implementation of this ESMP:

- Ministry of Public Works/Infrastructure Implementation Unit (MPW/IIU);
- Ministry of Transport (MOT) and Liberia National Police (LNP);
- Environmental Protection Agency of Liberia (EPA);
- Resident Engineers of River Gee;
- Environmental and Social Officer;
- Contractor; and
- Local Authority

### **ESMP Management Records**

Environmental management records shall be kept on site during the duration of construction and shall include:

- The updated version of the ESMP;
- All necessary permits and licenses;
- All site-specific plans prepared as part of the updated ESMP;
- All written instructions and reports issued by the RE/Supervising Consultant;
- A register of audit non-conformance reports and corrective actions;
- All related environmental, social, health and safety management registers and correspondence, including any complaints;
- All records shall be kept at site premises and maintained in a legible state for the full period of construction.

### **Auditing of the ESMP**

The Environmental and Social Officer (ESO) shall conduct quarterly audits to ensure that the system for implementation of the ESMP is operating effectively.



### **Costs of Mitigation**

Construction related costs for mitigation of environmental impacts will be included in the Bill of Quantities (BoQ) as part of the design and tender documentation for the project road.

### **Environmental and Social Monitoring**

During the construction and operation phases, monitoring will be undertaken to ensure that proposed mitigation measures for negative impacts and enhancement measures for positive impacts are implemented.

### **Costs for Monitoring**

The costs for mitigation of construction related impacts will be included in the contract documents. During construction and decommissioning phases of the project, the Environmental and Social Officer will coordinate the monitoring program and prepare reports for submission to the environmental authorities.

### **Environmental Training and Awareness**

The Contractor and sub-contractors shall be aware of the environmental requirements and constraints on construction activities contained in the provisions of the ESMP. The Contractor will therefore be required to provide for the appropriate environmental training and awareness as described in this ESMP in its costs and programming. An initial environmental awareness training session shall be held prior to any work commencing on site, with the target audience is all project personnel.

## **0.16 CONCLUSION AND RECOMMENDATIONS**

The findings of the environmental and social impact assessment (ESIA) concludes there is an overall positive socio-economic and environmental impact of upgrading, to bitumen standards, the first 50-km of Lot 3 – Fish Town to Kelipo Kanweaken. However, the impact of the project on the bio-physical environment is potentially slightly to moderately negative, both in the construction and operation phase. This is achievable only if appropriate mitigation and support measures are employed. The social impacts of land take and resettlement have been addressed during the RAP studies.

The environmental and social management measures proposed are generally straight forward. Much of the measures relate directly to sound operating practices both during the construction phase and subsequently over the life of the road.

Provided the road is upgraded with due attention to the mitigation and management measures outlined, the project will have a positive impact on both the bio-physical and socio-economic environment of the project area. It is recommended that this road project be implemented and that the proposed mitigation and monitoring measures are enforced.

## **0.17 RECOMMENDATIONS**

Based on the finding of overall positive impact of the project, we wish to recommend the following:



- The road project should be granted a license to commence.
- A monitoring program should be adhered to by the supervising Engineers and MPW/IIU during operation of the road.
- MPW/IIU should liaise with other entities/organizations having utilities on the road to ensure that they only use the edges of the road reserve to avoid future costs of relocation of service and inconvenience.
- MP W/IIU should survey and put beacons on the road reserves to stop encroachment and ease maintenance of roads.

## 1 INTRODUCTION

### 1.1 BACKGROUND

Adequate provision of basic infrastructure across Liberia has been a challenge since its independence – with only 657 km of all roads paved, while 9,943 km are unpaved. During the civil crisis, maintenance of the road network could not be undertaken due to the lack of financial capability and effective governance because various parts of the country were under siege by different war factions. Hence, most of the road network across the country deteriorated rapidly, making them unworthy for travelling thereon. At the end of the civil war and under a democratically led government, efforts have been made to improve road infrastructure across the country. However; the eight months of rain and the plying of overloaded trucks during the rains have led to further deterioration of the unpaved roads. This situation particularly exacerbated in the southeastern region of the country, which is the farthest distance from the capital, Monrovia.

Most of the Ganta–Harper road (510km) remains unpaved and is generally in an extremely deplorable state. The Government of Liberia (GoL) requested assistance from the African Development Bank (AfDB) for the rehabilitation and paving of this strategic road which forms part of the Trans-African Highway corridors in West Africa. The road when paved, will not only make it adaptable to the adverse climatic conditions but also protect the current investment in addition to other socio-economic benefits associated with road improvement.

While the overall project is considering the 510-km road from Ganta, Nimba County, to Harper, Maryland, transecting Grand Gedeh and River Gee Counties, the road has been phased into LOTS.

- Lot 1, for which construction work is ongoing and 10km of which has been constructed to the asphalt binder course, consists of the reconstruction of the laterite road from Harper to Karloken in Maryland County. The 16km section from Harper Junction to Cavalla Customs border with Cote D'Ivoire is being constructed as part of Lot 1.
- Lot 2, which is also under construction, consists of the section of road from Karloken to Fish Town (80 km) in River Gee County.
- Lot 3, 118 km from Fish Town to Gbagbo Town – includes the 50-km corridor studied as part of this ESIA.

The project aims to reduce travel time and vehicle operating cost by improving the road alignment and pavement condition. The road project will also enhance the flow of regional and inter regional traffic and trade, and reduce road user costs, thereby strengthening regional economic integration. The road safety measures that would be put in place will enhance safety standards on the project road. In addition, the project will also facilitate easy access by farmers and traders to social services along the corridor expected to generate more income to augment the Government's effort in achieving economic development and poverty reduction.

In addition to the construction and pavement of the road, the project will also deliver new bridges of varying size. There will also be realignment of the road in several places.

The project seeks to ensure suitable operating conditions for safe driving on the route during the entire year by providing adequate running surface and drainage systems. Against this background, the services of Stanley Consultants Inc. were hired to conduct an environmental and social impact assessment of the project area, to provide for the reconstruction and paving of the road between Fish Town to Kelipo Kanweaken in River Gee County.

Guided by national and international performance standards, the study provides mitigation measures for possible environmental, human and economic impacts, which may evolve from the proposed activity to determine the feasibility of the project.

It is important to note that this ESIA is being updated by Comptran Engineering & Planning Associates in association with NIRAS to reflect the design review of the road alignment.

## 1.2 PROJECT LOCATION

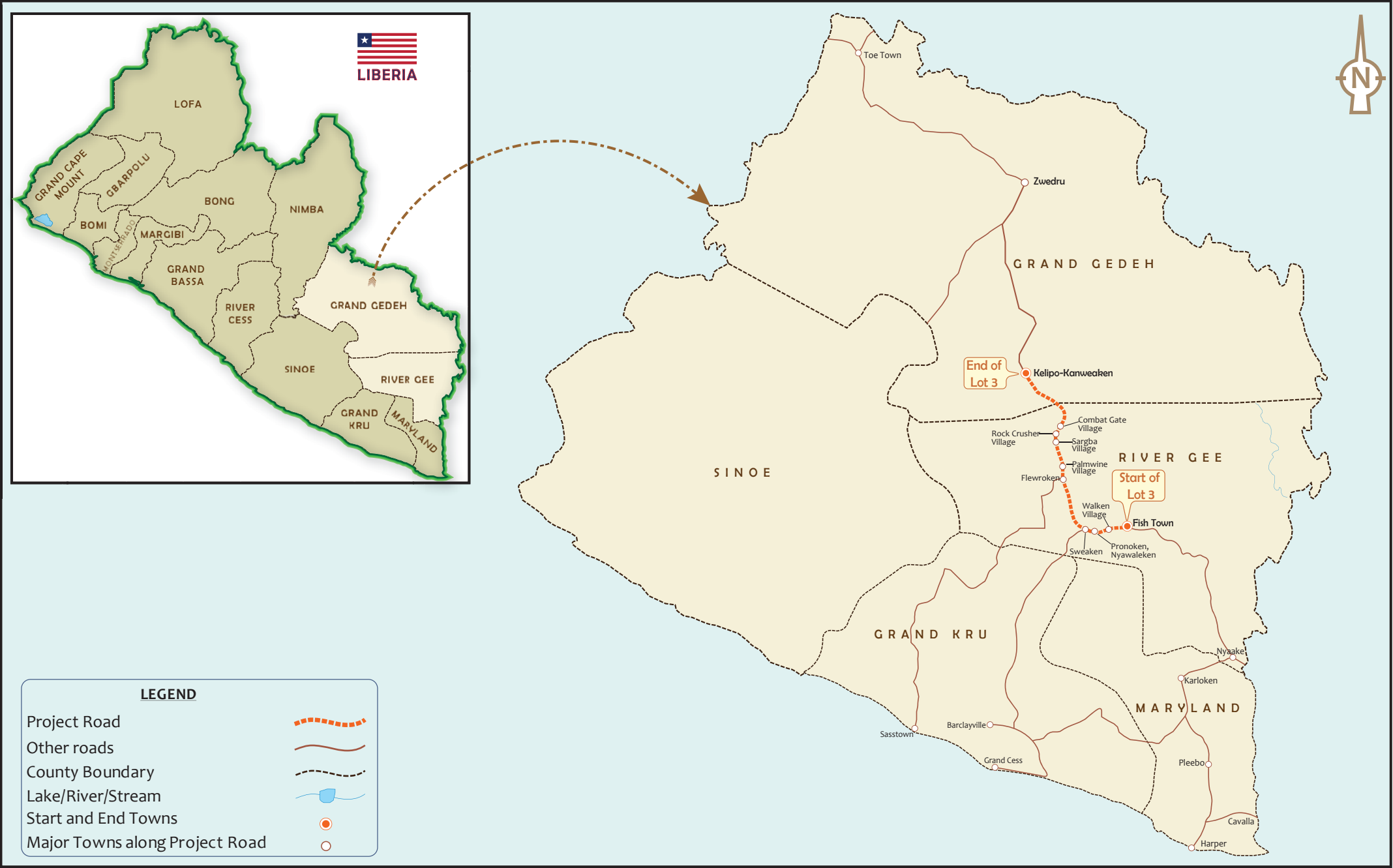
The Ganta – Harper road network runs from Northeastern Liberia to Southeastern Liberia with section 2 – Zwedru – Harper located entirely in the southeastern part of Liberia. The Zwedru to Harper section has been divided into three (3) lots. This ESIA covers the Fish Town – Kelipo Kanweaken section of Lot 3.

Figure 1-1 shows the portion of the Zwedru – Harper road section considered under Lot 3.

It is expected that the urban right-of-way of 15 meter from the centerline and a rural width of 22.25 meters from the centerline along this road length in Lot 3 will be affected because of its reconstruction. This is likely to lead to environmental, social and involuntary resettlement issues along the road corridor. The likely occurrence of these impact has therefore triggered the EPA and AfDB's Policy on the environment, which warrants the preparation of this ESIA.

Figure 1-1 shows the 50-km to be covered in Lot 3

Figure 1-1: Project Location Map



- Study the baseline environmental conditions in the project area, such as the physical, biological and socio-economic environment;
- Study the project conditions and requirements in terms of location, construction and operational requirements;
- Describe the policy, legal and institutional framework governing the road sector in the country;
- Undertake public consultation and disclosure.
- Assess environmental and social impacts of the project and suggest suitable mitigation measures for adverse impacts;
- Prepare an environmental and social management plan (ESMP) for implementation and monitoring of mitigation measures along with budgetary estimates, institutional and reporting requirements.

### 1.3 TERMS OF REFERENCE

The Terms of Reference for this assessment are based on the Environmental Protection and Management Law (EMPL) of 2002 and Environmental Impact Assessment Procedural Guidelines of 2006, as published by the Environmental Protection Agency (EPA) of Liberia. Per the EMPL and Guidelines, the Environmental Impact Study Report should, where possible, contain descriptions of the following:

- The objectives of the Project;
- The technology, procedures and processes to be used, in the implementation of the project;
- The materials to be used in the construction and implementation of the project;
- The products, by-products and waste generated by the project;
- A description of the potentially affected environment;
- The environmental effects of the projects including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated;
- Alternative technologies and processes available and reasons for preferring the chosen technologies and processes;
- Analysis of alternatives including project site, design and technologies and reasons for preferring the proposed site, design and technologies;
- An environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment; including the cost, time frame and responsibility to implement the measures;
- Provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the course of carrying out activities or major industrial and other development projects; and
- The measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies.

### 1.4 ENVIRONMENTAL ASSESSMENT AND SUSTAINABILITY

The proposed project is expected to have a viable impact on all aspects of sustainable development. The achievement of sustainable development rest solely on the interaction of its three main elements (social, environment and economic). The linkages between the three (3) major elements of sustainable development are well manifested in Figure 1-2.

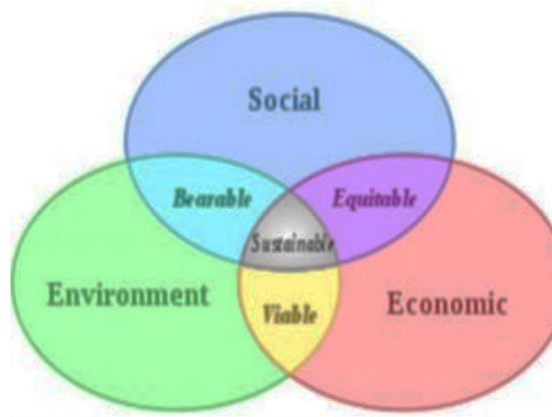


Figure 1-2: Sustainable development balance relationship

## 1.5 ESIA STUDY METHODOLOGY

### 1.7.1 Environmental Impact Assessment

The Environmental & Social Impact Assessment (ESIA) is based on field assessments, document review and discussion with relevant Government officials and project team members such as the Engineer, Geologist, Hydrologist, and Surveyor. The project team provided the proposed project details and desk environmental studies; whilst site environmental data collection was gathered through field survey, monitoring and investigation were done to cover roadside features with respect to environmental conditions. Secondary data gathered were existing basic documents which included topographic maps, scientific and technical reports; other Environment Impact Assessment documents, and Government reports. Information sources and references have been provided at the end of this report.

### 1.7.2 Social Impact Assessment

The assessment used both secondary and primary sources of data. The primary sources of information were mainly obtained through discussions with the Government officials involved a full presentation of the proposed project, its impacts, mitigation and enhancement methods. The interaction with Government officials also sought to solicit their views on social aspects to be considered during the design and implementation of the project. The data collection was carried out using structured and semi-structured questionnaires, checklists, observations photography, site visits, and consultation with stakeholders. The survey sampled a statistically representative sample of the people living in the project area, women and youths in the major towns along the corridor. Secondary data was gathered from 2008 census data, the county development agenda documents and other reports on the project area.

### 1.7.3 Stakeholder Consultations

Stakeholder consultations were conducted with the study team preparing and presenting the project, its proposed impact and mitigation methods. The stakeholders had the opportunity to raise any anticipated concerns and suggest how these can be mitigated. This included consultations with government officials and institutions within the project area. The study also held consultations with government officials and institutions within the project area.

#### 1.7.4 Public Consultations

Consultations with residents were also undertaken in several major cities/towns in the project area. They were organized by the consultant, with the support of the provincial administration and they were held in Kanweaken in River Gee County. This assisted in baseline data gathering by providing supporting data to interpret the data gathered from the survey as well as validating information from other sources.

The objectives of the public consultation process were as follows:

- To inform the public of the details of the proposed road project;
- To ask residents about challenges they anticipate during the different phases of the project and recommendation for mitigation;

#### 1.6 STRUCTURE OF THE REPORT

This report has been prepared under the following chapters:

- Chapter 1: Introduction. This chapter gives the background information relevant to the project and describes the objectives and requirements of the study.
- Chapter 2: Policy, legal and institutional/administrative framework. This chapter outlines the national and international policies on the environment, the relevant legislations relating to environmental protection and the institutions that deal with various aspects of environmental management, land and construction matters.
- Chapter 3: Project Description and Justification. This chapter summarizes the key project activities and presents a brief justification of the project, its purpose and the needs to be fulfilled by the project. It also gives a description of the status of the project in the project cycle, details of the proposed project, designs and implementation strategies
- Chapter 4: Alternatives to the project. This chapter presents the various alternatives considered to reach the project's objectives, including the "no action" option.
- Chapter 5: Description of the existing environment. This chapter provides a description of the existing environment to provide an understanding of the bio-physical and social environmental setting.
- Chapter 6: Public consultation. This chapter outlines the actions undertaken to consult the affected groups and other concerned key stakeholders. It also presents major findings and outcomes of public consultations.
- Chapter 7: Potential impacts and mitigation measures. The first part of this chapter presents the analysis of beneficial and adverse impacts of the project on the biophysical and human (social, cultural and economic) environments. The analysis covers anticipated impacts during the construction and operation phases.
- The second part identifies and briefly describes the mitigation measures proposed to prevent, minimize, mitigate or compensate for adverse impacts as well as the estimated cost of mitigation.
- Chapter 8: Environmental and social management plan. This chapter presents the surveillance and monitoring activities proposed in the Environmental and Social Management Plan prepared for the project.

Chapter 9: Conclusions and Recommendations. The conclusion briefly presents the environmental and social acceptability of the project, considering the impacts and measures identified during the assessment process.



## 2 POLICY, LEGAL & INSTITUTIONAL FRAMEWORK

This ESIA is guided by applicable policy, legal, regulatory and institutional frameworks within the context of Liberian Law. Preparation of this ESIA also draws on the policies and regulations of the African Development Bank and other international institutions.

### 2.1 POLICY FRAMEWORK

#### 2.1.1 Land Right Policy of Liberia (2013)

The Land Right Policy of 2013 provides policy recommendations for land rights in Liberia, centered on four basic types of rights: Public Land, Government Land, Customary Land, and Private Land.

The Policy also fosters equal protection of all relative to land matters. The policy recognizes that since the founding of Liberia, the lands of customary communities have been less secure than private lands. This must end such that lands under customary practice and norms are given protection equal to that of private lands. This policy aims to give equal protection to the land rights of men and women.

#### 2.1.2 National Policies for Reconstruction and Development

Liberia's first Poverty Reduction Strategy (PRS-1) - Lift Liberia (2008 -2011) articulated the Government's overall vision and major strategies for moving toward rapid, inclusive and sustainable growth and development. The PRS consists of four pillars: Peace and Security, Economic Revitalization, Governance and Rule of Law and Infrastructure and Basic Services. The growth strategy of PRS1 had three prongs: "rebuilding roads and other critical infrastructure; reviving the traditional engines of growth in mining, minerals, forestry, and agriculture; and establishing a competitive environment to help diversify the economy over the medium term".

Liberia RISING 2030 (PRS-2) is a development agenda to succeed Liberia's short-medium term Poverty Reduction Strategy – Lift Liberia. Similar to PRS-1, Liberia Rising 2030 embraces a strategy of broad participation and will serve as a roadmap for addressing the social, political and economic challenges that confront Liberia on its path towards economic growth and wealth creation.

The National Visioning Project implemented by the Ministry of Planning and Economic Affairs and the Governance Commission envisages a long – term dimension to Liberia's development process. The National Vision exercise will serve as the foundation for all development planning during the visioning period 2012-2030. This foundation and platform will define the framework for ensuring economic growth, wealth creation and socio-political transformation of Liberia over the next 18 years. The National vision and the PRS2 are on-going simultaneously.

The Ministry of Public Works (MPW) is guided by government's policy of poverty reduction strategies and has been made responsible for rehabilitating infrastructure and delivering basic services in: Roads and Bridges; Transportation; Energy; Water and Sanitation; Post and Telecommunications; Public Buildings and Housing; Health and Education

#### 2.1.3 National Environmental Policy (2003)

The National Environmental Policy aims at improving the physical environment, quality of life and coordination between economic development, growth, and sustainable management of natural resources. Key objectives of the policy include:

- The systematic and logical framework with which to address environmental issues;
- Benchmarks for addressing environmental problems in the medium- to long-term;

- Context for financial/donor support to specific sectors and non-sectors;
- The means for generating information and awareness on environmental problems; and
- To demonstrate Liberia's commitment to sustainable management of the environment.

The National Environmental Policy (NEP) provides a broad framework for the implementation of national objectives and plans. The policy aims at ensuring a sound management of resources and the environment.

The policy provides for:

- Integration of environmental considerations in sectoral, structural, regional, and socio-economic planning at all levels;
- Sound management of the environment and natural resources;
- Protection and maintenance of human habitats, the ecosystems, and ecological processes essential for the functioning of the biosphere;
- Guidance for national action plan and for healthy environmental practices on the national development effort;
- Sustainable development; and
- A common approach to environmental issues.

The primary aim of this policy is pursued through harmonization and enforcement of relevant laws on environment protection. The NEP identifies that the EPA will operate under the guidance of the National Environment Council.

#### 2.1.4 The National Transport Policy and Strategy (NTPS)

In 1987, the Executive Law - Title 12 of the Liberian Code of Laws Revised was amended to create the Ministry of Transport. The act mandates the Ministry to establish and implement, (among others) “overall transport policy and develop plans for the movement of goods and people within and outside the Republic of Liberia”.

In 2009, the cabinet adopted the National Transport Policy and Strategy document which was developed by the Ministries of Transport and Public Works. The National Transport Policy Document provides the general policy framework for the improvement of the transport sector.

This policy framework sets out medium and long term goals for the rehabilitation of the road sector which include:

- Innovative use of contracting techniques and partnerships with private sector to facilitate long term preservation of road assets.
- Establishment of effective maintenance strategy through participation of local enterprises and communities as well as innovative contract methods.

#### 2.1.5 Integrated Water Resources Management Plan (IWRMP), 2009

The Integrated Water Resources Management Plan (IWRMP) (2009) provides an overarching approach to manage water resources in Liberia that is sustainable and beneficial to most people.

This policy was designed to provide a broad-based charter that must be recognized by all concerned sector institutions, and be considered by all public and private projects and programs.

Two broad areas are covered in this policy:

- Water Resources Management: this covers the management framework, including policy objectives, principles and strategies for monitoring, assessment, allocation and protection of resources; and
- Water Resources Use: this covers the policy objectives, principles and strategies for the development and use of water for people, water for food security, water for industry and other water uses such as hydropower, recreation, non-revenue water and water for maintenance of productive ecosystems.

#### 2.1.6 National Forestry Policy, 2006

The National Forest Policy was published in 2006. The aim of the Forestry Policy of Liberia is to conserve and sustainably manage all forest areas, so that they will continue to produce a complete range of goods and services for the benefit of all Liberians and contribute to poverty alleviation in the nation, while maintaining environmental stability and fulfilling Liberia's commitments under international agreements and conventions.

In order to achieve this aim, the following specific objectives will be pursued to ensure that commercial forestry, community forestry and forest conservation activities are integrated and balanced to optimize the economic, social and environmental benefits from the forest resource:

- To conserve a representative sample of forest ecosystems so that important environmental functions are maintained;
- To contribute to the national development goals of poverty alleviation and increased food security by increasing the opportunities for forest-based income generating activities;
- To grant more equitable access to forest resources so that the potential for future conflict is reduced and the benefits from forestry development are shared throughout Liberian society.
- To ensure that all stakeholders participate in the formulation of forestry policies and in the conservation and management of the forest resource;
- To maximize the contribution of the sector to income, employment and trade through the development of appropriate processing activities;
- To ensure that forestry development contributes to national development goals and international commitments (including regional cooperation and trans-boundary issues) and is coordinated with other relevant branches of government; and
- To ensure that activities in the forestry sector (including forest management, plantation development, harvesting, conservation and industrial development) are based on sound scientific and technical principles.

#### 2.1.7 National Biodiversity Strategy and Action Plan, 2004

The overall goal of the National Biodiversity Strategy and Action Plan (2004) is to sustainably use biodiversity on a long-term basis to meet the needs of both the present and future generations.

#### 2.1.8 African Development Bank Group's Policy on the Environment

The policy considers the various opportunities, in terms of resources and skills, available to Africa for its development and for the improvement of the overall quality of life of its people.

The policy is based on the following key principles that have gained general acceptance as prerequisites to sustainable development:

- A strong and diversified economy shall be recognized as a just means to enhance the capacity for environmental protection; however, all development-related decision-making processes

shall integrate economic, social and environmental considerations. Nonetheless, lack of financial resources shall not constitute an impediment to the promotion of community-based natural resource protection and management.

- Environmental management tools, like environmental assessments, shall systematically be used to ensure that economic activities are environmentally sustainable, and to systematically monitor their environmental performance.
- Community involvement, specifically including women, in natural resource management decisions that affect the most marginalized and vulnerable groups shall be provided for, and the value of traditional knowledge shall be recognized and preserved.
- Transparency, accountability of governance structures and institutions, which are more responsive to the needs and priorities of affected communities in general, and poor people, women, and vulnerable groups shall be encouraged.
- AfDB will disclose an ESRS on its Info Shop. AfDB requires a 120-day international disclosure period.

## 2.2 LEGAL FRAMEWORK

The Liberian Constitution and other laws provide for management of the environment and natural resources. This section provides a detailed description of the legal framework for the management of the environment of Liberia, considering the following applicable Liberian Laws.

### 2.2.1 Liberian Constitution 1986

The constitutional basis for Liberia's environmental law is provided in Article 7 of the Constitution (1986). The Article provides for:

- environmental protection as a fundamental rule;
- public participation of all citizens in the protection and management of the environment and natural resources; and
- binds state organizations to adopt and activate environmental policy and formulate national development plans that are environmentally sustainable.

### 2.2.2 Environmental Protection Agency Act (2002)

This act establishes the EPA as the principal authority in Liberia for the management of the environment. The role of the authority is to coordinate, monitor, supervise and consult with relevant stakeholders on all activities in the protection of the environment and sustainable use of natural resources.

If an EIA/ESIA is required, the proponent will be requested to carry out a public consultation termed scoping. The scoping exercises will identify what possible impacts there may be from the project and from alternatives considered. This process will also lead to the identification of a Terms of Reference (ToR) for preparation of the Environmental and Social Impact Statement of the proposed project. The EPA must approve the ToR prior to commencement of the ESIA study. Consultants for the ESIA must also meet the qualification criteria set by the Agency, and be in its Registry.

Because of the nature of the proposed Project activities under the requirements of the EPAA, it is required that environmental permits be obtained for the Project. The Environmental and Social Impact Assessment (ESIA) process to be followed for this project is shown in Figure 2-1.

### 2.2.3 International Conventions and Agreements

Liberia is a signatory to several international conventions and agreements and legal obligations concerned with environmental and social issues. Table 2-1 below shows some of those covenants and agreements.

Table 2-1: International Conventions to which Liberia is signatory.

Convention/Treaty	Ratification date	Objectives
United Nations International Covenant on Economic, Social and Cultural Rights	1967	The granting of economic, social and cultural rights to individuals, including rights to adequate health, education and living standard.
OAU Convention on Conservation on Nature and Natural Resources	21/09/1978	Encourages action to conserve, use and develop soil, water, flora and fauna sustainably.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	11/3/1981	Ensures that international trade in specimens of wild animals and plants does not threaten their survival.
United Nations Convention to Combat Desertification	3/3/1998	To combat desertification and mitigate the effect of drought in countries experiencing serious droughts and or desertification
Convention on Biological Diversity (CBD)	8/11/2000	1. Promote Conservation of Biological Diversity
		2. Sustainable use of its components
		3. Fair and equitable sharing arising out of the utilization of genetic resources
The Cartagena Protocol on Biosafety to the Convention on Biological Diversity		To contribute to ensuring an adequate of protection in the field of living modified organisms resulting from modern biotechnology
The United Nations Framework Convention on Climate Change	2003	To achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climatic system
Kyoto Protocol		To strengthen the commitment of developed country Parties with a view to reduce their overall emissions
Abidjan Convention and Protocol on Management and Protection of Coastal and Marine Environment in the Sub-Region	22/03/2005	For the Cooperation in the Protection and Development of the Marine and Coastal Environment of West African region
Ramsar Convention on Wetlands of Importance	2/11/2003	1. To manage wetland systems so that the human uses of these areas are undertaken in such a way as to retain their natural capital for future generation.
		2. To encourage and support countries to develop and implement national policy and legislative frameworks, education and awareness raising programs, as well as inventory, research and training projects.

Source: Stanley Consultants, 2013

## 2.3 INSTITUTIONAL FRAMEWORK

The institutions that have statutory roles in implementation of this ESIA are as follows:

### 2.3.1 Environmental Protection Agency (EPA)

EPA is responsible for monitoring, coordinating, and supervising the sustainable management of Liberia's environment. It is mandated to ensure the conduct of environmental impact assessment for all projects and activities that are likely to have significant adverse effects on the environment. Per Environmental Impact Assessment Procedural Guidelines (2006), projects/activities which require mandatory EIA are classified into 26 categories. As the Project is to reconstruction of Zwedru – Harper road, it is categorized as No13, Building and Civil Engineering Industry.

### 2.3.2 Ministry of Public Works

This ministry has the statutory responsibility to approve the design and construction of all civil works, including motor road. Additionally, it is also responsible to carry out urban and town planning, as well as provide architectural and engineering supervision of infrastructure required for waste management.

### 2.3.3 Ministry of Lands, Mines and Energy

This Ministry, besides its pivotal role in mineral resource development, is also in charge of administering and regulating public and private lands. This includes land tenure, land policy, land reform and land use.

### 2.3.4 Ministry of Health and Social Welfare

The Ministry has a Department of Environmental and Occupational Health that handles matters relating to water and sanitation and general environmental issues. It mandates require that sanitary and working environments are conducive for all workplace, to ensure the health and safety of workers and nearby residents. The Ministry also provides capacity building and training of environmental health technicians.



### 3 PROJECT DESCRIPTION AND JUSTIFICATION

#### 3.1 EXISTING ROAD CONDITIONS

The existing laterite road is a primary two-lane highway as defined by MPW/IIU, which travels through mostly rural areas. Most of the Ganta – Harper corridor is unpaved but has been engineered to good riding comfort. Construction work has begun on the sections from Harper to Fish Town and from Harper Junction to Cavalla Customs. The gravel surface road from Fish Town to Kelipo Kanweaken in River Gee County is fairly graded with good camber to drain runoff from the carriageway into the unlined parallel drains on both sides of the road. The average width of the carriageway is about 6m with shoulders on both sides having average width of 3m. The city of Kanweaken has its roads protected by drains to carry runoff from the carriageway.

The roadway is classified as urban primary road within highly populated areas. Throughout most of the project limits, the road is classified as a rural road. The existing alignment is centered within the GOL right-of-way which varies from 30 meters (100-feet) in urban areas to 46 meters (150-feet) in rural settings. Figure 3-1 shows a segment of the existing road. Details on the cross section of the road design of both urban and rural areas can be seen in Figure 3-2.

Generally, the vertical and horizontal alignments require improvement to meet minimum curve radii and sight distances. Most crest curves have steep grades and poor sight distances and some of the horizontal curves also have small radii and require improvement to meet minimum standards for a primary road. Due to the sharp horizontal curves and poor sight distances of crest curves, drivers in opposing directions tend to scuffle for the use of the center of the carriageway, as if it were just one lane. Figure 3-1 shows a section of realignment design.

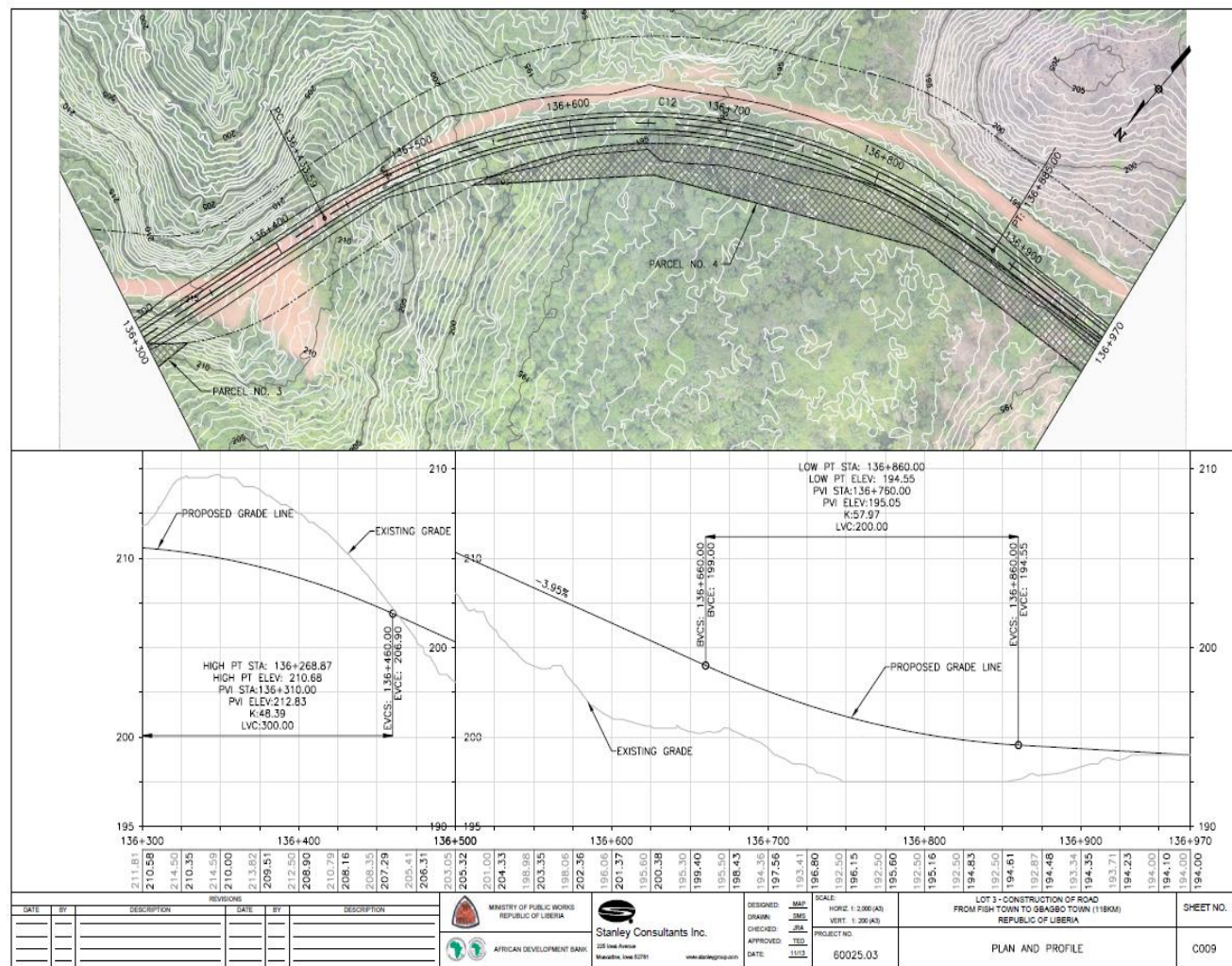


Figure 3-1: Sample of Proposed Realignment Design



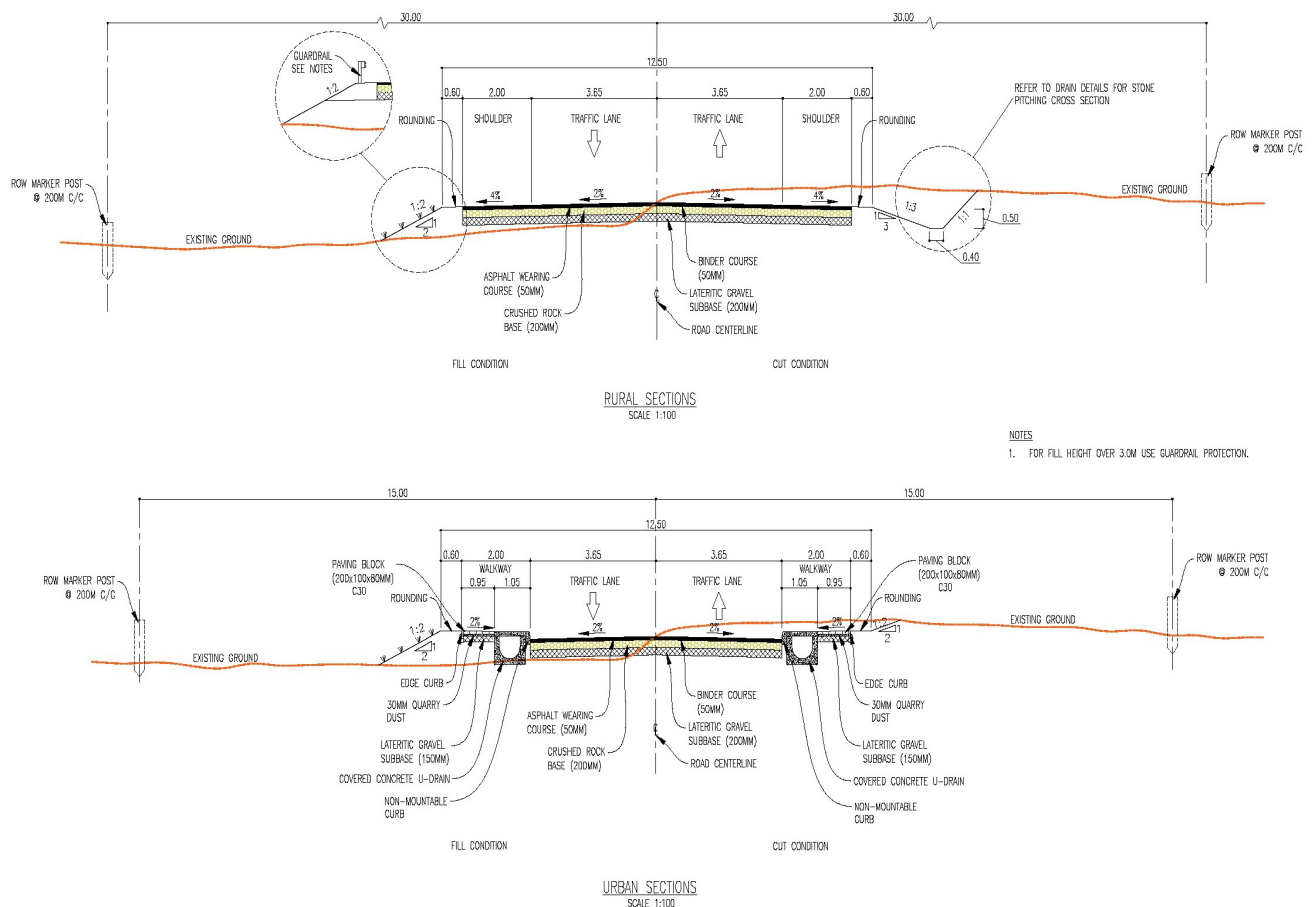


Figure 3-2: Cross section of both Urban and Rural road designs

Heavy rains are creating shallow longitudinal gullies, especially, at sections with very steep grades. Road surface becomes very slippery when wet, making it difficult to maintain control while driving, even for 4-wheeled drive vehicles in the rainy season.

There is no lighting along the route, however, there were some signs to identify bridges, towns, villages and junctions along the route.

With regards to land acquisition and resettlement, the realignment designs, temporary land take during the construction phase and clearance of the existing RoW for paving will have impact along the entire 50km corridor. Information gathered during the scoping assessment to update the this ESIA report for the proposed 50-km corridor showed that there are unmarked structures, possibly built after the 2013 study, that might present additional socio-economic challenges. These challenges are expected to be captured in the updated RAP report for the proposed 50-km corridor.

### 3.2 COMMUNITIES ALONG THE EXISTING ROADS

This project corridor passes through fourteen (14) communities along the corridor: Wanken, Gbeapo Pronoken, Sarbo Sweaken, Slobert Village, Gbeapo Kanweaken, Flewroken, Palm Wine Village, Doe Village, Juwah Village, Putuken, Sagba Village, Rock Crusher Village, Combat Gate Village and Kelopo Kanweaken.

The road that traversed the River Gee County had remained largely neglected until the African Development Bank provided grant support to the GOL in 2008 to rehabilitate the road infrastructure between Fish Town and Harper to an all-weather gravel standard, as part of the Labor-Based Public Works Project. The Government of Liberia through the Ministry of Public Works officially dedicated the Fish Town-Harper road project in 2012. In supplementary efforts, portions of the road between Gbagbo Town and Fish Town have been rehabilitated by the Putu Iron Ore Mining Company (PIOM).

Prior to the completion of the rehabilitation of road work, the Zwedru to Fish Town road used to be a terribly complicated zone to travel with passengers and road users taking over two weeks to leave from Monrovia to Harper especially during the rainy season. Thus, the people of this region lived in underdeveloped conditions in communities that are predominantly rural.

### 3.3 RIVER GEE COUNTY

River Gee County is also located in the Southeast of Liberia and borders the Maryland County to the South; the Cavalla River representing the international border with the Republic of Ivory Coast to the East; Sinoe County on the West; and Grand Gedeh County to the North. The County has eleven (11) administrative districts: Nyenebo, Tuobo, Sarbo, Garlo, Potupo, Gbeapo, Nyenawliken, Nanee, Karfoh, Jaedepo and Chedepo.

River Gee County is one of the two (2) newest counties in Liberia. It was initially part of both Maryland and Grand Gedeh Counties. In 1998, under the presidency of President Charles Taylor, it was given a county status and Fish Town is its capital.

River Gee County and the other South-eastern counties of Liberia, lack meaningful economic activities, employment and development. The main obstacles impeding growth in this region is the lack of incentives to stimulate private investment and the logistical challenges involved in accessing some of the remotest rural areas with no basic transportation infrastructure.

Prior to the war, the land possessed a variety of agricultural processing industries such as rubber, sugarcane, palm oil production and logging. Today, subsistence farming, rubber tapping and informal palm oil and sugar cane production are the main sources of livelihood.

### 3.4 PROJECT DESIGN AND ACTIVITIES

#### 3.5.1 Brief Description of the Project Activities

The proposed 50-km project roads, beginning Fish Town, consist of upgrading graveled surface to paved surfaced roads. The work will generally consists of clearing the topsoil, earthworks and excavation of longitudinal ditches, construction of culverts and several bridges, pavement construction, erosion control measures, drainage improvement, safety improvements including reflectorized paved markers, sidewalks, curb, gutter through urban areas and other ancillary works.

The project road will remain as a 2-lane facility (each lane will be 3.65 m wide) and will largely follow the existing road with major realignment in several places. Alignment shifting may occur at river crossings (i) to keep the existing bridge open while new bridges are under construction at another point (ii) due to construction and use of temporary bridges while new bridges are under construction at the original spot (iii) due to shifts of curves to meet international standards. The design speed of the road is presented in Table 3-1.

*Table 3-1: Design Speed Criteria of the Proposed Road*

Location	Design Speed (km/hr)
<b>Rural Areas</b>	100
<b>Approaches to settlements</b>	80
<b>Within Settlements</b>	60
<b>Steep grades and sharp horizontal curves</b>	60

Source: Stanley Consultants, 2013

The urban sections will have a new 1.50m sidewalk on either side. Rural sections will make use of a 2.40m shoulder, as shown in Figure 3-2. Property that are within the right-of-way 45m (22.25 m each side from the center line) will be compensated as per the Liberian laws and in accordance with the African Development Bank Environmental and Social Assessment Procedures for which a Resettlement Action Plan (RAP) has been undertaken for Lot 3.

### 3.5.2 Pre-Construction Phase

The pre-constructional activities cover the initial investigations and assessment phase. The main components being:

#### 3.5.2.1 Road Inventory

The revised design commenced in October 2015 with the 2013 design as the basis for road inventory and geodetic survey. Stanley Consultants undertook Inventory surveys of the road between February and June 2013, to collect all the information in pre-prepared standard formats concerning the actual condition of road, existing structures and other road furniture. Requirement of additional retaining structures, cross drainage/side drainage works and remedial measures was also assessed. The inventory work also included identification of deficient geometric and weak pavement locations requiring improvements.

#### 3.5.2.2 Geological and Geotechnical Investigation

Geological and Geotechnical Investigations were conducted for the entire project road; Harper to Zwedru and Harper Junction to Cavalla Customs. The exercise had three main objectives:

- To investigate the sub-grade strength of the existing road;
- To explore sources of naturally-occurring materials for road construction within economic haulage distance along the project corridor; and
- Laboratory investigation of all identified sources for their suitability for road construction.

A total of about seventy (70) test pits were excavated at (4km/5km) intervals along the entire corridor for materials testing at Central Materials Laboratory of the Ministry of Public Works and Earth Geological Lab.

#### 3.5.2.3 Material Exploration

Materials are for the construction of the pavement structure, major bridges and other ancillary works. During the field work, the materials team explored the project corridor for various construction materials within economic haulage distance. These materials, which sources are presented in Table 3-2, consist of:

- Lateritic gravel materials suitable for filling, sub base and base layers;
- Crushed rock for surfacing, concrete works, drainage structures, and as alternative - for road pavement base layer construction;
- Naturally-occurring sand for construction purposes.

*Table 3-2: Sources of Construction Materials in County along the Project Corridors*

Materials	River Gee County
Source of Lateritic Gravel	10
Sources of Sand	2
Sources of Rock Deposits	2

Source: Stanley Consultants, 2013

#### 3.5.2.4 Borrow Materials

For both corridors, borrow areas for lateritic gravel are within an average haulage distance less than 500m offsets from the existing road alignments. Generally, lateritic gravel was found in larger quantities along the project corridor.

#### 3.5.2.5 Sand Deposits

The source of sand deposit identified for concrete works during construction will be from the Kia Creek, near Suwruken. Generally, sand deposits across the project area of influence are minimal.

#### 3.5.2.6 Rock Deposits

A large rock deposit is located near Kanweaken. Others have been identified near the Siile Mountain, near Gekehrn, and another mountain near Krohnwodoken.

#### 3.5.2.7 Water for Construction

The main sources of water for people within the project corridor are creeks or rivers (e.g. River Gee) and mechanized boreholes. The study recommends the contractor to construct boreholes along the corridor as the source of water for construction purposes. Where it becomes necessary to use a source of water with questionable quality, then, remedial measures would be recommended to ensure that the quality of concrete is not impaired.

#### 3.5.2.8 Hydrologic and Drainage Investigation

The hydrologic analysis was done with considerable reliance on historical rainfall data obtained for the project catchment, geological/soil data, catchment characteristic observed and determined on site, in addition to local intelligence.

To critically assess the hydraulic performance and adequacy of the existing structures, a detailed field survey was carried out to obtain information on:

- Performance of existing drainage structures; Structural dimensions; Condition of the inlets and outlets of culverts; The type of construction; masonry, concrete, corrugated metal pipe, etc.;
- Structural soundness - structural defect; condition of wing walls, headwalls, etc.;
- Assess the state of the watercourse with regards to its ability to convey flow;
- Catchment vegetation and soil type;
- Waterlog or swampy areas;
- Drainage impedances; and
- Characteristics of catchment areas among others.

- Climatic condition, geological characteristic of the area, geographical features, physical characteristic of the drainage area and land use pattern were among information used to estimate the design flood for the project corridor.
- There is a total of 88 cross drainage structures observed along the entire stretch of the project road from Fish Town to Kelipo Kanweaken. These structures consist of the following as shown in Table 3-3 below:

Table 3-3: List of Drainage Structures

Type of structure	Total number
Pipe Culvert	85
Box Culvert	1
Concrete slab Bridge	1
Bailey Bridge	1

Source: Comptran, 2017

Run-off from the road surface is conveyed through drains or ditches to appropriate outfall. The condition of these ditches was carefully noted and approximate depth and width measured. Three types of roadside ditches were identified. These are trapezoidal lined drain, trapezoidal earth ditch and lined rectangular drain.

3.5.2.9 Alignment Characteristics

Chosen for this project. Major alignments shifting are not contemplated in order to minimize right-of-way taking. Alignment shifting may occur at river crossings to maintain the existing bridge open while the new bridge is under construction. Flattening of the horizontal curves included in the design at the certain locations will eliminate potential hazardous driving conditions. This kind of realignment will require land acquisition and some resettlement. Figure 3-2 shows a segment of the road with areas of realignment in red.

To minimize the requirement for property-take, right-of-way will be measured up to 75m from the existing road centerline on both sides for the corridors outside communities and limited to 35m for the corridors within the urban areas.

The proposed vertical alignment will follow the existing alignment for the most part.





Figure 3-3: Aerial view of segment of road showing areas of realignment shaded in red.

Source: Stanley Consultants, 2013

### 3.5.3 Construction Phase

#### 3.5.3.1 Design Interventions

Two (2) typical roadway sections are envisioned to pave the existing two-lane road:

- A two-lane rural typical section with paved shoulders.
- A two-lane urban typical section with sidewalk, curb and gutter.

In establishing the design interventions for the selected roads, due consideration was given to the levels of traffic flows and sub grade strength assessed from the traffic and road condition surveys undertaken on the various project road sections. Consideration was also given to the development dynamics of the local environment and potential of diverted and/or generated traffic in deciding on the levels of intervention proposed for the project roads.

Under the proposed interventions to be undertaken, the following activities are anticipated:

- General
  - ✓ Survey/preliminary works
  - ✓ Establishment and operation of work camps
  - ✓ Equipment mobilization and operation
- Site Clearance;
- Earth works;
- Quarries, borrow pits, stockpiles and spoil areas and dumping of spoils / debris;
- Construction of Culverts and drainage works;
- Road formation (gravel road shaping, sub-base and base preparation, shoulder and sidewalk construction);
- Road surfacing (use of bitumen for prime coat and surface dressing); and
- Ancillary works - Ancillary works associated with road upgrading will include safety features such as warning signs, speed restrictions, traffic calming measures, and drains, stopping lay-bys within settlements, junction improvements and direction sign boards.

Other aspects of the construction phase, which will be addressed include:

- Contractual aspects – specifically covering environmental clauses in contract specifications;
- Construction Supervision and Monitoring.

#### 3.5.4 Post-Construction Phase

The post construction phase will cover issues relating to the operation and maintenance of the project such as:

- Maintenance
- Area wide traffic management and enforcement mechanisms, which will focus on:
  - ✓ Road Safety features (such as warning signs, speed restrictions, traffic calming measures, drains, stopping lay-bys within settlements, junction improvements and direction sign boards)
  - ✓ Environmental improvements;
  - ✓ Public education and enforcement plans.

### 3.5 PROJECT JUSTIFICATION

The intense wet climatic conditions in Liberia present major challenges in the maintenance of unpaved roads which often come with high life cycle costs. In the absence of a suitable maintenance funding framework, such as a Road Fund, Liberia would increasingly find it difficult to maintain unpaved roads that require consistent routine and periodic regimes with associated technical and cost attention. Paving of the 50km Fish Town to Kelipo Kanweaken road would ensure that the road is better suited to the terrain and climatic conditions and has lower life-cycle costs.

The upgrading of the road corridor is consistent with the GOL's policy of upgrading all primary roads and provides connectivity with neighboring countries in the sub- region. The Ganta–Harper Highway is an alternative link on the Trans-Coastal: Lagos–Nouakchott Highway as identified by ECOWAS with the potential to facilitate Sub-Regional Trade and Integration in the future.

The project would improve access to transport services for the rural population in River Gee County with the rest of the country; improve farm to market linkages as well as uplift the quality of life of the people of the project area. The road corridor is situated in an area heavily endowed with mineral and agriculture resources such as rubber that could take the populace to a much-needed greater socio-economic development.



## 4 DESCRIPTION OF THE PROJECT ENVIRONMENT

This section describes the environmental and social conditions in the project corridor – first 50-km beginning Fish Town to Kelipo Kanweaken. Although the focus is on the project corridor, wider reference would be made to information on River Gee County, where the project roads are located. The Physical Environmental Baseline data was collated to facilitate impact studies on the hydrological and material investigations component of the project. The physical data collected included rainfall, temperature, water resource/drainage data and published geological/soil data. The Biological and Socio-Economic Baseline Data have also been collated to facilitate other impact assessment on the project.

### 4.1 BASELINE OF THE PHYSICAL ENVIRONMENT

#### 4.1.1 Geology

Geological investigations in Liberia have shown that nearly all of the terrain is underlain by Precambrian crystalline rocks which form part of the West Africa Shield. The country can be divided into three (3) geological regions, namely the Liberian Age province, the Eburnean Age Province and the Pan African Age Province. The Liberian Age province is underlain by rocks aged between 2.5 and 3.0 billion years, Eburnean Age Province aged between 2.0 and 2.5 billion years and the Pan African Age Province aged less than 500 million years.

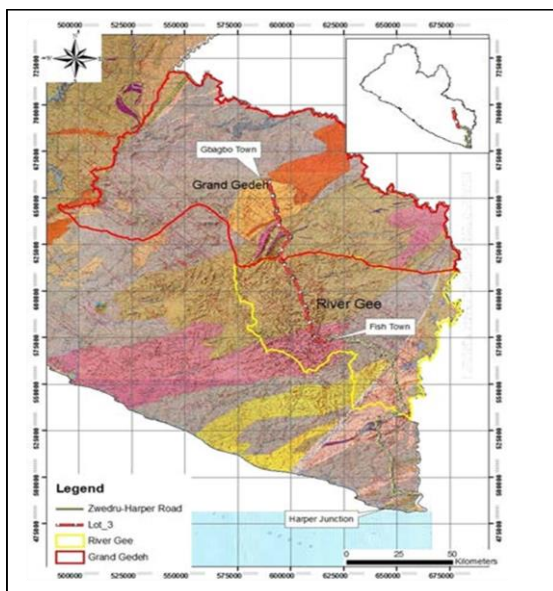


Figure 4-1: Local geological map of the project area

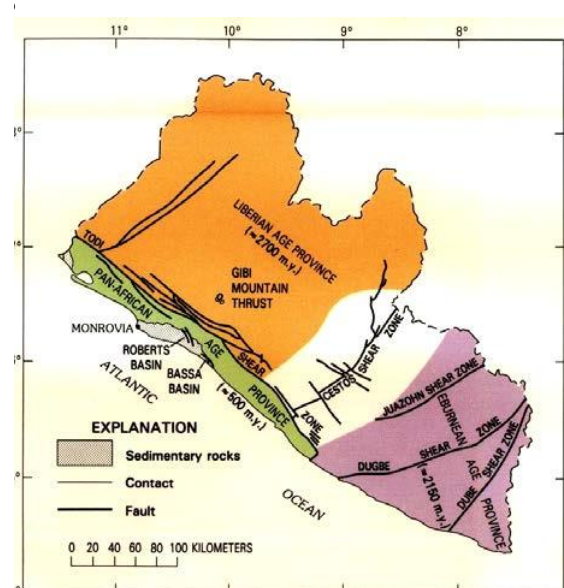


Figure 4-2: Regional geological map of Liberia.

This is shown in Figure 4-1 and Figure 4-2

The project site is located within the Eburnean Age Province. The rock type near Fish Town is mostly leucocratic gneiss. There are also dark grey diabase dikes that cut across the region, where visible outcrops can be seen in several places.



#### 4.1.2 Soils

At a national level, latosols (porous and friable soils rich in iron, alumina, or silica typically formed in tropical woodlands under very humid climate with relatively high temperature) cover about 75% of Liberia; these are typically de-saturated, reddish-brown in color and quite hard, with low humus content. They are suitable for surface farming techniques (traditional agriculture) and provide valuable materials for road construction. The parent materials of these soils are crystalline metamorphic and igneous rocks. The soils vary in thickness over bedrock from a few feet to considerable depth. Reed (1958) subdivided Liberian Latosols into 7 individual associations. These were: Kakata, Salala, Suakoko, Gborngo, Ganta, Zorzor and Voinjomo. Each of these associations was also often associated with Lithosols.

The next most common soil type is Regosols (very weakly developed mineral soil in unconsolidated materials), sandy with 60% of coarse and fine sand, white to gray in color which is typical of the coastal plain, with little humus and soluble cations. These are considered mostly suitable for pastures and palm cropping.

Finally, the least common of the Liberian soil groups are hydromorphic soils (soils associated with marshes, swamps, bogs, or poorly drained flat uplands), of a grey color, typical of the swamps, and water logged valleys during the rainy season. They account for around 4% of the country's area and their high humus content makes them fit for the cultivation of swamp rice, when properly drained.

Specifically, for the project area, the soil type is generally silty reddish-brown with high content of clay which might result from the weathering of sedimentary rock. There are also few areas with lateritic gravel. From the hydrologic point of view, soils with high content of clay often result in high run-off due to its relatively impervious nature. Rainfall run-off can significantly reduce where there are fault lines, fissures and cracks as the run-off finds its way through these openings. Geologically, the catchment is found to be stable with no geological features.

#### 4.1.3 Topography

In the catchment areas of River Gee County, there are generally gently rolling with wide and shallow valleys with the following identified geographical belts: mangrove swamps and beaches along the coast, wooded hills and semi deciduous shrub lands along the immediate interior, low mountains in northeast, dense tropical forests and plateaus in the interior.

The project area is endowed with abundant water resources. Data from the rural water supply program indicate that the depth to the water table in wells can be less than 10 meter, especially during the rainy season. Drilled boreholes can be as deep as 100 or more meters. River Gee County has large rivers: the Cavalla, located in the East, the Dube River and Grand Cess River which runs across the project road in the northeast and south respectively, the Wro Creek in the east, and the Gee River, in the Southeast. The Gee River has several waterfalls, which flow and drain from the swamps and tributaries into the Ocean.

The project road crosses major rivers and streams as well as small tributary creeks. The major rivers and streams are perennial whilst most of the tributary creeks are ephemeral. These ephemeral creeks often run completely dry during the dry season, except some few localized depressions in the creek bed.

The project area lies in a predominantly undeveloped watershed and traverse largely through forest. The topography can best be described as undulating with few hilly and mountainous sections.

4.2 WATER RESOURCES AND DRAINAGE

The project area is endowed with abundant water resources. Data from the rural water supply program indicate that the depth to the water table in wells can be less than 10 meter, especially during the rainy season. Drilled boreholes can be as deep as 100 or more meters. River Gee County have large rivers: the Cavalla, located in the East, the Dube River and Grand Cess River which runs across the project road in the northeast and south respectively, the Wro Creek in the east, and the Gee River, in the Southeast. The Gee River has several waterfalls, which flow and drain from the swamps and tributaries into the Ocean.

4.3 CLIMATE

4.3.1 Rainfall

The climate of River Gee County is synonymous with the rest of Liberia, a tropical one with relatively small variations between day and night and between seasons. There are two seasons -the wet season from May to October and the dry season from November to April.

Liberia experiences more rainfalls than other areas in West Africa. The continental and maritime air masses alternate their movements back and forth, from the north to south. This brings some seasonal differences in rainfall intensity. The coastal region has the heaviest rainfall from an annual 3900mm to 4500mm in the west and about 2500mm in the south-eastern part of the country. Rainfall decreases going north and inland except highlands and the northernmost part of the country. The eastward of the country following the Cavalla River receive over 1700mm of rain annually.

Figure 4-3 shows the annual rainfall of the country.

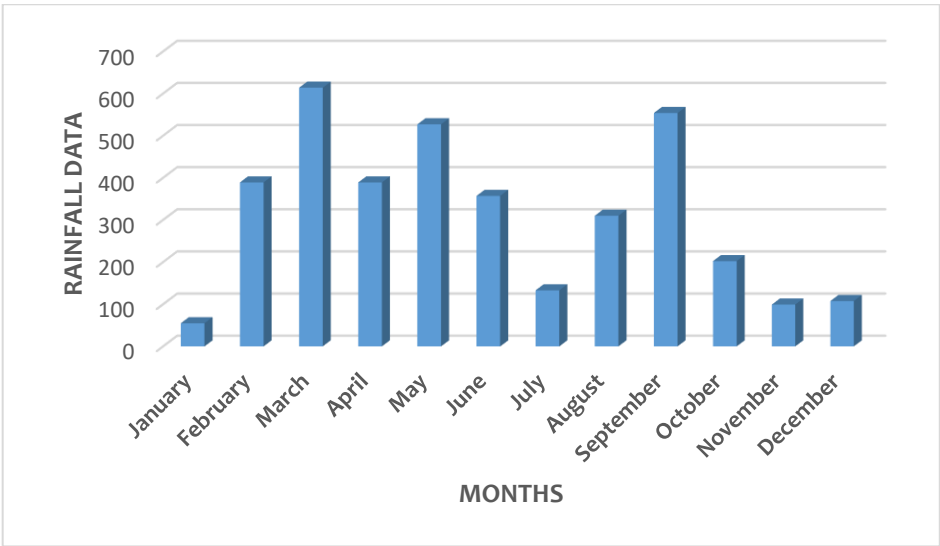


Figure 4-3: Average Monthly Rainfall (Millimeters)  
Source: Stanley Consultants, 2013

### 4.3.2 Humidity, Temperature, Wind, and Sunshine

The mean monthly relative humidity varies between 70 and 90%. The mean daily bright sunshine hours varies in excess of 4.0 hours. The mean monthly temperatures of the project catchment vary from 24.50C and 27.50C. Wind speeds are generally light being of order of 6 knots. Strong winds are usually associated with convective thunderstorm activity during the rainy season and are short. Temperature, humidity and wind affect run-off. High temperatures, low relative humidity and strong winds result in higher evaporation and subsequently reduce runoff. The highest temperature recorded in the project area is 32°C and the minimum is 22°C. Table 4-1 shows the average monthly temperature of the project area.

*Table 4-1: Average Monthly Temperatures*

Month	Temperature (°C)		Average
	Maximum	Minimum	
January	31	22	26.5
February	36	21	28.5
March	31	23	27
April	32	24	28
May	30	24	27
June	29	23	26
July	28	23	25.5
August	27	23	25
September	27	23	25
October	29	24	26.5
November	30	23	26.5
December	30	23	26.5

Source: COMPTRAN, 2016

## 4.4 BIOLOGICAL ENVIRONMENT

Biodiversity contains ecological, economic, and socio-cultural values that justify the need for conservation and sustainable use. The range of biodiversity in Liberia includes forests, wildlife, mangroves, wetlands and swamps. Liberia biodiversity is under threat due to many factors such as ignorance, insufficient public education and awareness, shifting agriculture, unregulated logging, un planned roads in logging areas, unplanned human settlements, fuel wood gathering, charcoal production, population pressure and establishment of rubber plantations.

### 4.4.1 Fauna

The Liberian forest serves as habitat for large amounts of endemic flora and fauna and is a unique ecological niche for some of the rarest species in the world. The Jentink's duiker (the rarest in the world), white-breasted guinea fowl, pygmy hippopotamus, Diana monkey, Liberian mongoose, the giant forest hog, chimpanzees, red colombus (a long-tailed monkey), bongo antelope, leopard and the golden cat are amongst the animal population inhabiting Liberia's forests. It is also home to hundreds of birds, nine of which are endangered; several dozens of reptiles, including three types of crocodiles and at least eight poisonous snakes; amphibians and at least a thousand different insects.

#### 4.4.2 Flora

The vegetation found covering the project area consists of primary and secondary forests and savannah. Most of the forests along the road are open, with only insolated huge trees such as *Antaris toxicaria*, *Pentaclethra macrophylla*, *Piptadenias-trum africanum*, *Sacoglottis*, *Terminaliasuperba* and *Triplochiton*, *scleroxclon*, which were giving abundant forest-regrowth. They are 260 species of trees, including the Mahogany, African Walnut, Mahere, Teak, Ebony, Ironwood, Makore, Sikon and Camwood within the project area of influence.

Shifting cultivation practices are also destroying the forests in the area. The road runs through a range of luscious secondary forest, with few rubber farms along the road. The coastal vegetation consists of mangrove swamps, savannah woodland and patches of forest scattered in fields of grassland.

#### 4.5 HUMAN ENVIRONMENT – SOCIO-ECONOMIC BASELINE

This data has been compiled using secondary source from LISGIS and primary source from the social survey conducted by the Earth Environmental Consultancy Social Team and updated by Comptran.

The communities in the project area of influence have social network and support systems. Generally, the social networks include associations along professional lines. For example, tailors, marketers; other associations are based on age, such as youth groups. On the other hand, some associations are based on gender, such as the woman development groups. Such interactions are used to promote and protect personal relationships and welfare. Another social network in the project area of influence is called “Susu”. This social network is particularly a support group of small scale businessmen and women, coming together for saving and loan purpose. The Susu does not only provide financial security to its members, but fosters solidarity and greater cohesion within the communities.

##### 4.5.1 Demographic Characteristics

##### **Population Size**

The population of River Gee County, the population is estimated at 71,509, with male and female at 52.1 and 47.9 respectively (LISGIS, 2011). In the County, the road under 50-km of Lot 3 traverses the road traverses the Chedepo, Gbeapo and Nyenawliken Districts. The total population of Chedepo, Gbeapo and Nyenawliken Districts is 26,611, representing 39.8% of the county population, with male to female ratio estimated at 52.2% to 47.8%. The population distribution of Lot 3 project road is presented in Table 4-2 below.

Table 4-2: Population Distribution of Districts within the Project Area

River Gee Co.	MALE		FEMALE		TOTAL	
District	No.	%	No.	%	No.	%
Chedepo	5,435	51.7	5,083	48.3	10,518	15.7
Gbeapo	5,743	52.5	5,191	47.5	10,934	16.4
Nyenawliken	2,668	51.7	2,491	48.3	5,159	7.7
River Gee (Total)	34,863	52.1	31,926	47.9	66,789	100

Source: Stanley Consultants, 2013

### **Communities Along the Road**

This project road passes through fourteen (14) communities along the corridor: Walken Village, Gbeapo Pronoken, Sarbo Sweaken, Slobert Village, Gbeapo Kanweaken, Flewroken, Palm Wine Village, Doe Village, Juwah Village, Putuken, Sagba Village, Rock Crusher Village, Combat Gate Village and Kelopo Kanweaken.

**Walken Village:** The first and small rural community of the 50-km corridor, just outside of Fish Town, with not more than 5 houses and a population size of approximately 20. The village has a creek, Konah creek, close to the road that serves as a source of drinking water. The only economic activity is farming of plantain, banana, cassava, rice and etc. and the affairs of the community is managed by a town chief, Morris Tweh.

**Pronoken Town:** Located in Gbeapo District, Pronoken is an urban community with more than forty houses and its population is approximately 400 represented by the town Chief Musa Chea. The town has one (1) Junior High School, Pronoken Junior High, three (3) Churches (AICA, Lutheran, and AG), four (4) Hand pumps and a football field and a local court house. The main livelihood activities are petty trade, and farming of cocoa, banana, palm and livestock.

**Sweaken Town:** An urban community, seat to Nyanwleken district commissioner's office, the town has more than 25 houses and a population size of approximately 150. The Chief Patrick Dweh and his people have benefited from a USAID Funded Sanitation Project, have a cassava processing center, a newly improved town hall and an Elementary School -Dweh Elementary School. They are mainly involved in petty trade and farming of rice and vegetable, with a few owning cocoa farms.

**Slobert Village:** This is a small village with less than seven (7) structures.

**Kanweaken also known as Gbeapo Kanweaken:** A populated urban community divided into nine (9) zones with lots of active businesses owned by mostly Liberians, Guineans and Nigerians. Other livelihood activities include the farming produce such as Rubber, Cocoa, Cassava, Plantain and etc.

River Gee County is managed Superintendent Phebe Butty, Assistant Supt Weiah N. Seide; while Kanweaken has an Acting Mayor Richard Q. Quay. The city can also boast of many different secondary school facilities:

- Two (2) Senior High School (Gbeapo Central High School, JJ Gelplay Public High School),
- Three (3) Junior High School (Matthew Swen Junior high School, AICA Mission Junior High School, Bethel World Outreach Junior High School)
- Three (3) Elementary School (KES Elementary School, Catholic Elementary School, and Baptist Elementary School)
- One (1) Day Care School (St. Amos Daycare)

Other social and public facilities include:

- Two 2 Health Centers (Gbeapo Health Center and Catholic Clinic),
- 3 Handpumps along with other socio activities makes Gbeapo a lively place to be.

**Flewroken:** This is a peri-urban community on the outskirts of Kanweaken and has one public primary school, but children and youth benefit from the proximity of the town to Kanweaken schools. They are involved in petty trade and with mixed farming - raising livestock and growing of crops.

**Palmwine Village:** This is a newly established rural community with about six houses. Other small towns include **Doe Village** with five (5) houses and **Juwah Village** with only four (4) houses. They all survive on traditional farming.

**Putuken: Located in Chedepo District,** this an urban community is home to more than fifty houses and its population is approximately 7,337 headed by a town chief, Piah Typson. The community has a few public infrastructures which include: two (2) schools - TMA Junior and High School, Victory Refuge Community School, one (1) Health Center - Putuken Clinic, two (2) Creeks – Malankee and Subee), eight (8) Handpumps in this community and a football field. Livelihood activities involves mixed farming and business.

**Sargba Village and Rock Crusher:** These two rural communities are home to five (5) houses and an approximated population of twenty-five (25), respectively. Sargba Village has a church (God's Sower) and a handpump. Villagers are carry out traditional farming as livelihood activities.

**Combat Gate Village:** This is a rural community that was established by a family in 2017 five (5) structure, three (3) of which are under construction, and its population is approximately fourteen (14). For livelihood source, they are involved in the making of large rice, cassava and corn farms.

**Kilepo Kanweaken:** This is populated peri-urban community headed by Chief Andy K. Tullay. The town has three (3) schools - Walpa Memorial Junior Institute, AICA Elementary, and AG Elementary; one (1) Health Center - Kilepo Clinic, five (5) Churches - AG, Baptist, AICA, Pentecostal, and ACFI; and seven (7) Hand pumps. Economic activities include petty trade and mixed farming.

### Age Distribution

During the socio-economic study of the project area, a sample size of the population was considered for the towns along the corridor in River Gee. A total of 59 persons were interviewed within the limit of Lot 3 – 30 males and 29 females. Of this group, 84.7% were between the age 18 and 59, while 15.3% were 60 and above.

### Ethnicity and Religion

The main ethnic group in River Gee County is Grebo – 67.8. Other tribes present were Kpelle, Mandingo, Kru, Lorma, Gio and Mano.

91.5% of the respondents in River Gee County are Christians and 8.5% Muslims. This outcome is similar to the national figures of 85.5% Christians and 12.2% Moslems, 0.5% practitioners of African Traditional Religion and 1.5% who professed no religious affiliation.



## 5 ALTERNATIVES TO THE PROJECT

### 5.1 ALTERNATIVE MODE OF TRANSPORTATION

There are no alternatives to this road that fulfill the functions of providing relatively fast, cheap land transportation. Air, rail, and water transport are unlikely to either complement or to substitute for roads or highways in this region. There is no railroad link in or near the project area. Hence, rail is not considered as an option. There are no water bodies that can be used as a mode of transportation in the project area. Streams or river in and near the project area are neither connected nor navigable. The only possible means is air transport but, this is a rather expensive alternative and cannot be used as an alternative to the road.

The road is the most important link between River Gee to Lot 2 and Lot 1 in Maryland County. It serves as the best interconnection within that region of the country, which is a high rubber, oil palm and soon to be iron ore producing area. The proposed project road is an existing gravel road and its upgrading will not involve any major horizontal or vertical realignment except as has been discussed in detail in Chapter 4 and elsewhere in this ESIA.

### 5.2 ALTERNATIVES CONSIDERED

The effect of road projects on the physical and human environment raises issues regarding alternative choices to the road projects considered. The analysis will assess the effects of these alternatives on the environment against expected benefits.

Two main project alternatives have been considered and they are:

1. ALTo: Base Case – Do Nothing
2. Engineering Intervention Option.

### 5.3 DO NOTHING OPTION

This alternative implies that the selected road corridor within River Gee County will not be improved and that it would be left in its present state characterized by several defects and related impacts. The main defects include the following:

- Narrow road widths at several sections;
- Presence of sharp curves with poor visibility at some sections;
- Poor pavement conditions;
- Very slippery road conditions in the rainy season;
- Inadequate drainage and erosion control measures contributing to the gradually deteriorating condition of some segments of the road.

The combined effect of these problems affects the smooth transportation of people and goods to and from the areas. Speed travel on these roads will continue to be slow and vehicular breakdown rate will continue to increase. Some communities are cut off during the rainy season and will continue to suffer that fate with the no option alternative. Social and economic activities in the communities will generally decline. Dust pollution and poor riding quality of the existing roads will continue to pose as health and safety problems to the communities. Development opportunities may not be realized and several natural endowments will remain unutilized. Potential negative environmental and social impacts (relocation of settlements, burial sites, etc.) during construction and operation of the proposed scheme would not be avoided with this option, but the measures being put in place will offset the impacts. Project acceptance has been 100%

because long-term commercial and social development advantages offered to the region by the Option 2 proposal is what the whole region is anticipating.

#### 5.4 ENGINEERING INTERVENTION OPTION

This option assumes that engineering measures will be provided to correct the problems highlighted in section 5.3 in order to improve the safety, health and social conditions of the local communities. In considering the various alternative solutions to the present state of the roads, the project aim of making accessible the Southeast region of Liberia to increase productivity, reducing transportation costs for the agricultural target centers and improving critical social services and road safety have been considered.

The road works standards proposed under the AfDB Project comprise the following:

- ALT1: Upgrade Gravel road to Double Bituminous Surface -Surface Dressing (chip sealing)
- ALT2: Upgrade Gravel road to Asphaltic Concrete Surfacing with Crush Stone Base

##### General

In the design of roads, alternatives with respect to route alignment, material acquisition, construction technique and technology need be analyzed to avoid and/or reduce potential environmental and social impacts and capital and operating costs.

##### Route Alignment Alternative

Factors such as engineering design standards and best practice, road safety, farming activities, existing and future mining activities, existing and future services, i.e. power lines, pipelines, and existing and future town developments were considered. Landowner needs were also considered, all within the norms of engineering, practicality and financial viability. All parties including PAP have agreed on the position of the alignment and the road reserve will be proclaimed and landowners and PAP will be paid compensation.

##### Material Acquisition

Construction material - borrow materials (laterite gravel), sand and rock deposits identified are all within an average haulage distance less than 3km offsets from the existing road alignments.

Acquisition of these materials will be established with the contractor and the MLME and with the consent of land owners. Impacts of transport of materials to site will not be significant as the distances are short and the road corridor is not very populated.

##### Technology Alternatives

Consultants are aware of the negative impacts associated with road pavement. Mitigation measures and best practices would be adopted to alleviate the associated adverse environmental impacts.

##### Economic Evaluation

The economic analysis conducted in the feasibility study used the Road Economic Decision Model (RED) for the economic analysis and evaluation of the Project road for a 20 year design life. This design tool has been specially developed to analyze whole life cycle costs of road investment and takes account of all significant economic factors over the life cycle; routine maintenance, vehicle operating costs, accident benefit costs, improvements in economic growth of the region served and some measure of the cost benefit to road users based upon travel times saved. The overall life cycle cost of the road under the various alternatives and the social advantages of the options were compared in the analysis. The most important benefits that can be derived from a transport infrastructure improvement, such as the proposed project, include the following:



- Savings in vehicle operating costs;
- Savings in road maintenance expenditure;
- Residual value of the road's structures at the end of the evaluation period;
- Value of time savings;
- Exogenous benefits, such as employment generation;
- Stimulation of economic development;
- Fewer accidents and reduced property damage;
- More effective regional/district integration;
- Greater self-sufficiency of the people in the influence areas;
- Increased comfort and convenience; and
- Improved access to social facilities or amenities, e.g. education, health, market centers, etc.

Increase in direct employment is estimated to be significant during construction, (approx. 158 skilled and 117 unskilled labors). Therefore, only during construction the direct employment benefits are included. The annual benefits are estimated to be US\$ 440,000 – 470,000/year for two (2) years, (2014-2015)<sup>1</sup>.

In general, the results of the economic analysis are more favorable towards DBST than AC since construction cost for DBST is lower than for AC. However, asphaltic concrete surfacing is being recommended over Double Bituminous Surface Treatment for the following reasons:

- Whole of life cost: This cost extends the construction cost to include maintenance, upgrading, rehabilitation, salvage value and design life issues.
- Maintenance costs for DBST are relatively higher than AC pavement especially with high traffic loading over time. DBST pavement tends to deteriorate faster with heavy traffic loading than AC pavement. This therefore warrants more frequent routine and periodic maintenance activities over the design life of the DBST pavement - maintenance, based on our experience, which is not a carried out on roads across Liberia, Ghana, Uganda and most of Africa.
- Life of the project was referenced to that of DBST roads which is 20 years, beyond which reconstruction will occur. However, AC roads could have useful lives beyond 20 years.
- Furthermore, salvage value of DBST pavement is lower than AC pavement. Beyond the 20 year design life, AC pavements are expected to have salvage value of approximately 20% of cost and will still have useful service life beyond 20 years. Salvage value for DBST pavement is relatively much lower and would require reconstruction after 20 years.
- Reliability: The minimization of design, construction and maintenance risks over the pavement life. Though this is a subjective assessment, it considers those risks of pavement design and construction that are not directly considered by other criteria. Failures of DBST pavement have occurred with heavy traffic loading and have not performed well over many years in many countries. AC surfaced pavement are highly susceptible to fuel spill damage and rutting under heavy wheels. Apart from these maintenance risks, asphalt can provide a highly reliable pavement compared to DBST.

## 5.5 THE PREFERRED ALTERNATIVE

The advantages to be derived from the road improvement alternative far outweigh the disadvantages of the “Do Nothing Option”. Although there are environmental implications associated with the improvement alternative, appropriate mitigation measures would be implemented to control them, thus justifying the case for implementing the project. Asphaltic concrete surfacing is being recommended over Double Bituminous Surface Treatment for the following reasons:

- Whole of life cost: This cost extends the construction cost to include maintenance, upgrading, rehabilitation, salvage value and design life issues.

<sup>1</sup> Rates for labor were obtained from the Client

- Maintenance costs for DBST are relatively higher than AC pavement especially with high traffic loading over time. DBST pavement tends to deteriorate faster with heavy traffic loading than AC pavement. This therefore warrants more frequent routine and periodic maintenance activities over the design life of the DBST pavement - maintenance, based on our experience, which is not a carried out on roads across Liberia, Ghana, Uganda and most of Africa.
- Life of the project was referred to that of DBST roads which is 20 years, beyond which reconstruction will occur. However, AC roads could have useful lives beyond 20 years.
- Furthermore, salvage value of DBST pavement is lower than AC pavement. Beyond the 20-year design life, AC pavements are expected to have salvage value of approximately 20% of cost and will still have useful service life beyond 20 years. Salvage value for DBST pavement is relatively much lower and would require reconstruction after 20 years.
- Reliability: The minimization of design, construction and maintenance risks over the pavement life. Though this is a subjective assessment, it considers those risks of pavement design and construction that are not directly considered by other criteria. Failures of DBST pavement have occurred with heavy traffic loading and have not performed well over many years in many countries. AC surfaced pavement are highly susceptible to fuel spill damage and rutting under heavy wheels. Apart from these maintenance risks, asphalt can provide a highly reliable pavement compared to DBST.

Based on the justification provided above, upgrading the gravel to asphaltic pavement is therefore recommended for implementation.

## 6 STAKEHOLDERS AND PUBLIC CONSULTATIONS

### 6.1 INTRODUCTION

Public consultation is useful for gathering environmental data, understanding likely impacts, determining community and individual preferences, selecting project alternatives and designing viable and sustainable mitigation and compensation plans.

Public consultation in the ESIA process is undertaken during the project design, construction and initial operation. The purpose of public participation in this ESIA study was mainly to create awareness on the project and involve and facilitate those likely to be affected positively or negatively. Other stakeholders were consulted by giving them an opportunity to raise their views, concerns, perceived impacts and ways mitigating/enhancing project effects. This is intended to create a sense of commitment in implementing the ESMP.

Inadequate public consultation on the other hand can result in significant information gaps, which could mislead road planners undertaking an environmental assessment. Lack of attention to communication and consultation processes can generate individual, community, or regional opposition to a road project. This can ultimately be a cause of substantial delays, increased costs, and unsatisfactory compromise solutions, which could have been avoided through earlier consultation.

Therefore; to ensure effective communication and get information about community concerns on the road project, the consultant interviewed key stakeholders, community leaders and the public along the project road. Standard questionnaires, observations and public meetings were the main techniques used to gather the required information.

### 6.2 THE CONSULTATION PROCESS

#### Stakeholders Consultations

Key informants were interviewed from June 30 to July 5, 2013 within River Gee County. Some are presented in Table 6-1 below.

*Table 6-1: List of key informants interviewed during the ESIA study*

River Gee County			
No.	Name	Institution	Position
1	Philip T. Jah	Ministry of Internal Affairs	Assistant Superintendent
2	D. Wilson Solobert	Ministry of Agriculture	Agriculture Coordinator
3	Joseph D. Bohlen	Ministry of Education	County Education Officer
4	Theodore T. Walker	Ministry of Education	District Education Officer
5	Dr. Joseph Sieka	Ministry of Health	County Health Officer
6	Eva Forpoh	Farmer	Chairlady, Karweaken
7	John T. Sinatue	Ministry of Internal Affairs	Paramount Chief, Karweaken
8	Josiah Quayee	Ministry of Internal Affairs	Town Chief, Sarbo Sweken
9	A. Tiasco Tweh	Transport Union	President
10	Catherine Doboh	Youth Group	President, Sarbo Sweken

Source: Stanley Consultants, 2013

Their comments on the various issues asked are as shown in Table 6-2.

Table 6-2: Comments from the key stakeholders

Issues	Comments
<b>A. Value of the existing roads</b>	
<b>Prevalent mode of transport within the two districts</b>	Pehn-Pehn i.e. motorcycles, private transport and public transport (buses), trucks
<b>Whether they find the roads useful and its benefits after upgrading of road to asphalt standard.</b>	All of them agreed that the road is useful in terms of:
	i. Access of markets especially when taking farm produce and inputs;
	ii. Carrying out private business easily;
	iii. Easy access to district headquarters to seek service;
	iv. Low transport costs due to low vehicle maintenance;
	v. Increased property value;
	vi. New transport routes;
	vii. Increased local investments
	viii. Saves time;
	ix. Reliable roads (all weather);
	x. Improves economy and development;
	xi. Commuter transport; and
	xii. Improved road safety.
<b>Disadvantages of upgrading current road to asphalt standard</b>	1. Accidents;
	2. Loss of property and livelihoods;
	3. Change of socio-cultural setup of the community;
	4. Air pollution;
	5. Discharge of runoff to nearby farms thus destroying crops and soil erosion issues;
<b>Effects that the deterioration of the road has had on the community</b>	1. Delay of the farm produces reaching the market;
	2. Waste of time and unreliable means of transport;
	3. Accidents;
	4. Breakdown of vehicles hence increase in transport costs;
	5. Delays in accessing social amenities like hospitals and schools;
	6. Hinders communication; and
	7. Slowed down economic growth of the area.
<b>How the road upgrading will impact on the community</b>	1. Easy transportation of agricultural produce hence improved livelihoods of the community;
	2. Opening up of the place for investments;
	3. Increased urbanization
	4. Establishment of institutions e.g. schools and etc;

Issues	Comments
	5. Reduced transportation costs and fares;
	6. Integration of communities;
	7. Increase accessibility;
	8. Transport to hospitals, schools and market centers;
	9. Improve economic status and economic empowerment;
	10. Expansion and growth of nearby centers; and
	11. Increased number of vehicles plying the route
<b>B. Change in the Local Economy</b>	
<b>Centers that are of major economic value along the road corridors in River Gee</b>	1. Kelipo Kanweaken
	2. Pronoken
	3. Karweaken
	4. Fish Town
<b>How has the existing road affected household income and local trade</b>	1. Cost of transportation of goods is high;
	2. Loss of Agricultural produce due to poor roads
	3. Poor pricing of produce by brokers;
	4. Lack of investment in the area;
	5. In access to services e.g. banks, extension services
	6. High costs of inputs and low margins for farmers;
<b>Major concerns regarding the upgrading of Zwedru – Harper road to asphalt standard</b>	1. Drainage and erosion concerns
	2. Road should be constructed to standard so that it can last longer;
	3. Rehabilitation of material sites and quarries;
	4. Disruption of services;
	5. Health and safety standards should be followed;
	6. Pollution;
	7. Incidences of accidents may increase;
	8. Economic growth in the area
	9. Unlocking the potential of the high potential areas
<b>C. Demographic and Settlement Patterns</b>	
<b>How the existing road has affected population and settlement patterns in the area</b>	1. Rural – urban migration;
	2. More population near the main road;
	3. Sparse population due to poor road;
	4. Migration of people to places where there are good road;
	5. Low property value; and
	6. High transport costs.

Issues	Comments
How the new road will affect population and settlement patterns in the area	1. Increased property value;
	2. Reversal of rural-urban migration;
	3. Increased investment in the area;
	4. More people will move and settle along the roads and urban areas leading to population increase;
	5. Expansion and growth of the major centers;
	6. Most farms adjacent to the roads will be turned into plots for construction;
	7. Increased population in to the area; and
	8. Development of new trading centers.
<b>D. Impacts on Land Use and Land Productivity</b>	
Major economic activities in River Gee	1. Agricultural crop and livestock production;
	2. Transport; and
	3. Trade
Constraints encountered in the named economic activities	1. Access to markets;
	2. Exploitation by brokers;
	3. No access to credit facilities
	4. Poor infrastructure;
How the new road will affect land use and land productivity in the area	1. Access to markets;
	2. Saves time to access markets;
	3. Change in land use especially in areas near trading centers
	4. Affordable transport
	5. Land value will go up;
	6. High land utility
Opinion on whether the road will improve the situation	All the stakeholders were in agreement that the road will improve the situation
<b>E. Impact of Undesirable Developments Abutting the Road</b>	
Main undesirable developments brought about by the present road	1. Poor access to markets;
	2. Increased transport costs;
	3. Insecurity;
	4. Idleness, immorality;
<b>F. Road Construction and Workforce</b>	
Ways in which the local community can be involved in road construction	1. Involve the locals in unskilled labor with a priority on skilled locals;
	2. Recruitment should be done in liaison with provincial administration;
	3. Use locally available raw materials supplied by locals.
	4. Involve the locals in road maintenance.

Issues	Comments
Locations recommended for road workforce	1. Kelipo Kanweaken
	2. Karweaken
	3. Fish Town
Services to be provided by the local community during construction	1. Guards including security;
	2. Catering services;
	3. Skilled and unskilled labor;
	4. Accommodation;
	5. Guides
	6. Drivers, mechanics;
	7. Clearing of road; and
	8. Culvert construction.
<b>G. Development within the Road servitude</b>	
Do you know the road right-of-way is not private land for development	All of them said yes
Interventions that the government should take to deal with encroachment on road servitude/ right-of-way	1. Through public centers and local administration;
	2. Legal means and enforce the law;
	3. Road servitude sensitization;
	4. Encroachers to be prosecuted;
	5. Provide survey maps of road servitude;
	6. Educating the local communities;
	7. Marking of road reserves.
If the new road has new alignments, would you expect compensation or relocation	All preferred compensation to relocate.
<b>H. Participation in Road Maintenance</b>	
Willingness of locals to carry out road maintenance	1. Some said that they were personally willing to, while others said that they were old but would rather opportunities be available for persons in their communities.
<b>I. Social Impacts</b>	
Impacts that the non-local workers will have on the locals	1. Increased income
	2. Disharmony with the local communities
	3. Prostitution;
	4. Pressure on local resources;
	5. Insecurity;
	6. Change of socio-cultural set up;
	7. Integration, peace building and friendship;
	8. Education/exchange of knowledge/ideas;



Issues	Comments
	9. Disease outbreak.
Suggestions to reduce the resultant negative impacts	1. Give the locals jobs;
	2. Involve local leaders in integrating local and non-local workers;
	3. Community policing;
	4. HIV/AIDS awareness;
	5. Sensitization and mobilization of the community;
	6. Increase security patrols;
	7. No grazing along the road to avert accidents; and,
	8. Advertise recruitment to the local community.

Source: Stanley Consultants, 2013



### 6.2.1 Public Meetings

Formal public meetings were conducted in Kanweaken, River Gee County. The meetings were held between June 30 and July 5, 2013 and were meant to introduce the project to the communities and get better understanding of social and community structures. The venue of the meeting is presented in Table 6-3. The list of attendants and minutes of meeting are appended in Appendix 1.

*Table 6-3: Comments from the key stakeholders*

No.	Location	Venue
3	Kanweaken	Administrative Building

Source: Stanley Consultants, 2013

An estimated 59 members of public attended the meeting. However; the meeting had low female turnout (29 women) and it is assumed that because the communities are patriarchal in their social setup and males take the lead in all major decisions and communal development matters. However, with the gender sensitization and women involvement in political and social matters, we anticipate more females and gender balance in future consultations.

### 6.2.2 Benefits of the Proposed Upgrading of the Road to Asphalt Standards

Generally, the local communities consulted were positive about the proposed project as they anticipate numerous benefits upon its implementation. Below are several highlighted benefits of the proposed road project:

#### 6.2.2.1 Improved Road Surface

With improved road surface, there will be increased comfort in travelling and better and reliable means of transport, unlike the current use of motor cycles, trucks and trekking.

#### 6.2.2.2 Access to Essential Services

Many people will be able to access essential medical facilities in Grand Gedeh and Tapitta Hospital in Nimba County. Supplies of farm inputs and other produce from the area will also be delivered with minimal delays and losses.

There are several government agencies, NGOs and Community Based Organizations (CBOs) who are involved in provision of medical services and development activities in the project area and use the project road to facilitate communication. This road provides an essential link for delivery of agricultural inputs and produce, in this high potential area.

#### 6.2.2.3 Improvement of Local Socio-Economy

The local community consulted mentioned that they would like to see improvement of the road, as it would increase business and boost the economy of the region. The road also provides a regional link between Southeastern Liberia and the rest of the other parts of the country.

The local communities anticipated that the local markets and trading centers would expand, attracting investors and businessmen. They anticipated that their incomes would improve with improvement in the transportation of their goods, since commodities will be transported everyday along the road as market days are allocated to each of the main trading centers during the week.

#### 6.2.2.4 Agricultural Development

Agricultural production is the main economic activity in the project area. The local communities anticipate that the upgrading of the road to asphalt standards will lead to the following agricultural development:

- Increased marketing of agricultural produces from the markets;
- Reduced wastage of agricultural produce due to spoilage due to lack of access to markets;
- Access to value chain centers, reducing transport/marketing cost;
- Easy access by the agricultural extension officers to educate farmers on good production practices;
- Easy delivery of produce to other local markets and even international markets.

#### 6.2.2.5 Increased Employment Opportunities

- Many people stated that they anticipate a creation of job opportunities during the construction of the road;
- More market and trading centers will open and existing ones will expand when the road is upgraded and business will flourish; thus creating more indirect employment.

#### 6.2.2.6 Reduced Transport Costs and Travel Time

- The businesses in the area were particularly keen on improvement of the road as it will attract more public passenger vehicles and with competition, it is hoped that the fares would decrease;
- It is anticipated that with an improved road, travel time will be reduced and women will be able to travel to the markets to sell their produce as opposed to using middlemen.

#### 6.2.2.7 Improved Security

Upgrading of the road project could ease the security patrols hence lowering the crime rates in the area and neighboring counties affected by cases of petty crimes and unlawful organizations.

#### 6.2.2.8 Reduced Vehicle Breakdown

With the construction of the proposed road, the communities believe it will reduce vehicle breakdown; thus saving on cost of vehicle maintenance.

### 6.2.4 Problems and Concerns cited on the Proposed Upgrading of the Road

The local communities consulted cited many problems they anticipate with the proposed road:

#### 6.2.4.1 Employment Discrimination

The communities expressed concern on employment; they wanted unskilled workers to be recruited from the local area and local leaders to be consulted as part of the recruitment to reduce the disputes or conflicts that could emerge between the Contractor and the local population during the construction period. This was stressed in all the local meetings. Unnecessary tension could potentially arise if the locals are not considered for employment.

#### 6.2.4.2 Encroachment onto the Road Reserve and Demolitions

Encroachment in the road reserve includes crop cover, buildings and temporary structures in several places along the project are within the road servitude or right-of-way. Some parts of the road will be realigned, leading to relocation of some community members. The community recommends they get fairly compensated and there be compensation and consideration of squatters' rights.

#### 6.2.4.3 Accidents

The communities expressed concern on the possible increase of accidents on the road due to:

- Over-speeding of vehicles;
- Lack of road safety signs;
- Lack of speed breakers;
- Livestock and children crossings.

#### 6.2.4.4 Breakdown of Social Values

The road traverses an area mainly dominated by locals with traditional practices and cultural norms, which they follow. Most community members expressed concern that with the influx of non-indigenous workers and petty traders during construction would be a probable breakdown of social values, which could result in unwanted pregnancies, social problems and spread of diseases.

#### 6.2.4.5 Transport Costs and Travel Time

People interviewed during public consultations were concerned about:

- Delays in transportation of goods and services during the construction of the road;
- The high public vehicle fares and length of time it takes to travel between towns;
- Poor road conditions which make it difficult to transport food stuff from neighboring towns; and
- Inaccessibility of some market centers during the rainy seasons.

The mitigation measures for the above concerns have been discussed in Section 7: POTENTIAL IMPACTS AND MITIGATION MEASURES. To avoid the disputes or conflicts that could emerge between the local administration and the population at the time of the construction of this road, there is need to consider the following recommendations:

- To sensitize the communities living along the project road about the importance of this road. This method of communication aims to avoid social tensions with the inhabitants.
- This campaign of information should be run by the local administration or organizations in order to prepare the population for eventual compensation;
- The affected communities or persons should participate in the inventory of the rural structures (crops and houses) that will be affected by the proposed works;
- Once the inventory of the rural structures is complete, the Ministry of Public Works should conduct their expert valuation; and
- Before the actual relocation, the Government should compensate the project-affected persons.

#### 6.2.4.7 Dust and Noise

The communities expressed fears of possible increase in dust and noise especially during the construction phase.

#### 6.2.4.8 Changes in Physical Features

Due to felling of trees within the proposed way leave, the community felt that this will negatively affect the physical appearance of the area.

#### 6.2.4.9 Degradation of Water Courses

The communities believed the value of the wetlands and water courses will be degraded.

### 6.3 PUBLIC DISCLOSURE

Once the final ESIA report is ready, it will be submitted to MPW for approval and disclosure. MPW and the EPA of Liberia are required to disseminate the ESIA report to lead agencies, including local authorities in the affected areas. The public will be notified and asked to respond within a specified time frame. If need be, MPW and the EPA will organize public hearing(s). Following the approval of the ESIA report, MPW will post the full ESIA report.

### 6.4 FUTURE CONSULTATIONS

The initial consultations during the design phase and ESIA study should be followed by more consultations during the construction and operation phases.

## 7 POTENTIAL IMPACTS AND MITIGATION MEASURES

### 7.1 INTRODUCTION

The purpose of the environmental and social impact assessment (ESIA) of the road project is to improve decision making and to ensure that the project progresses in a sustainable approach. The ESIA identifies ways of improving the project environmentally and socially by preventing, minimizing, mitigating, or compensating for adverse impacts. These measures will help to avoid potentially costly remedial measures.

The environmental impacts caused due to the development of the project road can be categorized as primary (direct) and secondary (indirect) impacts. Primary impacts are those which are induced directly by the project, whereas the secondary impacts are those which are indirectly induced and typically include the associated investment and changing patterns of social and economic activities due to the proposed action. Interaction of the project activities with environmental attributes is presented as Activity-Impact matrix in Table 7-1.

Potential direct and indirect impacts of the project during construction phase will be:

- Filling in low-lying areas for embankments of the road;
- Loss of vegetation due to the cutting of trees;
- Loss of topsoil due to clearing & grubbing of new alignment, borrow area and quarry operation, construction of camp, material stacking yard;
- Temporary impacts in terms of polluted environment on flora and fauna due to the construction activities;
- Impact on the drainage pattern due to raised embankment, introduction of new culverts and bridge constructions;
- Impact on Traffic Management System;
- Increased air pollution (including dust) during project road construction;
- Increased noise level due to the movement of vehicles and construction activities;
- Increased soil erosion;
- Spillage of oils and other hazardous materials;
- Pollution of surface and sub-surface water sources;
- Pollution due to generation of spoils and solid waste; and
- Loss of trees and construction activities and impacts on tranquility of material sites and quarries.

Potential direct and indirect impacts of the project during operation phase are:

- Increased noise pollution due to the vehicular movement;
- Impact on natural drainage pattern of the project area; and
- Pollution of water bodies and impacts on its ecosystem due to hazardous chemical or oil spillage into streams and wetlands.

The positive impacts of the project will be:

- Reduced air pollution due to better service levels of the road;
- Improved safe and efficient connectivity in the project area;
- Generation of local employment during road construction; and
- Improvement of local economy and industry due to better infrastructure facilities.

## 7.2 SUMMARY OF POTENTIAL IMPACTS

The potential impacts of the proposed project have been listed in Table 7-1 below and analyzed into different categories based on the stakeholders' views, perceptions and the Consultant's previous experience in undertaking road project ESIA's and experiences gained from other road construction projects.

Table 7-1: Impact identification matrix

No	Activities	Impact on							
		Physical Environment			Biological Environment		Geology		Topography
		Air	Water	Noise	Flora	Fauna	Drainage	Soil	
Construction Phase									
1	Labor Camp Activities	-	-ve/t	-	-	-	-	-	-
2	Quarrying	-ve/t	-	-ve/t	-ve/t	-	-ve	-	-ve/p
3	Material Transport & Storage	-ve/t	-	-ve/t	-	-	-	-	-
4	Drilling & Blasting	-ve/t	-	-ve/t	-ve/t	-ve/t	-	-	-
5	Earthwork	-	-	-	-	-	-ve/t	-ve/t	-ve/t
6	Pavement Works	-ve/t	-ve/t	-ve/t	-ve/t	-	-	-ve/t	-ve/t
7	Use of Construction	-ve/t	-ve/t	-ve/t	-	-ve/t	-	-	-
8	Plantation and Farms	+ve/p	-	+ve/p	+ve/p	+ve/p	-	-	-
9	Drainage Works	-	-	-	-	-	+ve/p	-	-
10	Culvert and Bridge	-	-ve/t	-ve/t	-	-	+ve/p	-	-
11	Stripping of Topsoil	-	-	-	-	-	-	-ve/t	-
12	Debris Generation	-	-	-	-	-	-ve/t	-ve/t	-
13	Oil & Grease	-	-	-	-	-	-	-ve/t	-
Operational Phase									
	Vehicular Movement	-ve/p	-	-ve/p	-ve/p	-ve/p			-
	Improved Road Surface	+ve/p	+ve/p	+ve/p	+ve/p	+ve/p	+ve/p	+ve/p	+ve/p
	Access to Service	-	-	-	-	-	-	-	-
	Agricultural	+ve/p	+ve/p	-	+ve/p	+ve/p	+ve/p	+ve/p	-
	Employment	-	-	-	-	-	-	-	-
	Improved	+ve/p	+ve/p	-ve/p	-	-	+ve/p	-	-
	Improved Security	-	-	-	-	-	-	-	-
	Reduced Vehicle	-	-	-	-	-	-	-	-
Note:	“-” = No impact; “	“-ve” = Negative impact; “				“+ve” ” = Positive impact			
		“t” = Temporary impact;				“p” = Permanent impact			

Source: Stanley Consultants, 2013

The impacts of the project will be both positive and negative. They have been presented as per the various phases of project cycle which includes construction, operation and decommissioning phases.

## 7.3 POSITIVE IMPACTS

### 7.3.1 Employment Opportunities

The construction of the 50-km Fish Town Kelipo Kanweaken road will create employment opportunities both directly or indirectly during construction and operational phases. Socio-economic study infers there are a lot of local human resources. Therefore, most people will be employed as semi-skilled and casual workers. Few



skilled workers will be available. It is anticipated that a lot of people will be employed directly and indirectly during the implementation period.

During the construction phase, the proposed project, upon implementation will directly employ as a minimum the following groups:

- Supervising engineering team;
- Contractor's staff (managerial, skilled and unskilled labor force);
- Suppliers of plant, machinery, materials and essential services;
- Construction monitoring personnel from the various Government agencies; and
- Skilled, semi-skilled and unskilled labor force.

### 7.3.2 Improved Local Socio-economy

The communities acknowledged that the project road will contribute to the growth and development of the local economy. The following are some ways they could benefit:

- Increased business opportunities at the market centers due to the presence of the project workforce during construction;
- Employment of locals during the construction phase of the project;
- Strengthening of local economy through the establishment of micro-enterprises such as bulking points, catering services etc.

### 7.3.3 Ease of Road Transport in the Project Area

Construction of the proposed road will improve transport and communication in River Gee because of improved road surface. After construction, the road will improve transportation of goods, commodities and services to and from the project area. This is a large positive impact.

### 7.3.4 Improved Living Standards

The implementation of the project will result in the improvement of the living conditions of population; thus contributing to poverty reduction.

The communities acknowledged the reduction in travel time and improved access to markets to sell their produce. Both gender also acknowledged the upgrading of the road will result in efficient traffic flow.

### 7.3.5 Increased Security

The project area is relatively peaceful and a safe place to live. However, incidents of theft do occur along the way due to the scarce road users at present. Better road usage with frequent users would result in an improved security. The upgraded road will also increase easier movement by security personnel. Any improvement in security from the current levels would be a major benefit to the communities.

### 7.3.6 Education

Improved road conditions would lead to the improvement and construction and of more schools, other advance institutions of learning and increase attendance of girls. Any improvement in educational attainment from the current levels would be a major benefit to the communities.

### 7.3.7 Improved National Transport

The main mode of transportation in the area is road transport, which is used for transportation of passengers and goods to the various town centers along the project area. There are no other affordable options for transport in the project area.

With improved road conditions, it is expected that there will be improved transport within the region. This is likely to benefit the local and regional economy in the short term and the national economy in the long term. There will also be easier access to the essential services offered in the neighboring towns and cities.

### 7.3.8 Road Safety

Road projects can lead to reduction in accidents when they involve significant improvements in vertical and horizontal alignments, improved carriageway width, junction layout or greater separation of pedestrians, non-motorized traffic and motor vehicles.

The proposed project design will contribute to improving road safety and the comfort of road users in several ways:

- Sight distance and visibility especially at approaches to bridges will be improved;
- Road signs (both warning and directional) and road markings have been included in the design; and
- Adequate shoulders have been designed throughout its length.

### 7.3.9 Empowerment of Women

Women play an important role in agriculture and general economy of the project area. However, the existing road makes it hard for women to access markets for their products due to the high transport costs as public transport operators are few and thus the fares are high. The poor state of the road leads to use of old motor cycles, converted cars, buses and trucks. These vehicles are very uncomfortable, gender insensitive and often overloaded as there is no space for comfort. It is even worse for women who are pregnant. Due to poor state of the road, it takes very long for women to reach trading centers and hospitals. This will however change with the construction of the proposed road, thus empowering women in the project area.

### 7.3.10 Improved Drainage

The proposed road is expected to improve drainage infrastructure and general discharge of storm water from the road/carriageway which will reduce soil erosion in the project area. This will be a major gain to the present road condition is largely affected by runoffs and limited or inadequate storm water discharge systems.

### 7.3.11 Improved Access to Social Services

Majority of the inhabitants of the project area have difficulty in accessing markets, schools, hospitals, government offices and other amenities. This is due to high transport costs, longer travel time, low economic growth and poor/lack of services due to the poor road network in the area. These challenges will be eliminated or mitigated with the construction of the road.

### 7.3.12 Reversal of Rural Urban Migration

Most of the people in the project area have shunned investing in the area and mass exit of human resources, especially the youth, in search of opportunities and services in urban areas. The road will enhance access to services, markets and stimulate economic activities, reducing and reversing rural urban out-migration which has become a major planning concern of the country.

## 7.4 NEGATIVE IMPACTS

### 7.4.1 Impact on Topography

The section of road between Fish Town and Kelipo Kanweaken passes through a few hilly areas. During realignment of some parts of the existing 50-km corridor, there would be cutting of slopes and filling which would change topography at some parts of these sections of the road. Earthwork for this would alter the existing topography, although the impact would be negligible.

In addition, the geological nature of the terrain is prone to earth flows/mass movement erosion and landslides. Protection measures need to and will be taken through construction, which might alter the topography at a localized level.

### 7.4.2 Impacts on Surface Water Drainage

Several streams cross the project road. Apart from these, there are various small drains, and water pans draining the area. In the hilly section, there are various valley drainage lines, which cross the project road and minor impacts are anticipated on the surface water drainage in the area during the construction phase due to the diversion of waterway. Precautions must to be taken during the construction works of culverts and bridges across these streams, such that the flow of these water bodies is not obstructed; thus affecting the cross drainage. In addition, any embankment work in low lying areas shall have provisions for cross drainage for natural drains to ensure that flow is not affected during the construction phase.

### 7.4.3 Impact on Climate

The proposed project is likely to improve the existing road and no changes in climatic conditions are anticipated. Moreover, landscaping is envisaged in the area along the entire length of the road, which will help in improving the overall microclimate of the area. The improvement works envisaged in the existing road does not have any significant microclimatic impacts.

### 7.4.4 Impacts on Soil Environment

#### 7.4.4.1 Mass Movement - Erosion

It was observed along the existing road that mass movement erosion is a common phenomenon. Most of these soil movements are small, but the areas affected by mass movements are usually destroyed and rendered non-productive for further agricultural use. Such areas need considerable efforts and investments for reclamation. The loss of fertile land, even if the area is very small fertile, is always a serious drawback for farmers.

Among other land use causes, surface runoff entering cracks could then cause rapid over-saturation of the surface layers leading to wet earth flow and subsequent slumping of the up-slope part of the crack, thus forming an initial erosion scar.

Because of the evenly distributed rainfall, the soil remains saturated over long periods. Less permeable under layers restrain deep percolation, encouraging lateral water movement and lead to temporary waterlogged conditions. These will cause plastic or even liquid-state conditions encouraging wet earth flow. This tendency will be greatest on steep slopes and may explain why all erosion scars observed in the area are located on convex slope sections.

#### 7.4.4.2 Impact on Top Soil

The impact on soil due to the project will be in terms of topsoil erosion. Strengthening and widening of the existing road will not cause significant soil erosion. Soil pollution would take place to a negligible extent due to spillage of construction material, oil, fuel, grease and asphalt around the construction yards. Care will be taken to minimize spillages of construction materials.

Loss of productive soil, during the construction stage, is envisaged at locations of workers' camps, stockyards, storage, etc. if these are located on fertile areas. The contractor should ensure that no productive areas are used for these purposes and avoid adverse impact. In any case, though it would be a direct impact, it would be reversible and insignificant in nature. The soils in the road alignment are of loam to clay loam soils, capable of producing high yields. Soils both within and outside the road corridors may be negatively impacted due to the proposed nature of project.

The loss of productive topsoil due to road construction is a direct adverse long-term impact. Since a major portion of the proposed road is on the existing alignment and do not utilize agriculture land, there will be minimum permanent loss of agriculture soil and land due to the road construction. In addition to this, there will be temporary impact on productive soil at diversions, and labor camp due to leasing of land for construction period. Hence, the impact on soil during construction phase must be controlled by strictly implementing the ESMP suggested for the project. During the operation phase of the proposed road project, no impact on the productive top soil is envisaged.

#### 7.4.4.3 Soil Erosion

The soil in the study area varies from loam to clay loam soils. Therefore, the potential for erosion varies along the alignments. Soil erosion will be aggravated if the vegetation is removed from the sides, for the roots are known to hold soil together. This will however be temporary until the compensatory afforestation and roadside turfing have matured. It will not be possible to widen the existing road without removing small trees and therefore temporary erosion will be unavoidable. Mitigation measures such as turfing of road embankment slopes with shrubs and grasses will mitigate soil erosion to a considerable extent. In borrow pits, the depth of the pits should be regulated so that the sides of the excavation will have a slope not steeper than 1 vertical to 4 horizontal from the edge of the final section of bank. The device for checking soil erosion includes the formulation of sediment basins, slope drains etc. Cutting of trees in phases will minimize the impact.

No soil erosion is envisaged when the road is in operation, as all the slopes and embankments of the project road shall be stabilized through turfing and pitching.

#### 7.4.4.4 Contamination of Soil

Contamination of soil during construction stage is primarily due to construction and allied activities. The sites where construction vehicles are parked and serviced are likely to be contaminated because of leakage or spillage of fuel and lubricants. Pollution of soil can also occur in hot-mix plants from leakage or spillage of asphalt or bitumen. Refuse and solid waste from labor camps can also contaminate the soil. Contamination of soil during construction might be a major long-term residual negative impact. Unwarranted disposal of construction spoil and debris will add to soil contamination. This contamination is likely to be carried over to water bodies in case of dumping being done near water body locations.

However, by following mitigative measures such as maintenance of vehicles, machines and fuel refilling in a confined area, contamination of soil can be avoided. The provision for oil interception chamber is suggested in the ESMP for treating the waste water generated from vehicle washing, refilling and maintenance areas. Fuel storage and refilling sites should be kept away from cross drainage structures and important water

bodies. All spoils shall be disposed of as desired and the site shall be fully cleaned before handing over. These measures are expected to minimize the impact on soil contamination.

During the operation stage, soil pollution due to accidental vehicle spills or leaks is a low probability but potentially disastrous to the receiving environment, if they occur. These impacts can be long term and irreversible depending on the extent of spill. The nearest cities should have fire fight facilities to meet the risks during the operation phase of the highways.

#### 7.4.5 Impacts on Water Resources Environment

##### 7.4.5.1 Impact on Surface Water Quality

The proposed road corridors are not expected to alter the existing water quality on a permanent basis. There are various water bodies, along the corridors including rivers, backwaters, and streams. Some impacts are anticipated on the water quality of these water bodies during the construction phase. Silt load in the streams at the culvert and bridge locations may increase during construction and the spillage of hazardous chemicals during accidents and may pollute the waters; thereby, affecting the ecosystem. The issue of blocking of cross drainage should be taken care throughout the project life. Care needs to be taken during the construction of culverts and bridges. In case of any water supply system at the downstream of the bridge location, prior information should be made to the concerned towns and villages and the construction activities should avoid discharge of any hazardous chemicals in to water system.

Degradation of water quality is also possible due to accidental discharges into watercourses from drainage of workers' camps and from spillage in vehicle parking and/or fuel and lubricant storage areas. However, mitigation measures such as construction works close to the streams and other water bodies shall be avoided, especially during wet seasons.

Disposal of waste arising from the project activities should be done by approved waste disposal agents and collecting and storing of bituminous wastes and taking it to approved disposal sites will minimize the impact.

During the operation phase, the possibility of degradation of water quality is very remote. The impact on the surface water quality during operation can be expected due to accidental spillage. However, the probability of such accidents is minimal since enhancement of road safety measures such as improvement of curves and widening of the roads and other pedestrian facilities are taken care of in the design stage.

##### 7.4.5.2 Impact on Ground Water Quality

No activities of the project construction or operation are expected to have any impact on the ground water quality of the region and hence the impacts on the ground water quality are not anticipated.

#### 7.4.6 Impacts on Air Environment

Vehicular emissions are one of the major sources of air quality impacts of highway projects. As the project envisages improvement of road conditions for smooth traffic flow, the project will have beneficial impact on air quality of the region during its operation. However, when viewed with respect to the existing ambient air quality or with respect to compliance of ambient air quality standards during the post upgrading phase of the life of the road, due to the increase in the traffic volume, the impact on air quality along the project roads is likely to be minor.

Impacts on air quality during the construction phase of the project will be considerable as the amount of work involved in the improvement of the road is significant, but any possible impacts will be temporary. However, provision of adequate air pollution control equipment, like dust filters and measures like dust



suppression by water sprinkling and planting of green belt may further help to significantly reduce the impact.

Emission of CO<sub>2</sub> and NO<sub>x</sub> due to the combustion of diesel will be a principal cause of air pollution during the construction phase.

After improvement of the existing road, the traffic is expected to move smoothly at higher designed speeds, which will assure lower emissions of gaseous pollutants, further improving air quality in the region and hence not expected to affect the air quality adversely. However, the extent of these impacts, at any given time will depend upon the rate of vehicular emission within a given stretch of the road and the prevailing weather conditions. The impacts will have strong temporal dependence as both factors vary with time. The temporal dependence would have climatic, seasonal, as well as long-term components.

#### 7.4.7 Impacts on Ambient Noise Level

During the construction phase of the road, the major sources of noise pollution are vehicles transporting the construction material to the construction yard and the noise generating activities at the yard itself. Mixing, casting and material movement are primary noise generating activities in the yard and will be uniformly distributed over the entire construction period. Construction activities are anticipated to produce noise levels in the range of 80 - 95 dB (A). The construction equipment will have high noise levels, which can affect the personnel operating the machines.

Use of proper Personal Protective Equipment (PPE) such as earmuffs will mitigate any adverse impact of the noise generated by such equipment.

The noise likely to be generated during excavation, loading and transportation of material will be in the range of 90 to 105 dB (A) and this will occur only when all the equipment operates simultaneously. This however is unlikely to occur. The workers in general are likely to be exposed to an equivalent noise level of 80 to 90 dB (A) in an 8-hour shift, for which all statutory precautions should be taken into consideration. Careful planning of machinery selection, operations and scheduling of operations can reduce these levels.

As the project road passes through populated areas at cities, towns and villages centers, people in these places will be exposed to the high noise levels. To avoid significant impacts on human health, it is recommended to avoid construction work at these sections during night times and ensure that only minimum required machinery is deployed on the site. Uninterrupted movement of heavy and light vehicles at high speeds may cause increase in ambient noise levels on the project road. It may have negative environmental impacts on the sensitive receptors close to the project road.

#### 7.4.8 Impacts on Fauna, Flora and Ecological Environment

##### 7.4.8.1 Impacts on Fauna

The increased activities of vehicle movement disturb the sensitive movements of fauna. The impacts are expected to be more severe during the times of accidents of vehicles carrying hazardous chemicals. In the absence of proper accident management mechanisms, such accidents will be very hazardous to flora and fauna of the region. Some sections of the proposed upgrading of the road to asphalt standard are near forest areas. From the site visits and discussion with officials, it is inferred that there are no noticeable habitats or wild or endangered animal habitats along close vicinity of the project road. This can be inferred due to the presence of farmlands and human settlements along existing roads. But upgrading of the road will result in increased human activities along the project area. Further, noise due to construction machineries and increased vehicular movement for raw material transportation for road construction will disturb the fauna along the area during construction phase. Due care should be taken in the construction stage that human

activities should be completely restricted to the proposed road corridors such that there should not be any human ingress in to forest areas for poaching of animals / any other natural features.

#### 7.4.8.2 Impact on Ecological Resources

The road traverses secondary forest terrains rich in bio-diversity as presented in base line environmental profile of the project road. The envisaged borrow pits and land acquisition in the project road will bring about hill cutting and tree cutting. This would have substantial irreversible and long-term impact on the flora and fauna of the project area.

Based on the reconnaissance by the Consultant, it was observed that that there is no endangered flora / fauna in the project area of influence and hence the impact of the loss of vegetation will not be very severe. Cutting of few large trees is envisaged along both sides of the project road. Trees will be cut down along the proposed road corridors. After completion of the project, the trees will be replanted along the road corridors with consideration on:

- Minimizing the impacts of loss of vegetation by limiting the number of trees to be felled where possible.
- Adequate care of the compensatory plantation should be taken up to achieve over 90% survival rate.
- Landscaping should be done with a lag of 3 to 4 months from the start of the work on any section. The section should be deemed to be complete when the landscaping is over.
- Survival rate of plants must be included in the contract specifications to ensure that the compensatory plantation achieves the objective of replacing cut trees.
- Indigenous and endemic tree species suitable for the area should be planted at the onset of the wet season. The plants should be provided with adequate protection from animals and proper monitoring should be carried out to ensure their growth.

#### 7.4.9 Impacts on Human Use Values

##### 7.4.9.1 Land Acquisition

The proposed upgrading of the project road will involve land acquisition and demolition of road side structures. A detailed analysis of the impacts of land acquisition and structures in the project area are part of a RAP already undertaken. The project area runs through peri-urban areas and hence the impact of land acquisition is expected to have significant effect on livelihood and economic activities of the project area.

The client should therefore ensure that the Resettlement Action Plan prepared for the project area is implemented to mitigate / minimize this impact.

##### 7.4.9.2 Construction of Site / Camp Buildings

This activity will involve construction of buildings for office, construction camps and habitation during the construction phase. This may result in clearing of vegetation and pose sanitary & health problems in the construction camps. Due care should be taken to maintain hygienic conditions at site by providing proper drinking water and sanitation facilities. However, the impact due to such activities is reversible and short term.

##### 7.4.9.3 Impact on Land Use

The land use along the project road is expected to experience a change due to increased economic activities after project completion. Characteristics of areas of major concern for impact mitigation along the project road include the following:



**Settlements** – As described earlier, there are various settlements and few peri-urban areas along the project road. After the proposed upgrading, some of the structures will be very close to the road thereby creating safety concerns for the people. Similarly, several schools and churches are located along the section of the road, which would get affected due to increased vehicular movement and speed. Also, ribbon development might take place along the project road due to the ease in traffic movement.

**Rivers / Streams** – There are several small rivers/streams along the project road, which might get contaminated owing to the project activities both during and after construction. Field investigations showed that any activity that obstructs the natural flow of the streams could lead to flooding problems.

**Forest Zone**–As described earlier, the project road passes through forested areas, which are considered sensitive. Incidents of animals crossing the project road are few but the increased vehicular movement and the increased noise and air pollution would impact the existing fauna, which needs to be controlled with adequate speed and vehicle movement restrictions.

**Sensitive Receptors** – The project road runs close to schools, religious places, various, residential settlements and commercial areas. However, most of the impacts predicted above are not totally new to the project area since the project road already exists and the proposal is only to upgrade it to provide better service level. Hence, the impacts are anticipated to be minimal. However, it is recommended that all the mitigative measures should be implemented as recommended in the ESMP of the report.

#### 7.4.10 Cultural Changes

The road traverses land inhabited dominantly by indigenous communities. Some of the people are Christians, while others are traditionalists and they have established social systems.

The upgrading of the road is likely to increase the attractiveness of the area, which may result in:

- Degradation of the cultural values and norms in the area;
- Increase in the levels of crime of the area;
- Increased desirable and undesirable social interaction in the area.

To mitigate this, the client should strengthen the cultural organizations ensure that the project contributes to the creation of an atmosphere that is conducive to the functioning of all social and religious centers which are in the project zone of influence.

#### 7.4.11 Impacts on Cultural and Historical Resources

During the road design and asset inventory of the project area, several graves were identified. No other significant cultural or historical resources were encountered. A Resettlement Action Plan was prepared for the project.

It is expected that the graves will be relocated, as provided for in the Resettlement Action Plan. Hence; there will be no further impact to cultural or historical resources.

#### 7.4.12 HIV/AIDS

Nowhere is impact prevention more important than road safety and human health. The road project may have serious negative consequences for the health of local populations.

Throughout the world, the spread of AIDS and other sexually transmitted diseases (STDs) can be linked to the construction of roads and the resultant opening-up of new regions. Although there are no empirical data to support this theory as far as Liberia is concerned, it is believed that migrant populations, particularly truck

drivers and construction workers whose mobility is enhanced by new road project are the most likely vectors for these diseases.

Sensitization and awareness campaigns should be the responsibility of the National Aids Control Programs together with local and international partners' organizations. The contractor and proponent have the responsibility to sensitize communities and staff on HIV/Aids related issues. The contractor has a social responsibility to run awareness campaigns throughout the project period while the proponent will carry out sensitization campaigns throughout project life.

#### 7.4.13 Impact on Public Health

Dust borne communicable diseases, respiratory infections and minor throat and eye irritations are expected, especially during the dry season because of the emission of vehicular pollutants and dust (carbon monoxide and particulates). The presence of construction workers and related increase in disposable cash makes the transmission of STDs a possibility. Inadequate management of construction waste and domestic waste generated at the work sites and sewage from the construction camp(s) would create conditions for the growth of vectors of diseases such as cholera and dysentery. The outbreak of these diseases would have far-reaching negative implications for the health of residents. The increase in health cases could bring pressure to bear on personnel and resources at the limited health posts in the county.

An awareness and sensitization campaign by the contractor and MPW through other government agencies should ensure that the people in the project area are made aware of the issues. A complimentary initiative has been budget for in the program costs to mitigate these issues.

#### 7.4.14 Occupational Health and Safety

Injuries resulting from falling from heights and falling objects, as well as from the misuse of equipment and tools, cuts from stepping on sharp objects such as nails and other metal off-cuts and injuries resulting from clashes between vehicles and the workers as they both operate within the same space are likely to occur during the implementation of the project.

This impact is considered significant since it affects human lives and would therefore require adequate mitigation measures.

The contractor should prepare a Health, Occupation and Safety plan and ensure that is compliant with the safety aspects.

#### 7.4.15 Impacts During Decommissioning Phase

The project is expected to be in operation for more than 20 years after construction and therefore decommissioning is in the distant future. However; should this happen, all the positive impacts mentioned in this report would be reversed to be negative. Other negative impacts during decommissioning may include:

- Solid waste generation;
- Noise pollution;
- Dust and exhaust emissions; and
- Occupational hazards.

Positive impacts may be realized during decommissioning phase. They may include:

- Rehabilitation of the whole area
- Employment opportunities

The potential project impacts and mitigation measures can be summarized in Table 7-2.

Table 7-2: Potential Project Impacts and Mitigation

Environmental Issue	Potential Impact	Mitigation Measure
<b>Soil Erosion and Silting</b>	Site preparation and clearing; Removal of vegetation, soil disturbance and poor drainage	<ul style="list-style-type: none"> <li>• Clearing of the site would be staggered so that areas will be cleared only when construction is about to commence there. Besides maintaining some vegetation on the site, the staggered clearing will limit the area exposed to help prevent massive sheet erosion;</li> </ul>
		<ul style="list-style-type: none"> <li>• Large surface area of credible earth material would not be exposed at one time.</li> </ul>
<b>Air quality/Noise/Vibrations</b>	Construction –Earthworks, material transport, quarry blasting, etc.	<ul style="list-style-type: none"> <li>• Construction materials would be covered by tarpaulins when being transported by truck;</li> </ul>
		<ul style="list-style-type: none"> <li>• Regular watering and limiting the speed of vehicles travelling through the settlements will reduce air quality impacts;</li> </ul>
		<ul style="list-style-type: none"> <li>• Borrow pits, quarry concrete plants and asphalt mixing plants will be located more than 500m from any community to reduce noise impacts;</li> </ul>
		<ul style="list-style-type: none"> <li>• Regulate blasting activities near settlements to specific time frames;</li> </ul>
		<ul style="list-style-type: none"> <li>• Ultimately however, the road reconstruction will result in the total elimination of that dust from the road under the present baseline condition of the road.</li> </ul>
<b>Water ways/Drainage Sites</b>	Site preparation & clearing activities; Bridge and culvert construction; heaping of materials; chemical spillage	<ul style="list-style-type: none"> <li>• Work on water courses would be commenced in the dry season when the water flow gets very low;</li> </ul>
		<ul style="list-style-type: none"> <li>• Clean fill materials will use (e.g. quarried rocks containing no fine soil) around water courses;</li> </ul>
		<ul style="list-style-type: none"> <li>• Buffer zones of undisturbed vegetation will be provided between road sites and water bodies;</li> </ul>
		<ul style="list-style-type: none"> <li>• Settling basins will be provide to remove silts, pollutants and debris from road run-offs before discharge to adjoining stream.</li> </ul>
<b>Water Resources: - Water Quality/ Modification of</b>	Water abstraction, Bridge and culvert construction; Site	<ul style="list-style-type: none"> <li>• Contractor will provide alternative source of water e.g. borehole for both life camps and for construction works, including supplies for dust suppression in consultation with MLME;</li> </ul>
		<ul style="list-style-type: none"> <li>• Fueling areas would be designate away from streams and wetlands;</li> </ul>

Environmental Issue	Potential Impact	Mitigation Measure
<b>water flow, Diversion of water course</b>	preparation & clearing activities; chemical spillage	<ul style="list-style-type: none"> <li>• Handling of hazardous materials will be confined to construction sites.</li> </ul>
<b>Biodiversity – flora/fauna</b>	Quarry Extraction; land take for ROW	<ul style="list-style-type: none"> <li>• The Consulting Team have consulted the Forestry Development Agency and they will be available to give advice on measures to alleviate the adverse impacts especially on wildlife;</li> </ul>
		<ul style="list-style-type: none"> <li>• Culverts will be designed with the needs of migratory aquatic species in mind. Down-stream siltation will be avoided so as not to ruin possible spawning beds for fish;</li> </ul>
		<ul style="list-style-type: none"> <li>• Schedule for construction would be adhered to as not to frighten wildlife away because of prolonged construction.</li> </ul>
<b>Ecological Sensitive Sites</b>	Materials Haulage, land take	<ul style="list-style-type: none"> <li>• Land take for ROW will not affect any of the ecological sensitive sites along the route. Sapo National Forest and Grebo National Forest are located more than 50 km away from the road corridor respectively.</li> </ul>
<b>Cultural/historical Sites</b>	Land take	<ul style="list-style-type: none"> <li>• MPW, community leaders and County Administrators will work with contractor to relocate or preserve the several burial sites along the route.</li> </ul>
<b>Occupational Health and Safety</b>	Construction activities	<ul style="list-style-type: none"> <li>• Workers are provided with adequate personal protective equipment and enforced to use them;</li> </ul>
		<ul style="list-style-type: none"> <li>• Technical specifications relevant to safety measures are regarded in the installation and use of plant and equipment (e.g. diligent execution of works, general observance of safety rules leading to inherently safe systems);</li> </ul>
		<ul style="list-style-type: none"> <li>• The workers have received sufficient training and experience in connection with safety measures and their observance as well as in the ESMP;</li> </ul>
		<ul style="list-style-type: none"> <li>• There is proper and sufficient supervision of workers.</li> </ul>
<b>Disruption to Road Use</b>		<ul style="list-style-type: none"> <li>• The contractor would have to complete work in a continuous and consecutive sequence without leaving isolated sections. Hence, road users can expect brief delays in specific locations as work proceeds but markets must remain reachable on any day;</li> </ul>

Environmental Issue	Potential Impact	Mitigation Measure
	Construction - Careless planned detours and road closures	<ul style="list-style-type: none"> <li>• The contractor will be expected to ensure that the whole road remains in a usable condition throughout the contract period.</li> </ul>
Increase in moral laxity	Migrant workers	<ul style="list-style-type: none"> <li>• Engage in community consultation;</li> </ul>
		<ul style="list-style-type: none"> <li>• Ensure local representation in labour force;</li> </ul>
		<ul style="list-style-type: none"> <li>• Intensify HIV enlightenment for construction workers and communities.</li> </ul>
Conflicts over land ownership	Land take and resettlement	<ul style="list-style-type: none"> <li>• Engage in community consultation.</li> </ul>

Source: Stanley Consultants, 2013

## 8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental & Social Management Plan (ESMP) is the synthesis of all proposed mitigative and monitoring actions, set to a time-frame with specific responsibility assigned and follow-up actions defined. It contains all the information for the proponents, the contractors and the regulatory agencies to implement the project within a specified timeframe.

The ESMP is a plan of action for avoidance, mitigation and management of the negative impacts of the project. Environment Enhancement is also an important component of ESMP. The ESMP refers to all implemental tasks at different stages of project, namely,

- Construction Phase, and
- Operation Phase

The ESMP has been developed with project knowledge and information available to date. Some of the Project's final details, such as proposed locations of construction camps, actual locations of borrow areas to be used by the Contractor, disposal areas for construction debris among other issues, are currently unknown. As project commencement and scheduling plans are developed and changed, components of the ESMP might require amending. This is therefore a working document, which can be updated whenever new information is received or site conditions change.

### 8.1 OBJECTIVES OF THE ESMP

The Environmental & Social Management Plan (ESMP) describes the range of environmental issues associated with the Project and outlines corresponding management strategies that will be employed to mitigate potential adverse environmental impacts. The ESMP conveys the Project's environmental and social constraints.

The Project will comply with all local laws and regulations, which seek to ensure that the construction work does not adversely affect the environment and community resources. The Supervising Consultant may periodically revise the ESMP in consultation with the Contractor, and subject to the approval from the Ministry of Public Works/Infrastructure Implementation Unit (MPW/IIU) and the Environmental Protection Agency of Liberia. Revisions may be made to accommodate changes in work, weather and site conditions. The ESMP should be made available to all Project Staff.

The objectives of the ESMP are:

- To bring the project into compliance with applicable national environmental and social legal requirements;
- To outline the mitigating/enhancing, monitoring, consultative and institutional measures required to prevent, minimize, mitigate or compensate for adverse environmental and social impacts, or to enhance the project beneficial impacts;
- To address capacity building requirements within the relevant Ministries if necessary.

### 8.2 RESPONSIBILITIES

To ensure sound development and effective implementation of the ESMP, it will be necessary to identify and define the responsibilities and authority of the various persons and institutions that will be involved in the project.

The following entities will be involved on the implementation of this ESMP:

- Ministry of Public Works/Infrastructure Implementation Unit (MPW/IIU);
- Ministry of Transport (MOT) and Liberia National Police (LNP);
- Environmental Protection Agency of Liberia (EPA);
- Resident Engineers of River Gee;
- Environmental and Social Officer;

- Contractor; and
- Local Authority

### 8.2.1 The Ministry of Public Works/Infrastructure Implementation Unit

As the statutory governmental agency empowered to do so, the project road is under the supervision of the Ministry of Public Works - the project proponent.

The Ministry of Public Works has established an Infrastructure and Implementation Unit to supervise and monitor all infrastructure projects in the country, including all road projects. Therefore, the responsibility for ensuring that mitigation measures specified in this ESMP and the contract documents are implemented will lie with this unit.

### 8.2.2 Ministry of Transport and Liberia National Police

Road safety and accident prevention is the responsibility of the Ministry of Transport and the Liberia National Police. It will be the responsibility of the two institutions to ensure that road safety policies detailed below is implemented:

- Mandatory use of seat belts;
- Compulsory driver training and testing;
- Prohibition and punishment of driving while impaired by drugs or alcohol;
- Traffic safety education for children; and
- Testing and inspection of all vehicles in accordance to national vehicle safety standards.

The Ministry of Transport and Liberia National Police should also ensure the following:

- Ensuring that post-accident emergency assistance and medical care are available to all accident victims;
- Developing an accurate accident data recording system;
- Conducting research and regularly monitoring the state of road safety;
- Determining the need for further road improvements - based on accident data; and
- Encouraging research and development of new, safety-oriented road technologies.

### 8.2.3 Environmental Protection Agency of Liberia (EPA)

The responsibility of EPA is to

- Exercise general supervision and co-ordination over all matters relating to the environment;
- Be the principal instrument of Government in the implementation of all policies relating to the environment; and
- Ensure that all mitigation measures proposed are implemented.

### 8.2.4 The Supervising Consultant, Resident Engineers and Environmental and Social Officer

The Supervising Engineer, Resident Engineer (RE) of River Gee County will be appointed by the Ministry of Public Works. They will be required to oversee the construction programs and construction activities performed by the Contractor, in compliance with the present ESMP. The RE will have an Environmental and Social Officer (ESO) in its team to co-ordinate all aspects of the environment during project implementation. This will include (i) following the construction to monitor (ii) review and (iii) verify the implementation of the project's ESMP.

During construction, the ESO will be responsible for the following tasks:

- Updating environmental aspects (not covered in the ESIA / EMP) during project implementation;
- Auditing environmental and safety aspects at the work sites;
- Participate in the definition of the no working-areas and the location of campsite, borrow pits, quarries and other areas;



- Recommending solutions for specific environmental problems;
- He shall facilitate the creation of Community Liaison Groups and shall monitor the compliance of the social clauses of the Contract, in terms of local labor force and HIV/AIDS campaign;
- Overseeing strategies for sensitizing the local population on health and safety problems;
- Attending consultations held at key stages of the project with the community and interested parties;
- He will be required to liaise with the respective Environmental Authorities on the level of compliance with the ESMP achieved by the Contractor on a regular basis for the duration of the contract;
- Controlling and supervising the implementation of the ESMP; and
- Preparing quarterly environmental and social progress or audits reports on the status of implementation of measures and management of work sites.

### 8.2.5 The Contractor

The Contractor will be appointed by the Ministry of Public Works and will be required to comply with the requirements of the ESIA/ ESMP and the Standard Specifications for Road Works in Liberia, as published by the Ministry of Public Works. This document includes specifications for environmental protection and waste disposal, borrow pit and quarry acquisition and exploitation, landscaping and grassing and so on.

### 8.2.6 Local Authorities

The relevant departmental officers in the local authorities of River Gee County should be called upon when necessary during project implementation to provide the necessary permits and advisory services to the project implementers.

Some of the areas for which the officers will be required include:

- Approving locations for establishing work camps;
- Involvement in relocation of project affected persons along the road;
- Liaising with the NGOs in the project area to assist in the sensitization campaigns for HIV/ AIDS and public health to the workforce and the local community;
- Issuing permits for tree felling, vegetation clearing, exploitation of quarries and borrow sites (whenever necessary);
- 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 and / or ILO standards.

## 8.3 ENVIRONMENTAL AND SOCIAL MANAGEMENT

The set of instructions provided in this Chapter and summarized in Table 8-1 constitute the Environmental & Social Management Plan (ESMP). To facilitate the use of this ESMP, the environmental management instructions are presented per the sequence of the following project stage activities:

- Construction; and
- Operation.

The following issues require special attention:

- Material sources, especially the quarry sites;
- At the locations for livestock grazing and crossings, signage must be erected.
- Exact locations will be identified by the local administration in consultation with the locals.
- Designs must take into considerations the soil conditions especially the poorly drained clay loam soil areas;
- Informative signs shall be considered for all social amenities (educational institutions, hospitals, trading centers, etc.;
- The Contractor shall ensure that all pertinent permits, certificates and licenses have been obtained prior to any activities commencing on site and are strictly enforced/adhered to;

- The Contractor shall maintain a database of all pertinent permits and licenses required for the contract and for pertinent activities for the duration of the contract.

Table 8-1 is a summary of the environmental and social management plan. It includes the impacts, mitigation measures, responsible parties and the estimated costs.

Table 8-1: Summary of Environmental and Social Management Plan

Environmental / Social Aspect	Recommended mitigation, monitoring and/or management measure	Impacts	Responsibility for implementation	Time frame
<b>Land Acquisition, clearing encroachments and road corridor</b>	* The land acquisition would be in accordance with the RAP and entitlement framework. All road corridor activities are to be completed before starting the construction of the roads.	* Loss of property and livelihoods	MPW/IIU	Pre- construction
<b>Relocation of utilities and common property resources</b>	* All the utilities and common property resources being impacted due to the project will have to be relocated with prior approval of the concerned agencies before construction starts.	* Damage to utilities, inconvenience to Public.	Contractor	Pre- Construction
<b>Debris disposal, site identification</b>	* Selection of the disposal sites will be carried out in consultation with the relevant authorities and local community. Ensure that no natural drainage, productive lands or natural habitat is adversely impacted due to disposal. Preferably, debris disposal site should be identified in barren, infertile land.	* Loss of productive lands or natural habitats	Supervising Engineer and the Contractor.	Construction
<b>Establishment of Quarry and Hot- mix plants</b>	* Specifications of stone crushers, hot mix plants and batching plants to be established for the project should comply with the requirements of the relevant statutory bodies.	* Air, water, noise and soil pollution	Contractor and RE and ESO	Construction
<b>Selection of construction vehicles, machinery and equipment</b>	* All the vehicles, machinery and equipment to be engaged for the construction work should be attached with the latest, advanced pollution control measures available in the country and those should conform to the relevant National and International standards.	* Air and noise pollution	MPW/IIU, Contractor and RE	Construction
<b>Materials (Sand, earth and aggregates) sourcing</b>	* Contractor should procure materials from licensed sources. * Every detail (Location, ownership, agreement, redevelopment Plan) of the material sourced should be implemented and periodic inspections so that appropriate measures are implemented at site towards safe operation and minimizing impacts.	* Loss of productive land, noise, water and air pollution	Contractor, RE and ESO	Construction

Environmental / Social Aspect	Recommended mitigation, monitoring and/or management measure	Impacts	Responsibility for implementation	Time frame
<b>Haul roads maintenance</b>	<ul style="list-style-type: none"> <li>* During the inception of the project, Contractor should identify the network of roads (especially the earth roads) to be used for haulage of construction materials.</li> <li>* Strategy for the maintenance of identified haul road stretches is to be prepared so that regular maintenance is carried out to those stretches by the Contractor for easy plying of construction vehicles as well as the regular local commuters.</li> </ul>	* Air and noise pollution	Contractor, ESO and RE	Construction
<b>Selection of Borrow areas</b>	<ul style="list-style-type: none"> <li>* Compliance to all the Statutory requirements towards operation and environmental protection of borrow areas is the sole responsibility of the Contractor.</li> <li>* RE will inspect locations intended for operation and mitigation measures will be instructed towards satisfactory redevelopment.</li> <li>* Inspection to the borrow areas carried out.</li> <li>* Obtain subsequent approval from E PA</li> </ul>	* Air, water and noise pollution, loss of productive lands	Contractor and MPW/IIU, RE and ESO	Construction
<b>Stone quarries and borrow area</b>	* A comprehensive Quarry Management Plan need to be prepared incorporating Environmental and Safety Management Plan with special emphasis to Quarry redevelopment for approval by RE and decommissioning certificate by EPA.	* Air and noise pollution, loss of productive lands	Contractor, RE and ESO	Construction
<b>Removal of vegetation cover, Excavations of borrow pits</b>	<ul style="list-style-type: none"> <li>* Turfing of road embankment slopes, compensatory afforestation and borrow area rehabilitation should be done as preventive measures for soil erosion.</li> <li>* Further top soil from borrow areas has to be stripped to a specified depth.</li> </ul>	* Increased soil erosion, loss of top soil.	Contractor and RE	Construction and operation

Environmental / Social Aspect	Recommended mitigation, monitoring and/or management measure	Impacts	Responsibility for implementation	Time frame
<b>Movement of Heavy Vehicles</b>	<ul style="list-style-type: none"> <li>* Construction vehicles, machinery and equipment shall move, or be stationed in pre-identified designated areas only.</li> <li>* If operating from temporarily hired land, it will be ensured that the topsoil for agriculture remains preserved &amp; not get compacted.</li> </ul>	* Compaction of productive top soil	Contractor and RE	Operation
<b>Spillage of fuel, lubricants and hazardous chemicals</b>	<ul style="list-style-type: none"> <li>* Vehicles and machinery are maintained and refilled in such a fashion that fuel spillage does not contaminate the soil.</li> <li>* Fuel storage and refilling sites should be kept away from cross drainage structures and important water bodies.</li> <li>* All spills shall be disposed as desired and the site shall be fully cleaned before handing over.</li> <li>* Soil quality monitoring should be conducted throughout project life.</li> </ul>	* Contamination of soil and negative impact on the growth of the floral vegetation and faunal distribution.	Contractor and RE	Operation
<b>Disposal of construction waste.</b>	* The construction waste should be dumped in selected pits, developed on infertile land and approved. Acquire all applicable waste disposal licenses. Approved waste land to be preferred for construction debris disposal.	* Loss of productive lands	Contractor and RE	Construction and operation

Environmental / Social Aspect	Recommended mitigation, monitoring and/or management measure	Impacts	Responsibility for implementation	Time frame
<b>Surface runoff from the construction site, dumping of construction debris in or nearby water bodies</b>	<ul style="list-style-type: none"> <li>* No labor camps, stone crushers, hot mix plants and other heavy machinery should be located near water bodies. No discharge from such establishments should be directed to water bodies.</li> <li>* Dumping of debris in or nearby water bodies to be strictly avoided. Waste products must be collected, stored and taken to approved disposal sites as per prevailing regulations.</li> <li>* Runoff from the construction site should be passed through silt traps. Pitching, stabilization of soil and slope protection measures should be taken up to reduce erosion of soils.</li> <li>* Water quality monitoring should be conducted as per Environmental &amp; Social Monitoring Plan so that appropriate measures are taken up towards abatement of pollution.</li> </ul>	<ul style="list-style-type: none"> <li>* Increased turbidity of water.</li> <li>* Deterioration of Water quality of community water sources.</li> <li>* Adverse impact on aquatic ecosystem</li> </ul>	Contractor RE, MPW/IIU and local administration	Operation
<b>Spillage of fuels and lubricants, spillage of hazardous chemicals</b>	<ul style="list-style-type: none"> <li>* Appropriate drainage arrangements with catch drains and catch pits designed to safely drain out the hazardous chemicals should be provided.</li> <li>* To avoid spillage of fuel and lubricants, the vehicles and equipment shall be properly maintained and repaired.</li> <li>* Maintenance to be carried out on impervious platforms with spill collection provisions. Surface run off from vehicle parking, washing and fueling areas and hot mix plant areas should be passed through oil interception chambers and the oil will be skimmed off from the chamber and will be disposed of by approved agents.</li> <li>* Water quality monitoring should be conducted to detect any</li> </ul>	<ul style="list-style-type: none"> <li>* Deterioration of water quality of community water sources. Adverse impact</li> </ul>	Contractor and RE	Operation

Environmental / Social Aspect	Recommended mitigation, monitoring and/or management measure	Impacts	Responsibility for implementation	Time frame
<b>Cultural Changes</b>	<ul style="list-style-type: none"> <li>* Strengthen the cultural organizations and encouraging competitions through organization of cultural tournaments;</li> <li>* Ensure that the project contributes to the creation of an atmosphere that is conducive to the functioning of all social centers which are in the project zone of influence.</li> </ul>	* To reduce the breakdown of the socio-culture of the natives.	MPW/IIU and local administration	Operation
<b>HIV/AIDS</b>	<ul style="list-style-type: none"> <li>* Sensitization and awareness campaigns should be the responsibility of the National Aids Control Commission together with their county coordinators.</li> <li>* Provision of condoms at strategic places in camps and major towns.</li> </ul>	* To reduce prevalence rates	MPW/IIU and National Aids Control Commission	Operation
<b>Construction of bridges across major water bodies</b>	* The construction of bridges across major water bodies should be done by serving prior notice to the users. Care should be taken to avoid mixing of construction materials with water channel such that it may affect the downstream users or water supply schemes.	* Water shortage in downstream water users	Contractor and RE	Construction
<b>Construction of embankments</b>	* Earth, stone or any other construction material Should be properly disposed of so that the flow of water in cross drainage channels is not blocked.	* Blocking of cross drainage and resultant flooding.	RE and contractor	Construction



Environmental / Social Aspect	Recommended mitigation, monitoring and/or management measure	Impacts	Responsibility for implementation	Time frame
<b>Dust generation due to material handling, operation of crushers and hot mix plants, movement of construction vehicles and construction activities</b>	<ul style="list-style-type: none"> <li>* All precautions to reduce the level of dust emissions from the hot mix plants shall be taken.</li> <li>* The hot-mix plants should be sited at least 500 m from the nearest habitation and from major water bodies. They should be fitted with dust extraction units.</li> <li>* Water should be sprayed on the earth mixing sites, asphalt mixing site and service roads.</li> <li>* During sub grade construction, sprinkling of water should be carried out at least twice a day on a regular basis during the entire construction period especially in the dry seasons. Special attention should be given in the sections where the alignment passes through sensitive areas such as schools, hospitals and urban areas.</li> <li>* As soon as construction is over the surplus earth should be utilized to fill up low-lying areas. In no case, loose earth should be allowed to pile up along the alignment. Vehicles delivering material should be covered. Air quality monitoring should be conducted as per Environmental Monitoring Plan.</li> </ul>	* Dust generation due to material handling, operation of crushers and hot mix plants, movement of construction vehicles and construction activities.	RE and contractor	construction

Environmental / Social Aspect	Recommended mitigation, monitoring and/or management measure	Impacts	Responsibility for implementation	Time frame
<b>Noise generated from construction vehicles, asphalt plants and equipment</b>	<ul style="list-style-type: none"> <li>* Construction contract should clearly specify the use of equipment emitting noise of not greater than 90 dB (A) for an eight-hour operation shift.</li> <li>* The siting of construction yards should be done leaving at least 100 m distance from any residential areas which will allow noise to attenuate. The main noise producing sources such as the concrete mixers, generators, grader etc. should be provided with noise shields. The noise shields can be any physical barriers, which is effective in adequate attenuation of noise levels.</li> <li>* For protection of construction workers, earplugs should be provided to those working very close to the noise generating machinery. At construction sites within 150 m of human settlements, noisy construction should be stopped between 6pm and 8:00 am.</li> </ul>	<ul style="list-style-type: none"> <li>* Since the noise generating activities are localized and intermittent, no serious impact on human health is anticipated.</li> <li>* Residential areas nearby the construction site may experience increase in night time ambient noise levels.</li> </ul>	RE and contractor	Construction
<b>Removal of trees for widening of existing road and construction of realignments</b>	<ul style="list-style-type: none"> <li>* Small trees shall be transplanted wherever possible to minimize the impacts of loss of trees. Trees should be removed in phases.</li> <li>* Adequate care of the afforested plants should be taken up to achieve optimum survival rate. Landscaping should be done with a lag of 3 to 4 months from the start of the work on any section. The section should be deemed to be complete when the landscaping is over.</li> </ul>	<ul style="list-style-type: none"> <li>* The impact on biodiversity will be negligible since most of the trees are of common occurrence.</li> <li>* Loss of trees will lead to Increase in soil erosion, loss of shade and other benefits of trees, and decline in air quality.</li> </ul>	RE and contractor	Construction

Environmental / Social Aspect	Recommended mitigation, monitoring and/or management measure	Impacts	Responsibility for implementation	Time frame
<b>Poor maintenance of machines and vehicles, poor light conditions at the work place, carelessness and poor management of work</b>	<ul style="list-style-type: none"> <li>* To ensure safe construction environment, lighting devices and safety signal devices shall be installed. Traffic rules and regulations to be strictly followed.</li> <li>* Safety of workers undertaking various operations during construction should be ensured by providing them with helmets, masks, safety goggles etc.</li> <li>* Regular tool talks, mock drills, training programs to be organized towards educating workers towards adopting safe working methods.</li> <li>* The electrical equipment should be checked regularly to avoid risks to workers. At every work place, a readily available first aid unit including an adequate supply of dressing materials, a mode of transport (ambulance), nursing staff and an attending doctor to be provided.</li> </ul>	* Accident risk to workers from construction activities	RE, traffic department and contractor	Construction
<b>Improvement of roadside amenities</b>	<ul style="list-style-type: none"> <li>* Restoration and improvement of bus shelters, bus bays and truck stoppage sites to be carried out as per detailed design. Road furniture like footpaths, railings, traffic signs etc. shall be erected as per design.</li> </ul>	* Improved comfort level of travelers	RE and contractor	Construction

Environmental / Social Aspect	Recommended mitigation, monitoring and/or management measure	Impacts	Responsibility for implementation	Time frame
<b>Unhygienic conditions at work place and camp sites, Non- availability of good drinking water.</b>	<ul style="list-style-type: none"> <li>* Adequate drainage, sanitation and waste disposal to be provided at workplaces.</li> <li>* First Aid facility to be made available at each work locations</li> <li>Periodical medical checkup facility to be provided to all the workers.</li> <li>* At every workplace, good and sufficient water supply shall be maintained to meet the daily chore of the residing population.</li> <li>* Measures to be implemented so that waste water is collected in septic tanks/soak pits. No surface stagnation of water will be allowed to avoid disease outbreak.</li> </ul>	* Health problems to workers	RE and contractor	Construction
<b>Use of water for construction from community water sources</b>	<ul style="list-style-type: none"> <li>* Arrangement for supply and storage of water will be made by the contractor in such a way that the water availability and supply to nearby communities remain unaffected. If a new well is to be bored, proper sanction and approval by relevant authorities is needed.</li> <li>* The wastage of water during the construction should be minimized. In case of tapping water from community sources, consent to be obtained from local administration for the same.</li> </ul>	* Scarcity of water to the community	RE and contractor	Construction

Environmental / Social Aspect	Recommended mitigation, monitoring and/or management measure	Impacts	Responsibility for implementation	Time frame
<b>Absence of proper sanitation and waste disposal in construction camps</b>	<ul style="list-style-type: none"> <li>* Construction laborers' camps shall be located away from the habitation and from major water bodies. Adequate sanitary facilities, drainage, washing and toilet facilities with septic tanks and refuse collection and disposal should be provided to the workers. The provision of water supply and toilet facilities should be made as per regulations.</li> <li>* Water quality monitoring should be conducted as per Environmental Monitoring Plan.</li> </ul>	<ul style="list-style-type: none"> <li>* Contamination of water bodies and spreading of water-borne diseases.</li> <li>* Health risk to workers &amp; public</li> </ul>	Contractor and RE	Construction
<b>OPERATIONAL PHASE</b>				
<b>Improvement of road geometry and pavement condition</b>	<ul style="list-style-type: none"> <li>* Proper implementation of traffic rules by the Traffic Police.</li> <li>* Proper maintenance of traffic signs.</li> </ul>	* Less chances of accidents	Traffic police	Operation
<b>Improvement of road surface and its maintenance</b>	<ul style="list-style-type: none"> <li>* Proper implementation of vehicular emission control rules by the traffic Department.</li> <li>* Roadside tree plantation to be restored and maintained as per the compensatory plantation plan.</li> </ul>	<ul style="list-style-type: none"> <li>* Reduced dust generation from road.</li> <li>* Increased Vehicular emissions due to increased traffic.</li> </ul>	Contractor, MPW / IIU and LNP	Operation
<b>Increase in traffic</b>	<ul style="list-style-type: none"> <li>* Development of greenbelt comprising selected species of trees with high canopy along the project road for attenuation of noise.</li> <li>* Use of horns should be restricted at sensitive locations like schools and hospitals through the use of appropriate signboards along the road.</li> </ul>	* Increase in the ambient noise levels, especially during night time along the project road.	Traffic police	Operation

Environmental / Social Aspect	Recommended mitigation, monitoring and/or management measure	Impacts	Responsibility for implementation	Time frame
<b>Increase in embankment height and improvement of flood water drains</b>	* The cross-drainage system and the flood water drains should be periodically cleared.	* Water logging during wet seasons will not take place	Contractor and MPW/IIU	Operation
<b>Movement of vehicles with higher speed.</b>	* Drivers should be warned with proper sign boards for speed restriction within area with high human concentrations.  * Usage of air horns should be completely avoided within noise sensitive areas both during day and night time.	* Road accidents	Traffic police	Operation
<b>Improved safety measures and improved traffic management</b>	* Traffic management plan to be developed, especially in high population areas.  * Traffic control measures including speed limits to be enforced strictly. Road corridor should be properly marked and further encroachment of road corridor should be strictly prevented.  * Road side vendors should be restricted to designated areas only.	* The chances of accidents would be reduced	LNP	Operations

Source: Stanley Consultants, 2013

### 8.3.1 Uncertainty in ESMP

Uncertainty in ESMP may be occasioned by the following aspects:

- Non-homogenous baseline due to ever changing external factors occurring during the entire project cycle;
- Changes in legal and regulatory policy which influences the assessment of future baselines and post development issues;
- Non-uniform soil profiles which may be realized during project implementation;
- Noncompliance of the proponent and contractor with the implementation schedule.

The proponent MPW/IIU ought to beware of the above listed issues and together with the contractor adopt a proactive strategy to address the emerging issues and knowledge gaps.

### 8.3.2 ESMP Management Records

Environmental management records shall be kept on site during the duration of construction and shall include:

- The updated version of the ESMP;
- All necessary permits and licenses;
- All site-specific plans prepared as part of the updated ESMP;
- All written instructions and reports issued by the RE /Supervising Consultant;
- A register of audit non-conformance reports and corrective actions;
- All related environmental, social, health and safety management registers and correspondence, including any complaints;
- All records shall be kept at site premises and maintained in a legible state for the full period of construction.

### 8.3.3 Auditing of the ESMP

The ESO shall conduct quarterly audits to ensure that the system for implementation of the ESMP is operating effectively. The audit shall check that a procedure is in place to ensure that:

- The ESMP being used is the up-to-date version;
- Variations to the ESMP and non-compliance and corrective action are documented;
- Appropriate environmental training of personnel is undertaken;
- Emergency procedures are in place and effectively communicated to personnel;
- A register of major incidents (spills, injuries, complaints, legal transgressions, spot fines and penalties etc. is in place and other documentation related to the ESMP;
- Ensure that appropriate corrective and preventive action is taken by the Contractor once instructions have been issued through the RE.



### 8.3.4 Costs of Mitigation

Construction related costs for mitigation of environmental impacts will be included in the Bill of Quantities (BoQ) as part of the design and tender documentation for the project road.

## 8.4 ENVIRONMENTAL AND SOCIAL MONITORING

Environmental and social monitoring during construction and operation helps to predict unforeseen environmental and social impacts and allows measures to prevent or avert adverse impacts to be developed or introduced in a timely manner.

Maintenance of infrastructure during construction and operation is also important in contributing towards environmental conservation by for example, preventing soil erosion along the road and its upstream and downstream catchments and ensuring proper drainage of run-off, away from the road.

During the construction and operation phases, monitoring will be undertaken to ensure that proposed mitigation measures for negative impacts and enhancement measures for positive impacts are implemented. The Environmental Monitoring Plan is presented in Table 8-2 below.

*Table 8-2: Environmental Monitoring Plan*

Environmental Aspect	Location	Responsibility during design and construction	Responsibility for monitoring during operation	Mode and Period (c) = Construction (o) = Operation	Frequency of monitoring
<b>Land acquisition and Resettlement</b>	* Way leave	MPW/IIU	RAP Report	RAP Report	RAP Report
<b>Solid Waste</b>	* Construction Camp * Project Sites	Contractor, Supervising Engineer.	-	Site visit and visual inspection (c)	Daily (c)
<b>Air pollution</b>	* Project site	Design Engineer, Contractor, Supervising Engineer, FDA	LNP; MPW/IIU	Visual inspection (c)	Daily (c) Random (o)
<b>Noise pollution</b>	* Project site	Supervising Engineer and Contractor	LNP and MPW/IIU	Speed gun (o) Observation/Inspection (c)	Random (o)
<b>Liquid wastes</b>	* Project site (workshops)	Design Engineer, Supervising Engineer, and Contractor	MPW/IIU	Visual inspection (c) Routine maintenance (o)	Daily (c) Twice a year (o)
<b>Vegetation loss</b>	* Way leave	Design Engineer, Contractor, Supervising Engineer, Forest Department	MPW/IIU	Visual Inspection (c)	At the end of construction

Environmental Aspect	Location	Responsibility during design and construction	Responsibility for monitoring during operation	Mode and Period (c) = Construction (o) = Operation	Frequency of monitoring
<b>Water</b>	* Material sites and project area	Contractor, Supervising Engineer	MPW & MLME	Water quality analysis (c)	Monthly
<b>Soil erosion</b>	* Project area	Contractor, Supervising Engineer	MPW/IIU	Drainage of project area (c)	Weekly

Source: Stanley Consultants, 2013

## 8.5 COSTS FOR MONITORING

The costs for mitigation of construction related impacts will be included in the contract documents. During construction and decommissioning phases of the project, the ESO will coordinate the monitoring program and prepare reports for submission to the environmental authorities.

## 8.6 ENVIRONMENTAL TRAINING AND AWARENESS

The Contractor and sub-contractors shall be aware of the environmental requirements and constraints on construction activities contained in the provisions of the ESMP. The Contractor will therefore be required to provide for the appropriate environmental training and awareness as described in this ESMP in its costs and programming. An initial environmental awareness training session shall be held prior to any work commencing on site, with the target audience is all project personnel.

The training should include but not limited to the following:

- Basic awareness and understanding of the key environmental features of the work site and environs;
- Understanding the importance of and reasons why the environment must be protected;
- Ways to minimize environmental impacts;
- Relevant requirements of the ESMP;
- Prevention and handling of fire;
- Health risks pertinent to the site, including prevention of communicable diseases;
- Awareness, prevention and minimization of risk regarding the contraction and spread of HIV/AIDS and other sexually transmitted diseases;
- The Contractor shall erect and maintain Environmental and Health Information Posters for his employees regarding HIV/AIDS and natural resources; and  
The Environmental and Health Information Posters shall be erected at the eating areas and any other locations specified by the RE.

## 8.7 ENVIRONMENTAL RISK MANAGEMENT

The failure of environmental mitigation can result in serious impacts such as erosion, increased road accidents and disruption of the community lifestyles. Construction of a road also involves occupational health and safety risks to road workers, primarily in the areas of storage and handling of dangerous materials, and operation of heavy machinery close to traffic, slopes and watercourses.

The anticipated risks in this project include:

- Exposure to excessive dust particles or toxic fumes from bitumen and other chemicals used in road works;
- Potential collapse of trenches;
- Risk of accidents involving passing traffic;
- Risk of bush fires during dry seasons;
- Risk of rock falls during blasting;
- Risk of fuel spills and therefore contaminating soil and groundwater.

The risks can be mitigated through:

- Strengthening staff skills and training in environmental management;
- Monitoring environmental actions and responsibilities and making provision for remedial actions;
- Planning for remedial measures in case initial planned actions are not successful;
- Limiting time of exposure to dust particles, chemicals and noise;
- Establishing safety and inspection procedures in materials handling, operating heavy equipment and constructing trenches; and
- Safe handling of toxic materials, explosives and other hazardous substances.

## 8.8 EMERGENCY PROCEDURES

The Contractor shall submit Statements covering the procedures for the main activities which could generate emergency situations through accidents or neglect of responsibilities.

These situations include, but are not limited to:

- Accidents at the work place;
- Accidental fires;
- Accidental leaks and spillages;
- Vehicle and plant accidents;

Specific to accidental leaks and spillages:

- The Contractor shall ensure that his employees are aware of the procedure for dealing with spills and leaks;
- The Contractor shall also ensure that the necessary materials and equipment for dealing with the spills and leaks is available on site at all times. Specific to hydrocarbon spills:
  - The source of the spill shall be isolated and the spillage contained using sand berms, sandbags, sawdust, absorbent material and/or other materials approved by the RE;
  - The area shall be cordoned off and secured.
- The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/breakdown the spill;
- The quantity of such materials shall be able to handle a minimum of hydrocarbon liquid spill;
- The Contractor shall notify the relevant authorities of any spills that occur;
- The Contractor shall assemble and clearly list the relevant emergency telephone contact numbers for staff and brief staff on the required procedures. These contact details shall be listed in English;
- The treatment and remediation of areas affected by emergencies shall be undertaken to the reasonable satisfaction of the RE at the cost of the Contractor where his staff has been proven to be responsible for the emergency.

## 9 CONCLUSION & RECOMENDATIONS

### 9.1 CONCLUSION

The findings of the environmental and social impact assessment (ESIA) concludes there is an overall positive socio-economic and environmental impact of upgrading, to bitumen standards, the first 50-km of Lot 3 – Fish Town to Kelipo Kanweaken. However, the impact of the project on the bio-physical environment is potentially slightly to moderately negative, both in the construction and operation phase. This is achievable only if appropriate mitigation and support measures are employed. The social impacts of land take and resettlement have been addressed during the RAP studies.

The environmental and social management measures proposed are generally straight forward. Much of the measures relate directly to sound operating practices both during the construction phase and subsequently over the life of the road.

Provided the road is upgraded with due attention to the mitigation and management measures outlined, the project will have a positive impact on both the bio-physical and socio- economic environment of the project area. It is recommended that this road project be implemented and that the proposed mitigation and monitoring measures are enforced.

### 9.2 RECOMMENDATIONS

Based on the finding of overall positive impact of the project, we wish to recommend the following:

- The road project should be granted a license to commence.
- A monitoring program should be adhered to by the supervising Engineers and MPW/IIU during operation of the road.
- MPW/IIU should liaise with other entities/organizations having utilities on the road to ensure that they only use the edges of the road reserve to avoid future costs of relocation of service and inconvenience.
- MP W/IIU should survey and put beacons on the road reserves to stop encroachment and ease maintenance of roads.

## REFERENCES

African Development Bank	Environmental and Social Assessment Procedures – For African Development Bank’s Public Sector Operations; © June 2001.
African Development Bank	Group Policy on the Environment; 2004.
African Development Bank	Policy Guideline Checklist for ES Safeguards
EPA of Liberia	Environmental Impact Assessment Procedural Guideline (2006)
Geographic Maps of Liberia Liberia Institute of Statistics & Geo-Infor- mation Services (LISGIS)	Republic of Liberia – 2008 National Population & Housing Census Final Results Monrovia, Liberia; May 2009
Ministry of Public Works	Socio-economic Survey Report of Lot 2 of the Zwedru – Harper Road Project (May – June 2013).
Ministry of Foreign Affairs	An Act to Adopt the Environmental Protection and Management Law of the Republic of Liberia (2002)
Ministry of Foreign Affairs	National Environmental Policy of the Republic of Liberia (2002).
Ministry of Planning & Economic Affairs	Lift Liberia Poverty Reduction Strategy - Final Report: A Results-Focused Assessment (June 2008 – December 2011);
Ministry of Planning &	Liberia Rising, 2030

## APPENDIX

### Appendix 1: Meeting Minutes

MEETING: Kanweaken City, River Gee County		VENUE: Administrative Building
DATE: May 30 , 2013		TIME: 2:00 mid-Day
Issue/s Raised	Participant concerned	Response
Will the entire structure be paid for if it is marked with an arrow	Prince Morris	Mr. Henry Z. Mah, not only the affected area will be paid for
Who will receive the money if I lease the land for 5 years and build a house on it and we are 2 years into the lease agreement	John Bleddee	Mr. Henry Z. Mah, according to the World Bank policy the one who build the house receives the money but if your lease agreement expires and you turn the property over to the owner the money is not yours
If my house breaks down before payment, will I still receive payment	Eliza Teah	Mr. Henry Z. Mah, Yes because your record is already there
Those houses around my house are marked but mine is not mark	Doris Williams	Mr. David G. Carter, that means your house is not affected
How is the valuation going to be done	Anthony Wesseh	Mr. Henry Z. Mah, valuation is done based upon the type of structure you have
Who is going to do the valuation	Brison Sloor	Mr. Henry Z. Mah, the contracting entity will do the valuation

Attendance list for consultative meeting held with project affected People (PAPs) in Kanweaken City, River Gee County.

Venue: Administrative building

Time: 12 pm

Administrative building

Date: May 30, 2013

- 1 Hon. Odeious S. Poree sr. Asst. Supt
- 2 Hon. Moses Diawaper City Mayor 0884779341
- (3) Gabriel N. Pour - Adm/Asst - Kanweaken City
- 4 O'dlady Sineh - Market/Association
- 5 Doris Williams
- 6 King Dargge
- 7 Evelyn Young
- 8 Memie Dolo
- 9 AB Bek
- 10 Channe JA Roh
- 11 Elzer Teah
- 12 Anthony Klesseh
- 13 Anthony Myers
- 14 Nancy Klesseh
- 15 Wlatee Morris
- 16 Orosco Ben
- 17 Prince Weah



- (25) Victor Quayee  
 (26) Vasco Sherman
- (1) Rickson Hlesse  
 (2) G. Wellington Targba  
 (3) D. Sayle Bodkuo  
 (4) Bestman S. Targba  
 (5) Raymond Twch  
 (6) Jenone Tuwilo  
 (7) Cometone Toe  
 (8) Emmanuel Dossan  
 (9) Roland George  
 (10) Ben W. Sanea  
 (11) Brown Toe  
 Perry T. Saytre  
 (13) S. Napoleon Chenekan  
 (14) George Dickson  
 (15) Brown Toe  
 (16) Alfred T. Chenekan  
 (17) Tries Gibson  
 (18) Toe Chenekan  
 (19) Patince Targba  
 (20) Anthony Foday I  
 (21) Anthony Foday II  
 (22) Charles Jah  
 (23) Oldpa George  
 (24) Honnor Quayee

- 1 Constien Dhleh
- 2 Agatta Gery
- 3 Hamey Togba
- 4 Richard Doe
- 5 Deqba J. Williamson
- 6 Betty Sika
- 7 Beatrice Appleton
- 8 ~~martha~~ martha marka
- 9 Annita Shlen
- 10 James Williamson
- 11 Moses K. Cooper
- 12 ~~Titon~~ Titon Socro 0886320032
- 13 Tito Joco Tweh - 0886486734
- 14 Jaxye Doe
- 15 Samuel W. Weah
16. Daniel D. Wesseth -
17. William Jallof
- 18 Rejthura T.B. Quayee
- 19 Joseph A. Chedison 0886537525
20. Mon. Sylvester Tol 0886489724

- Anthony P. Wuo Sr - 0886532352
- (2) John T. Sinatue
  3. George J. Joseph Sr.
  4. Richard Quayle
  5. Jonah Winnika
  6. Scott D. Chenekau - FZ-408X
  7. Mamie Dodo.
  8. Roger Saye Gondah
  9. Evon Wilson
  10. Watta Carter
  11. Alvin S. Dweh - 0886469412
  - (12) Victor S.G. Quayle
  13. Alfred C. John 0886496396
  14. Et'inson Quayle
  - (15) Hannah T. Quayle
  - (16) Elizabeth Targba
  - (17) Mariyi Kockar



**COMPTON**  
in association with  
**NIRAS**

**SEPTEMBER 2017**