

LUZOHN COMMUNITY FOREST

BOOMING GREEN LIBERIA, INC.
Grand BASSA County



Environmental & Social Impact Studies Report (ESIS)

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1.0 INTRODUCTION

1.1 GENERAL BACKGROUND

Zuzohn Community Forest (ZCFMA) is located in ZuzohnClan, Marka Chiefdom, Yeablo Administrative District, Grand Bassa County. This parcel of forest which has a total of 12,611 hectares was awarded to Booming Green Liberia, Inc. for logging purpose by the Clan. In so doing, the Company will sustainably manage it under the regulations and supervision of the Forestry Development Authority, FDA.

The Company's operations will be carried out within the **specified Contract Area (12,611 ha.)** and no more. The project is planned for the harvesting of Logs from that block of forest. The company shall employ modern logging methods to minimize the impact on the environment during its operational period.

The objective of these undertakings in the **Zuzohn** Community Forest (ZCFMA) is to carry out logging operations that will lead to the supply of wood/timber for both the local and international markets. The Environmental Protection and Management Laws of Liberia, (EMPL) provides condition and set standard for social and environmental impact assessment by which the performance of each company is measured in terms of compliance.

In view of the above, this report is prepared in line with Environmental and Social Impact Assessment (ESIA) requests stipulated in the Environmental Protection and Management Laws of Liberia (2003).

The basic purpose for the Environmental and Social Impact Assessment is to identify, predict and analyze the magnitude of environmental and social impact and propose mitigation measures for impacts that are likely to arise from the various activities of the project.

Biological resource survey, field observation, social economic assessment and secondary data from other sources were some of the tools utilized during the conduct of the ESIA. In addition, the Environmental and Social Impact Assessment Guideline by the Environmental Protection Agency of Liberia was also used.

The studies identified both positive and negative project impacts on the environment. On top of this, environmentally sound and socially acceptable impacts enhancement and management options were also suggested.

Public consultations were held with the local authorities and Communities of the project area and the outcome of the consultations included in this report. During the discussions, emphasis was made on the Community participation in the management of their forest as well as the importance of the protection of the environment. The ESIA process was also highlighted.

1.2

Objective of the Environmental & Social Impact Assessment Study

The main objective of this Environmental and Social Impact Assessment is to ensure that Booming Green Liberia's activities in the **Zuzohn** Community Forest (ZCFMA) are conducted in an environmentally sound and socially acceptable manner, and contributes to the overall development of the environmental and social functions of the local Community and the country at large.

This study is expected to provide means whereby the overall environmental performance and social benefits of the project can be enhanced through:

- Identification of sensitive environmental components likely to be affected by the logging project in the **Zuzohn** Community Forest (ZCFMA);
- Defining positive social and economic benefits that the local Community can derive from the proposed project implementation;
- Identification, prediction and analysis of the potential environmental impacts associated with the logging process in the project area;
- Preparation of Environmental Management Plan and recommendations regarding the measures that will minimize adverse effects and enhance beneficial impacts of the project.

1.3 Approaches and Methodology

1.3.1 General Approach

The methodology adopted in conducting the environmental and social impact assessment of the **Zuzohn Community Forest Management Contract area (ZCFMA)** follows the conventional methods that meet the requirements stipulated in the Environmental Protection Agency of Liberia as well as International Standard for the Performance of Social and Environmental Assessment.

The collection of primary and secondary data for the environment and social components was a tool used.

Desk study on impact analysis, choosing mitigation and enhancement measures, different optimization tools and developing environmental protection, monitoring and management plans were made.

Focus groups discussions, meetings, questionnaires and interviews are common techniques by which local Community consultations were also held during the ESIA process.

1.3.2 Collection of Available Information

The documentation process involved the collection and review of published national and regional states of Environmental policies, legislations, regulations and guidelines as well as international conventions and protocols ratified by Liberia.

Other Primary data and information on the study area were collected using different tools and techniques including household questionnaires, focus groups interviews, local community representatives' consultations and checklists.

1.3.3 Field Survey

A three- man team, (2 from Forest & Environment Research Institute, FERI, and a representative from the Company) was set up and went to Zuzohn Clan, Yeablo Administrative District, Grand Bassa County to assess the baseline environmental and social conditions of the proposed project area. The team's mission was to assess the areas to be impacted by the Project and conduct environmental and socio-economic survey.

1.3.4 Key Stakeholders Consultations

During the ESIA Process, discussions were held with decision making bodies, key stakeholders, sector institutions on the concepts and nature of the proposed project as well as the importance of the Environmental and Social Impact Assessment. Emphasis was placed on the levels of public participation, role of key stakeholders and joint contributions of these actors to the success of the project.

Key stakeholders and authorities of the Zuzohn Community with whom consultations were made in the project study area.

A total of five towns/villages were surveyed in the Zuzohn Community forest, they included in the matrix below:

Key Towns		
Name of Town	Town Chief	GPS
GaybeonTown	Zechariah Cee	29N 0382919 UTM 0682534
Yavoka Town	Emmanuel Mopo	29N 0381979 UTM 0685407
WalayourTown	Andrew Gueh	29N 0382286 UTM 0685958
DyouwoloTown	Isaac Gargana	29N 0381908 UTM 0688279
Burtay Town	Siafa Kiazulu	29N 0386194 UTM 0689517

1.3.5 Public Consultations

Public Consultation was held in two phases, one during identification of the social and environmental issues and the other during impacts assessment study. During the impact assessment, individuals and community members were interviewed and others consulted on the project's socio- economic and environmental impacts. The Local Community' consultative meetings were all conducted in the **Zuzohn** Community, Grand Bassa County as part of the ESIA process.

The participants included among others, community elders, Women Groups, ZCFMB (**Zuzohn** Community Forest Management Body) members and youth group members in the target Community. These meetings

allowed the participants to freely express their concerns on vital issues relating to the company's proposed activities in the area.

Following the consultative meetings, participants were asked to reduce their concerns and opinions into writing some of which are incorporated in the annex of this report.

1.3.6 Public Participations

The proposed Logging project will be subjected to best **International Timber Harvesting Practices** as required by the Laws of Liberia. Accordingly, the issue of public participations in these meetings was underlined at the initial environmental examination. The aim was to know their opinions and views with regard the Booming Green Liberia, Inc. logging activities in that community

1.3.7 Report Structure

The main body of the ESIA report is structured under 9 sections:

Introduction

Initial environmental examination

Environmental Legislations and institutional frameworks

Project Description

Environmental impacts Identification,

Prediction and Analysis

Environmental Management Plan mitigation measures

Environmental Monitoring Program

Conclusion and Recommendations

Project Closure

2.0 Environmental Scoping

With the aim of defining the limits of the study area for the project and drawing lists of activities and impacts to be studied during the assessment, the Consultant carried out an initial environmental examination and scoping.

The scoping exercise was carried out with the following main objectives:

- To define the limits of the study area,
- To define list of Valued Ecosystem Components within the study area,
- To define lists of activities, type and magnitude of the proposed project, and
- To assess and include views and concerns of key stakeholders on the scope of ESIA study.

In order to carry out the above tasks, the Consultant employed different tools and techniques relevant to the proposed project. The process included the use of environmental scoping checklists, consultations with different stakeholders (including project affected Community, local administrators and sector institutions, etc.) and informal discussions and talks with prominent individuals, local elders, youth, women groups and general public in the project area.

2.1 Limits of the Study Area

The Environmental and Social Impact Assessment study was conducted for those areas that would be influenced or impacted by the Company's activities in the **Zuzohn** Community Forest (ZCFMA). The project site was defined as the **Zuzohn** Community Forest (ZCFMA) area located in the Clan, Grand Bassa County covering **12,611 ha.** of land.

The study also considered local farming activities in and around the project area which could be directly or indirectly affected by the implementation of the project.

2.2 Concerns of Key Stakeholders

Views and concerns of key stakeholders were assessed in the **Zuzohn, Marka** Communities with special emphasis on Communities within and around the project areas which could probably be affected directly or indirectly by the project. The stakeholders' concerns in the implementation of the project are about ensuring community participation, employment opportunity priority for unemployed local community members, assisting local community with supply of basic social

services and infrastructures to include the following: safe drinking water for home consumption, schools , clinics, markets, roads, Concrete bridges.

3.0 Policy Legislative and Institutional Framework

3.1 Policy Framework

Several pieces of policy, laws and institution relative to environmental management can affect the harvesting of Forest products and their processing. These include both national and international instruments. In 1992, at the United Nations Conference on Environment and Development (UNCED) held in Rio De Janeiro twenty-seven environmental Principles were outlined in an attempt to enshrine a charter for the protection of the earth in Agenda 21, a program of action for the 21st Century.

- Principle 1 states that human beings are at the center of concerns for sustainable development and they are entitled to a healthy and productive life in harmony with nature.
- Principle 3 mentioned that the right to development must be fulfilled so as to equitably meet development and environmental needs of present and future generation; and
- Principle 17 states that environmental impact assessment should be a natural instrument that shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment.

The above principles can be seen as a mechanism by which the international community will cooperate to promote sustainable development that can be mentioned indefinitely because it is socially desirable, economically viable and ecologically sustainable. Within this context the government of Liberia has tailored its Environmental Policy to reflect the Principles of Agenda 21.

The national Environmental Policy of Liberia, 2002 has as its ultimate aim to ensure that improvement of the physical environment for present and future generations and to reconcile economic development and growth with the sustainable management of natural resources.

3.2 Institutional Framework

3.2.1 Role of EPA

The Environmental Protection Agency (EPA) is the main Agency and principal authority for the management of environment in Liberia. The key functions of the EPA are:



- Coordinates, integrates, harmonizes and monitors the implementation of the environment and the decision of the policy council;
- Proposes environmental policies and strategies to the policy council and ensures that integration of environmental concerns in the overall national planning;
- Collects, analyzes and prepare basic scientific data pertaining to pollution, degradation and environment quality, resource use and other environmental protection and conservation matters; undertaking research, prepare and disseminate every two years and report on the state of the environment of Liberia.
- Ensures the preservation and promotion of important historic, cultural and spiritual value of natural resources heritage and in consultation with indigenous authorities, enhance indigenous methods for effective natural resource management;
- Encourages the use of appropriate environmental sound technologies and renewable sources of energy and natural resources.
- Establish environmental criteria, guidelines, specifications and standards for production processes and the sustainable use of natural resources for health and welfare of future generation.
- Reviews and approve environmental statement and environmental impact assessment;
- Initiates and coordinate actions required in a state of environment emergency or any other situation which may pose serious threat to the environment and public health;
- Functions as the national clearing house for all activities relating to regional and international environmental related conventions, treaties and agreements, and as national liaison with the secretariat for all such regional and international instruments; and
- Advises the state and participate in the process of negotiating, ratifying or acceding to relevant regional and international environmental agreements.

The EPA has a mandate to work along horizontal linkages with other line ministries and agencies and along vertical linkages with local government. In order to ensure effective environmental management at the local government level, the EPA Act provides for the establishment of

counties and districts environmental committees whose function is to ensure the integration of environmental concerns in plans and projects of local government and the dissemination of environmental information.

Along the horizontal linkages the most important institutions, besides the EPA, dealing with the environmental issues is the Forestry Development Authority (FDA). It has the power to protect, manage and conserve forest resources and wildlife on a sustainable basis (forest cover more than 42% of the total land area of Liberia).

Other institutions

International organizations continue to have important role in the management of Liberia environment. These include: USAID, UNDP, UNEP, UNFAO, UNESCO Conservation International, FFI and the International Tropical Timber Organization.

Liberia is a member of regional bodies that influence the protection and management of the environment including the Economic Community of West African States (ECOWAS), MRU, WARDA and the AU.

3.2.3 Policy of Booming Green Liberia, Inc.

The policy of the **Company** is in consonance with the National Environmental Policy and its objectives are anchored on the following:

A. Occupational Health and Safety

The Company is committed to the principles of sustainable development and continual improvement throughout all phases of its activities, from initial development, construction, operation and decommissioning and post closure.

The company is also committed to developing a culture and management system that supports its Safety and Health Values by encouraging behaviors and implementing processes that ensure the safety and health of all employees, contractors, customers and Community associated with its operations. Furthermore **Booming Green Liberia, Inc.** is committed to working closely with the local community to promote independent sustainable economic development.

B. Employees Housing and Recreation

The employees shall be housed well with adequate utility and service that will guard against environmental degradation. Appropriate infrastructure for recreation and relaxation shall be provided.

C. Hazardous Waste Management

"Hazardous Waste" is a solid or liquid waste exhibiting one or more of the following characteristics: flammability, corrosively, reactivity, and toxicity. Waste oil and solvents are included in this definition.

This Policy is designed to ensure that every effort is made to minimize the generation of hazardous wastes and that all hazardous wastes are properly managed and disposed.

This policy is applied to all **the Company's** employees and contractors who may generate hazardous wastes including personnel in the harvesting operations and transportation of goods and services.

The Office of Environment (OE) has oversight responsibility for the hazardous waste management program, including waste pickup, segregation, labeling, storage, disposal, inspection, road keeping and training. This department is responsible for properly managing its area. The department accumulation area must be carefully maintained and inspected weekly. Each area must be equipped with a containment tray or tub to separate incompatible waste streams.

Hazardous waste will be collected by the OE and stored at central accumulation area. This area must be secured, marked with signs and inspected weekly. In the event of a spill or accidental release, spill kits will be kept on site to facilitate a timely response and cleaning.

The OE shall conduct hazardous waste training for all **the Company's** employees and contractors who may generate work with/or near hazardous waste. Each employee covered by this program must be trained annually.

Record will be kept for all permits, licenses, hazardous waste shipping document, inspection logs, training documentation and agency correspondence. These documents will be kept on file for at least three years.

D. Petroleum Product Management

This policy is designed to ensure that Petroleum storage tanks maintained by the Management of **Booming Green Liberia, Inc.** are managed to protect the environment and the people of the **entire Yeablo Administrative District** in Grand Bassa County. This policy applies to all underground and above ground petroleum storage tanks.

The Administrative Manager is responsible for tanks installation, modification, closure and removal of out-of-service tanks in collaboration with the OE. He/ She shall also be responsible for the operation of all tanks including maintenance, repairs, annual inspections and record keeping. The office of the Environment is responsible for spill prevention and notifying the County Coordinator of the Environmental Protection Agency. The OE shall periodically conduct accident prevention briefing.

E. Air Quality Control

This policy is designed to ensure that **Booming Green Liberia, Inc.** air emission sources are operated to protect the environment and control Air pollution. The Policy applies to all emission sources including: generators, heavy-duty machineries, vehicle and auxiliary activities.

The management shall take steps necessary for the effective management of the natural environment. The intent of this action is to ensure the sustainability of the environment and to promote the participation of the members of the public in the process of integrating environmental concerns in the planning operations and ensure that any activity which may cause an adverse effect on the natural environment be assessed before such activity is commenced and that such adverse effect be taken into account in deciding whether or not such activity should be implemented.

The policy of **the Company** embodies principles of environmental management such as:

- The "Precautionary Principle" where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation.
- The "Avoidance Principle" is preferable to avoid environmental damage, as it can be impossible or more expensive to repair rather than prevent damage.

- The "State of Technology Principle" measures protecting the environment are restricted by what is technologically feasible and as the improved technology shall be used to prevent and repair environmental damage.

F. Environmental Education

The objective of this policy is to deliver effective and integrated environmental education that will build the capacity of people in the employ of **the Company** and the Community within its Community Forest

Management Contract area to move towards more sustainable behaviors; to have an informed, aware and motivated staff with sufficient training to perform their duties in a way which minimizes risks to the environment and work place.

G. Biodiversity

The policy objective here is to have integrity and diversity of the flora and fauna and the natural landscape of the project area sustainably managed.

3.2.3 Safety Policy of *Booming Green Liberia, Inc.*

A. GENERAL SAFETY RULES/CORPORATE RESPONSILITIES

1. The employer (**Booming Green Liberia, Inc.**) shall provide a safe work environment and enforce safe work practices.
2. Each employee shall be held responsible for performing all work in a safe manner so that injuries to that person and to others will be avoided.
3. Employer, supervisor, employee, or designated person shall instruct new employees in safe practices.
4. Employees shall be familiar with the location and use of all safety, emergency care, and fire suppression equipment located at the jobsite.
5. An employee shall notify his employer or supervisor before attempting any work which, in the employee's opinion, appears hazardous above and beyond normal operating conditions.
6. An employee shall report all injuries to his employer or supervisor without delay, regardless of the nature of the injury.



B. Personal Conditions

1. Any employee who has intoxicating substances in his possession, uses them on the job, or reports to the jobsite under their influence shall be removed from the jobsite immediately and shall be subject to appropriate disciplinary action by the employer.
2. Indulgence in practical jokes, horseplay, scuffling, and other actions deemed unsafe by the employer are forbidden.
3. Employees shall observe and adhere to all relevant employer operations and safety policies.

D. Seat Belts

A seat belt is provided for each vehicle or machine operator.

1. Each employee uses the seatbelt while operating vehicle or machine.
2. Each employee securely fastens seat belt to restrain the employee within the vehicle or machine cab.
3. Each seat belt is maintained in a serviceable condition.

E. Weather Conditions

Work shall be terminated and employees moved to a place of safety when environmental conditions such as but not limited to storms, high winds, heavy rain, fires, and darkness that may endanger employees in the performance of their jobs.

F. Training

1. The employer shall provide training for each employee, including supervisors, at no cost to employees.
2. Current employees assigned new work tasks, tools, equipment, or machines and new employees prior to starting work shall be trained immediately in at least the following:
 - Recognition of and preventive measures for safety hazards associated with their individual work tasks.
 - General recognition and prevention of safety hazards in the logging industry.

4.0 Project Descriptions

4.1 Location & Description

Booming Green Liberia, **Inc.** proposed Logging project is located in Zuzohn Clan, Marka Chiefdom, Yeablo Administrative District, Grand Bassa County. The project is expected to cover about **12,611 hectares**, adhering to the Forestry Development Authority regulations relevant to timber harvesting in Liberia.

4.1.1 Project Goal

The company proposed this project having an overall goal of taking advantage of opportunities existing in timber industries and the supply of quality products to foreign and domestic markets.

The project will utilize internationally acceptable timber harvesting practice. The company will also employ the state of the art timber harvesting equipment.

4.1.2 Project Components

The Project will be sub-divided in four components:

- Construction of buildings for accommodations, wastes and wood processing facilities;
- Contract area demarcation and inventory
- Roads and up-grading services
- Timber harvesting, transportation, and other activities

4.1.3 Demarcation and Harvesting of Contract Area

The **Zuzohn** Community Forest (ZCFMA) area covers about **12,611 ha**. The contract area shall be sub-divided into compartments in accordance with the FDA Chain of Custody System.

The significance of this requirement is to produce the traceability of all logs harvested in the contract area.

4.3 Construction Works for Logging

4.3.1 Roads

Roads provide needed access to the forest. At the same time, roads can produce significant amounts of sediment and can be one of the greatest adverse impacts on the local environment, on water quality, aquatic and wildlife. Roads can produce significant erosion, cause gullies, and have impact on ground water, and vegetation.

Therefore, roads should be well planned to minimize the sum of skidding and road construction impacts, which in turn will also lead to cost minimization. The most efficient spacing, of roads can be derived by looking at the cost tradeoffs between skidding distance and road spacing.

4.3.2 Road Classification

4.3.3 Two Types Of Roads To Be Considered

A. Primary Forest Roads

These are permanent, all-weather roads that provide access from public roads to the Community Forest Management Contract area. These should have quality of carrying log volumes of about 2,000m³ or more per week and may be in service during the entire logging operation of a 15-year Management Plan (CFMC) or during the operation of Community Forest Management Contract.

B. Secondary Forest Road

These are roads that provide access to a logging compartment, connecting feeder roads and log landing to primary roads. They will carry log volumes of about 1,000m³ per week and will be serviced for 1-2 times year only. Secondary roads are often upgraded to primary roads as the logging operations precede.

4.3.4 Road Planning

In planning the location of roads the following shall be considered:

- Primary and Secondary forest roads shall avoid all protected and exclusion areas and their respective buffer strip.
- Roads shall be kept at least 40m away from the edge of buffer strips (e.g. 55m from the bank of creeks, the edge of a gullies), except at designated water course crossing point.

- Roads should be located on ridges as much as possible.
- Efforts should be made to minimize the number of water course crossing, and
- Road shall be located wherever possible on well-drained soils and slopes where drainage will move away from the road. Roads should, therefore, follow the natural terrain by conforming to the contour, rolling the grade and minimizing the use of cuts and fills.

4.3.5 Road Widths

Every effort shall be made to minimize the width of the forest roads. Road widths depend on the class of road, the type of soils, and the forest through which the roads are to be constructed.

The maximum road widths for forest roads on loam and clay soils are shown in the table below:

Table: #1: Maximum road width for loam and clay soil

Road classification	Limit of Clearing meter	Limit Roadway meter	Limit of Road Bed meter	Limit of Travel way meter
Secondary Road	20	15	8	5
Main Road	25	20	9	6

Table: #2: Maximum road width for Sandy soil

Road Class	Limit of clearing	Limit of Roadway	Limit of Road Bed	Limit of Travel way
Main Road	15	11	9	6
Secondary Road	15	10	8	5



- Primary and Secondary roads on clay and loam soils should have trees removed alongside the road to allow sunlight into the road to dry the surface quickly after rain. Road on white sand soils should be protected from rain and direct sunlight by limiting crossing to the roadbed and ditches to maintain trafficability.
- On primary and secondary roads, tree stumps should be grubbed on at least one side of the road to allow for movement of tractors and other heavy machinery that would damage the road surface.
- Passing spots should be provided on road with a roadbed narrower than 7m, at least every 500m and at bridge approaches and hillcrest.

4.3.6 Crossing of water Course

The Company's Contract Area has few streams and creeks. The management will construct culverts on the creeks and streams.

The culverts shall be made of concrete ranging from one (1m) meter to two depending on the size of the stream/creeks. These culverts shall be used on the access and main roads soldered end to end two hundred (200) slitters' drums will be used on secondary roads as these roads will be used for short period of time.

Every culvert shall be placed on natural soil with good bearing capacity using non scouring materials that shall be carefully compacted; a proportionate larger of earth shall be placed over the culverts, i.e. 60cm of the earth for 100cm diameter culverts; 70cm earth for 200cm diameter culverts.

4.3.7 Road Maintenance

For all primary and secondary forest roads maintenance shall be carried out regularly and at least on an annual basis. The crown of the road surface and road shape shall be maintained to allow effective drainage. Additionally:

- Surfacing gravel or loam should not be pushed to the road edge or into drains.
- Soil vegetation and other materials that would obstruct water flow shall be removed from ditches.

- Turnout drains, culverts and bridges shall be kept clear and in a good working condition at all times.
- Bridge decking, foundation and sidewalls should be checked regularly.
- Any debris that has been pushed into the watercourse shall be removed.
- Water should flow freely under bridges, and silt traps should be cleaned regularly.

4.4 Camps and other Facilities

Booming Green Liberia, Inc. contract area (ZCFMA) has a duration of 15 years; therefore a camp will be constructed near one of the towns. Few other towns within the contract area may be improved to accommodate the company's needs. Hand pumps shall be installed in the towns as enshrined in the Management Agreement. Pits latrines shall also be installed more than 50m from a stream or water point and right above the water table. The company's offices, garages and workshops shall be located in their camps.

The company's storage facilities will be provided in the garage and workshop. All chemicals and petroleum products will be stored. Special care will be put into place to prevent these products from polluting the water courses and surrounding areas.

4.5 Timber Harvesting and Transportations

4.5.1 Harvesting

The Management of **Booming Green Liberia, Inc.** is cognizance of the numerous impact of timber harvesting on the forest ecosystem including:

- ✓ Forest structure – the population structure is changed directly by dysgenic selection, i.e. sound individuals of commercial species are taken out thereby decreasing their absolute and relative abundance and increasing the same for non-commercial species.
- ✓ Physical function of the forest runoff, percolation stream and storage discharge may change; change in runoff and infiltration may speed up nutrient loss from the soil. Large pulse of nutrients may be released from dead matter and a part of the nutrients in exported from the system in the form of logs. Additionally, due to the opening of the canopy, light tunnel, average temperature, soil structure and decomposition rate all change in specific manner.
- ✓ Wildlife Habitat – The availability of resources and habitat suitability and attributes are altered. **The Company's** Management will adopt a controlled felling system during its timber harvesting operations:



- To avoid destroying potential crop trees and regeneration, to ensure maximum safety for the felling crew, to maximize use of felled trees and facilitate favorable log position for case of extraction. Since the terrain is rough in terms of elevation, the Company will only fell those trees that their machines can reach and remove with ease.

The techniques for controlled felling involve:

- To decide whether a tree should be felled or not, the feller will have to identify potential crop tree and seed trees as reported by the inventory crew and avoid damaging them.
- Preparing the tree for felling; i.e. clear the area around the tree of all obstructions and cut all visible and accessible climbers around and next to the tree. Ensure safety of the felling crew.
- Determine the direction of the fall of the tree.
- Determine the felling height. Trees will be cut as close as to the ground as possible. Tree with small or no buttress will felled 30cm above the ground. Prove of buttress is necessary to obtain a cylindrical bole shape in order to enable the back cut to be completed before the tree starts to fall.

4.5.2 Transportation

Extraction is the first stage in the transport of logs from the stump to the saw mill/log yard. It is the Extraction of logs, after topping and butt trimming from felling site to road side landing. This involves the dragging of the logs on the forest floor along a skid trail, which dimension may be a hundred to a thousand meters. Wheeled tractors will be used to clear the track to logs to be extracted but the soil will not be bladed for secondary skid trails, the main skid trail will be bladed.

Large area/landings will be created for stock piling of logs for onward transportation. They shall be at least 60m away from water courses and where mud, debris from cross-cutting and other waste will not reach the water courses. Of the 8,000 hectares, there shall not be more than three landings, each not exceeding 0.1ha (25m X 40m).

The final stage of log transport will involve the evacuation of logs from the landings to a place or point of destination. **The Company's Management** will use trailers for this purpose.

Materials and personnel including equipment, fuel, and lubricants will be transported from integrated villages to the site of operation including forests and saw mills.

4.5.3 Primary Timber Processing

The Management will install a small scale "mighty-mite" saw mill in the contract area. This mill shall have a capacity of producing 10-15M³ of saw lumber per 8 hour shift. The input to the mill shall be an assortment of logs amounting to 30M³ 8 hour shift. During the contract period the mill will process at least 10,000M³ of logs for local consumption and the export market.

However, the Management looks forward to adding value to its operations by installing other operations such as Peeler for veneer and wood chips in the nearest future.

To install the plant, **the Company** will undertake an initial capital investment of USD50, 000. This includes the procurement of the appropriate type of machineries.

The efficient operation of a sawmill requires skilled labor force including technicians hence available trained technician will be engaged to operate the machines and local community members will be employed and trained on the job.

The installation of the mill ensures a fuller utilization of the timber species of the contract area. It will also contribute towards socio-economic improvement and enhance poverty reduction through employment of community members of the contract area and its environs. Self-employment will also be engendered by ventures such as charcoal production from by-products of the mill.

Furthermore, the selective harvesting of high-grade timber species for the export market with little consideration for the local markets which has induced the "pit sawing phenomenon" will be minimized in the district, when this mill is brought into operation.

5.0 Baseline Environment Assessment

5.1 Land Use and Land Cover

The land use and land cover of the **Zuzohn** Community Forest (ZCFMA) is characterized by shifting cultivation with patches of disturbed natural forests and settlement in the area. The cultivated land is confined to well drain soil. The land uses are mainly for crop production such as rice, cassava, etc. The major crops are rice, cassava, rubber, plantain/banana etc.

5.2 Climate

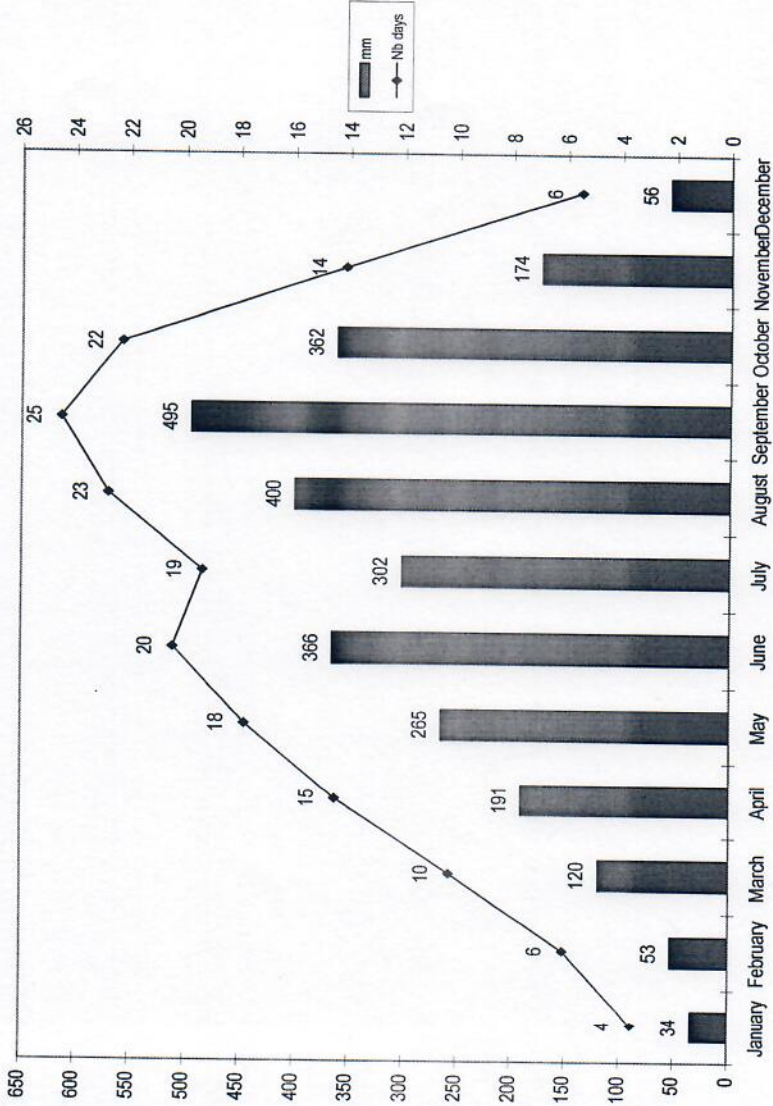
The climate of the project area is influenced by its location (Liberia) and elevation. The project site is placed in the low altitude with an elevation of approximately (210- 250m) meters above sea level. The area lies in the tropical climate zone. The main rainy seasons of Liberia runs from April to late October with heavy rainfall occurring between June and September.

5.3 Rainfall

The project area is situated within one of the high rainfall receiving areas of the country. The annual rainfall varies from 34 to 495mm and the average is estimated to be 234.8mm followed by virtual dry season from June to October. The five wettest months cover 68.3% of the total annual rainfall. September month receives the heaviest rainfall record, while January shows the lowest moisture record. (See figure- below).

The project area experiences rainfall throughout the year. However, from June to October the project area experience the heaviest rainfall. The five wettest months cover 68.3% of the total rainfall. September month receives the heaviest rainfall record, while January shows the lowest. (See figure below).

Table 3: All Estate Average Rainfalls from January to December Between 2000-2007



5.5 Water Resources

Surface water comes as the result of the outburst of the earth crust. Meanwhile, precipitation contributes to the formation of surface water but does not penetrate into the ground or return to the atmosphere. This water can be drawn from streams, river, lakes and reservoirs for human usage. Some precipitations enter the soil through the influence of gravity. Precipitation of such passed through porous materials deep into the earth and saturates pores made by micro-organism in the soil and cracks in sponge like, or permeable layers of gravel, porous rocks and sand. The water in these layers is registered as ground water. Ground water quality is usually excellent if the quantity of dissolve particles is normal, because porous materials act as filters removing suspended particles and bacteria.

5.5.1 Water Quality

The four water samples (from major streams within the forest and those used as domestic water by the Community) were collected and sent to the laboratory by FERI field Technicians. The result is attached in Tables:.....

The results from the analysis of the water samples are presented in the table below. All of the samples indicated very low pHs While the other parameters of the samples were within the WHO acceptable standard.



5.6 Human Environment (General)

The population of Liberia is about 3.5 million according to the 2008 National Population and Housing Census. About 53% lives in rural areas. The country's population is young; in 1984 it was estimated that 44% of the population was younger than 15 years of age. The percentage may be higher now due to the outcome of the prolonged civil war.

The female population is larger than the male but there are more literate males than females; the illiteracy level is about 63%. About 50% males and 76% of females are illiterate. In the rural areas 50% of the males and 69% of the females had not completed any formal education. The high level of illiteracy amongst the population can be attributed to inadequate access to educational facilities, unavailability of functional schools and economic deprivation of people in most parts of the country.

Over 82% of the population depends on wells, ponds and rivers for drinking water. Access to health services is skewed in favor of urban areas.

Unemployment stands at 85% with 1.4 million people living in abject poverty (US\$0.50/person/day). About 60% of the most productive age group (24-44 years) falls below the poverty line; most of these people depend on natural resources around them/forest for livelihood.

5.6.1 Socio-Economic Aspect (*Liberia's Social determinant*)

Liberia's population is estimated at 3.5 million, with a growth rate of 2.1 %, according to the 2008 National Population and Housing Census of Liberia.

The overall sex ratio in the population is 100.2, which means an almost even distribution of the population between males (1,739,945) and females (1,736,663). Average household size is around 5.1 persons, with indications of increasing urbanization—a challenging environmental health issue.

In 2008, the national population density was 93 persons per square mile, ranging from as high as 1,540 for Montserrado to as low 22 for Gbarpolu. The 2008 Population and Housing Census reported 17 major ethnic affiliations. Most Liberians (86 %) identified themselves as Christian, while Muslims made up 12.2 % and "Other" 2.2 %. Nationally, 47 % of the population lives in urban areas.

During the ESIA process Group of people from several communities were interviewed by the Forest & Environment Research Institute, (FERI), and Inc. Socio-economic Impact Assessment Team.



The purpose of this interview was to identify the present and future impacts due to Human activities resulting from changes to the natural environment in the project and contiguous area. The data collection instrument was used to enumerate administered questionnaires. Information from the instrument was extrapolated to determine trends for the Community within the Project area.

Most of the respondents are aware of the intervention of **Booming Green Liberia, Inc.** as company in the area. More than eighty five percent (85%) of those interviewed has been carrying on various activities in the project area. Some of these activities are as follows:

- Farming
- Hunting (low), and
- Petty Businesses etc.

The team carried out a rapid socio-economic survey in five towns/villages within the project community and the findings are below:

Zuzohn Community Forest (ZCFMA) is accessible by one main motor road. The villages and towns are lined up along this main route.

School: there is no school in the Zuzohn Clan; they want the Company to help them start an elementary school.

Clinic: there is no clinic or any medical facilities in the Zuzohn Community; sick people are mostly treated on traditional basis or critical cases driven to SOS Junction and or Buchanan. No ambulance system for community.

Safe Drinking Water: there are no hand pumps in the community; people fetch water from running creeks and streams. Find results of the creeks/streams they used for drinking, bathing and cooking in table: (See Appendix #5).

5.7 Biological Environment Terrestrial Vegetation (General)

5.7.1 Biological Environment

The upper Guinea forest which contains most of Africa biodiversity Hot Spot extending from Guinea to Togo is the portion of land Liberia is found within. 42% of the forest in this region is in Liberia. The forest can be classified into four (4) distinct types namely: The Coastal Mangrove Swamps, the Tropical Evergreen forest and the Transitional Deciduous forest. It can also be divided into four (4) classes:

- Primary Dense Forest
- Climax Secondary forest, young secondary forest, and
- Other Mix Vegetation

Biologically, the diversity of species in Liberia's forest is high because the forest is a tropical rain forest. Despite the high rate of extinction in the world, Liberia is still the home of 600 birds' species, 162 native fish species, 74 reptiles and amphibians and more than 1,000 insect species. Liberia also has over 200 flowering plants, 240 timber species and other unclassified biological forms.

5.7.2 Vegetation of the Concession Area

Zuzohn Community Forest (ZCFMA) is stock with some valuable trees species. Below is a table showing some tree species observed during the studies:

S Table le# 4: Some Tree species seen in the contract area

Botanical Name	Family	Trade Name	Class
Tetrabeliniatubmaniana	Leguminosae	Tetra	A
Heritiera utilis	Sterculiaceae	Niangon	A
Piptadeniastrum africanum	Leguminosae	Dahoma	A
Terminalia superba	Combretaceae	Frake	A
Lophira alata	Ochnaceae	Ekki	A
Sacoglottis gabonensis	Humiriaceae	Sacoglottis	B
Uapaca guineensis	Euphorbiaceae	Uapaca	B
Paninaria galabar	Rosaceae	Parinari	B
Erythrophloeum ivorense	Leguminosae	Tali	B
Bussea occidentalis	Leguminosae	Bussea	C
Fagara macrophylla	Rutaceae	Fagara	C
Anthonotha fragrans	Leguminosae	Anthonatha	C
Parkia bicolor	Leguminosae	Parkia	C
Futumia elastic	Apocynaceae	Futumia	C
AmphimaspteroCorpoides	Leguminosae	Lati	C
Bridelia grandis	Euphorbiaceae	Bridelia	D
Afzeliabracteata	Leguminosae	Alfzelia	D
Anthocleistanobilis	Leguminosae	Anthocleista	D
Vitex micrantha	Verbenaceae	Vitex	D
Cola Spp	Sterculiaceae	Cola spp	D
Pentadesmabutyracea	Guttiferae	Pentadesma	D
Masanga Cecropiodes	Maraceae	Musanga	D
Dacryodes klainerana	Burseraceae	Dacryodes	D
Xylopia staudtii	Annonoaceae	Xylopia	D
Harungana madagascariensis	Guttiferae	Harungana	D



5.7.3 Wildlife

Some large animals were observed in the area in the last two to three decades. The hunting activities of the community residents have had significant effect on the animal's population in the project area. Some of the animals seen occasionally are listed in the table below.

Table # 5a: Status of mammals and birds of forest blocks of five Communities within the Booming Green Liberia, Inc.

Mammals: status of animals per community

Mammals	Gaybeon Town	Yavoka Town	Walayour Town	Dyouwolo town	Burtay Town
Elephant	Abs	Abs	Abs	Abs	Abs
Giant Forest hog	Abs	Abu	Abu	Abu	Fa
Zebra duiker	Abu	Abu	Abu	Fa	Abu
Chimpanzee	Abu	Abs	Abu	Abu	Fa
Mona Monkey	Abu	Abu	Abu	Fa	Fa
Diana monkey	Abs	Abu	Abu	Abs	Fa
Red colobusMonkey	Abu		Abu	Abs	Abu
Giant pangolin	Abu	Abu	Abu	Abu	Abu
Olive colobus Monkey	Abs	Abs	fa	Fa	Fa
Forest buffalo s/bush cow	Abu	Abu	abu	Abu	Abu
Royal antelope	Abu	Abs	Abu	Fa	Fa
Long tailed Pangolin	Va	Va	Va	Va	Va
Crested porcupine	Va	Va	Va	Va	Va
Bush tailed Porcupine	Va	Va	Abu	Abu	Abu
Black duiker /black deer	Abu	Abu	Va	Va	Va
Cane rat/opossum	Va	Va	Va	Va	Va
Water deer	Abu	Abu	Abu	Abu	Fa

Key:

VA Very Abundant
 Abu Abundant
 FA Fairly Abundant; Abs: Absence

During the assessment of the contract area, birds such as white tailed swallow, red eyed dove and horn bill were heard in the area.

Table #5b: BIRDS: Some Birds specie noted and absent in the Contract Area

NAME OF COMMUNITY	Yabeon town	Yavoka town	Walayour Town	Dyouwolo Town	Burtay town
Crowned Hawk Eagle	Abu	Abu	Abu	Abu	Fa
AhantaFranconlin	Abs	Abs	Abs	abs	Abs
Latham's Forest tFrancolin	Abs	Abs	Abs	abs	Abs
Crested Guinea Fowl	Va	Abu	Abu	Fa	Fa
White Breasted Guinea Fowl	Abu	Abu	Va	Fa	Fa
Nkulengu Rail	Abs	Abs	Abs	Fa	Abs
Grey Wood Pigeon	Va	Va	Va	va	Abu
Red Eyed Dove	Abu	Abs	Fa	Abu	Fa
Gray Parrot	Abs	Abs	Abs	Abs	Abs
Great Blue Turico	Abs	Abs	Abs	Abs	Abs
Brown Cheeked Hornbill	Fa	Abu	Va	abs	
B/W Casqued Hornbill	Abs	Fa	Abs	Abs	Abu
Piping Hornbill	Fa	Abs	Abs	Fa	Abs
Black Casqued Wattled Hornbill	Abs	Abs	Abs	Fa	Abs
Yellow Casqued Wattled Hornbill	Abs	Abu	Fa	Fa	Abu
White Crested Hornbill	Abs	Abs	Abs	Fa	Abs
African Pied Hornbill	Abs	Abs	Abs	Abs	Abs
Red-tail Brist-lebill	Abs	Abs	Abs	Abs	Abs
Common Bulebul	Abs	Abu	Abu	Abu	Fa
Gray-headed Bristlebill	Va	Va	Va	Va	Va
Black Headed Paradise Fly Catcher	Abs	Abs	Abs	Abs	Abs

Key:

VA	Very Abundant
Abu	Abundant
FA	Fairly Abundant
Abs	Absence



6.0 Environmental Impacts Identification, Prediction and Analysis

6.1 Pre-construction Phase Impacts

Potential negative impacts associated with the pre-felling phase activities of the project include loss of vegetation from baseline and block cutting in the project area.

6.1.2 Loss of Farming Land

The project is mainly situated in Zuzohn Community land with a stock tropical trees species. The main towns and villages are situated on the main secondary road leads #2A, Grand Bassa County.

6.1.3 Construction Phase Impacts

The construction phase of the project involves clearing, land leveling, and transportation of construction materials, construction of access roads, and installation of generator and other facilities. Potential adverse impacts associated with these activities of the project are:

- Removal of vegetation, landscape and land use pattern alteration,
- Impact on air quality,
- Impact on flora and fauna,
- Nuisance noise,
- Work place accidents.

6.1.4 Removal of Vegetation, Landscape and Land use Pattern Alteration

Land clearing and removal of the existing vegetation resulting from the activities of the Booming Green Liberia, Inc., Zuzohn Community Forest (ZCFMA) **project** could be a cause for the alteration of landscape integrity, grasses, perennial vegetation and change in land use pattern in the project area. In addition, some of the indigenous commercial tropical trees species will be selectively impacted. Non-Timber Forest Products, NTFPs will be affected. Presently the community members are harvesting Xylopia, (Country spice) and locally trading it to some aliens at the rate of LRD200 for 25kg. rice bag.

6.2. Impact on Air Quality

Local land degradation due to earth moving operation during the site preparation and land leveling and other pre-felling activities are the main air quality concern of the project during the construction stage. As the impact that can arise from the problem is localized, the contribution of the project to air quality degradation is not significant. However, as the dust storm can have visibility impact on site operation and decrease breathing because of the suspended particles in the air, the problem is an important issue that requires consideration.

6.3 Impact on Flora and Fauna

Removal of vegetation and cutting trees during land preparation for timber harvesting activities, transportation and installation facilities will affect the biodiversity of the area. Potential impacts include those associated with the loss of flora and fauna Community, and increase in natural instability of the Community. However, the project site is mainly tropical primary forest with few patches of secondary forest, destruction of perennial vegetation and wildlife habitat will occur. The project site is known to be a host of wildlife which serves as an important ecosystem of indigenous tree species; therefore, the construction phase has impact on flora and fauna.



6.4 Nuisance Noise

Logging operation involves the use of machinery and vehicles. As a result some noise pollution is expected in and close to the project site. Though the logging operation doesn't involve the use of explosives or blasting machines that bring about significant noise effect, due care will be taken to minimize negative noise effect.

6.5 Work Accident

Traffic load in the process of delivering supplies to the Logging operation site coupled with the concentration of casual labor can potentially increase accident. Moreover, visibility problem that may be caused by dust storm during clearing and land leveling may create accident problem in the site operation. Work accident during felling activities may be due to lack of training, personnel protective equipment (PPE) and experience.

6.6 Operation Phase Impacts

6.6.1 Impact on Ground Water

Accidental spillage of petroleum products that may leach into the soil from filling station, fields and other places in the contract area may be the main pollution sources that can cause a likely significant impact on the ground water bodies found in the project area.

6.6.2 Impact on soil erosion

Soil erosion is another impact that can arise from logging activities; rainfall and runoff will also be higher. Moreover, the slope of the contract area undulating giving rise to rapid erosion.

6.6.3 Impacts on terrestrial fauna and flora

As the project site is known to contain forest, it serves as habitat for wildlife population in the area. Hence, the logging activities in the **Zuzohn** Community Forest (ZCFMA) will have a negative impact on the wildlife population. Some of their habitats could be destroyed by roads construction, trees harvesting and noise.

6.6.4 Impacts on Socio Economic Environment

6.6.5 Impacts on Households

Several villages are found within the boundary of the project area. Family members living in this Community will benefit from the company's presence by utilizing the employment opportunities. The Company envisioned beginning employment with a force from 45 and above initially and this figure will increase as the operations of the Company grow.

6.6.6 Environmental health: Safe Water Supply and Basic Sanitation

The provision of safe drinking water is a major problem in Liberia mainly rural communities. The communities fetch domestic water from creeks and other streams. The basic sanitary facilities in the project areas are almost none existent and those available may not be properly used. **The company** will make sure that there is provision for safe drinking water facility within areas that could be affected by the project.

6.7 Health Care Facilities and Health Programs

The Zuzohn Clan has no health facilities.

6.8 Pollution from Solid and Liquid waste from Camps and other facilities

Booming Green Liberia, Inc. will generate effluents arising from washing, camps and other facilities which could affect their environs if not well managed.

The company will manage the waste water appropriately.

6.8.1 Impact mitigation measures

6.8.2 Mitigation Measures for Removal of vegetation

The following mitigation measures are proposed to minimize and/or prevent the anticipated impacts.

- Maintaining some trees of ecological importance while clearing lands for preparation for construction of residential camps.
- Soil removed from the construction site will be redistributed for the use of landscaping.



- Creating awareness on the value of conserving biodiversity in general and indigenous species trees in particular among the workers engaged on the construction activity. In this regard, training will be conducted for workers prior to commencement of construction activities.

6.8.3 Mitigation Measures for Impact on Air Quality

To avoid any adverse consequence of visibility loss due to dust creation during operation, the practical option is to reduce vehicular speed in the project area, creation of speed breaks and regular maintenance of equipment in line with Environmental Health and Safety (EHS) and Obligated Health and Safety (OHS) guidelines, applicable for project staff and contractors.

6.8.4 Mitigation Measures for Impact on flora and fauna

Though the impact on flora and fauna loss is minimal, in order to avoid damages during the construction activities and keep the greenness of the environment, the following measures are recommended:

- Limit clearing and soil disturbance in the sites in such a way that vegetation is maintained.
- Limit and control movement of trucks and construction machineries during construction in a manner that trucks will not damage vegetation.
- Create an awareness for the local people and workers in every opportunity about the importance of vegetation cover for soil and water conservation
- Grade disturbed areas and restore landscape.

6.8.5 Mitigation Measures for Nuisance Noise

- Conducting construction at the time where most of the people are in the field
- Using modern machineries that have less nuisance noise effect.

6.8.6 Mitigation Measures for Work Accident

The following proposed measures mitigate the impact:

- Train and equip some of the workers to voluntarily serve as a traffic service person during the beginning and end of daily work



- Aware and train workforce on the safety issues during site operation and on road safety
- Put in place necessary signpost on site and near the gate
- Develop a Traffic Management Manual

6.8.7 Mitigation Measures for Impacts of Oil Spillage

The majority of organic solid wastes, fuel spillage that are generated during the project implementation will be handled appropriately.

The procedures will ensure that chemical application (construction wood and timber preservatives) rates do not exceed those recommended. It will also maintain accurate records of date and conditions of application, rate applied and effectiveness in order to guide future decisions. The project will undertake chemical application only when environmental conditions are such that the risk of movement into waterways through spray drift is minimal. The application of the agrochemicals could be delayed near watercourses if environmental conditions are not favorable. The use of chemical is to minimize insect pests' infestation with in project area.

6.8.8 Mitigation Measures for Impacts on Terrestrial Fauna and Flora

The project activities that will affect the vegetation and the terrestrial habitats will include land clearing and leveling, building access roads, felling and skidding and establishment of site facilities. The project will take all necessary measures to control the activities of the project that will affect terrestrial fauna and flora in the project area. In general the project will endeavor to protect trees of ecological significance.

As per guidelines of the Environmental Protection Agency (EPA) which provides that mitigation measures be developed to address the potential impacts on biodiversity identified in the Social and Environmental Assessment. Mitigation measures designed shall achieve no net loss of biodiversity and favor impact avoidance and prevention over reduction and compensation.

6.9 Mitigation measures for socio-economic impacts

6.9.1 Mitigation Measures for Reduction of Farming Activities

The mitigation measures for reduction of farming activities due to land acquisition and infrastructure development are:



- Giving priority for the project affected people for job opportunities available in the project;
- The project will assist in providing alternative livelihood of the affected community.

6.9.2 **Mitigation measures for Environmental health: safe water supply and basic sanitation**

The project will provide adequate clean water and basic sanitation to the affected Community, its workforce and their families by developing boreholes.

The project will prevent or minimize the potential for community exposure to water-borne, water based, water-related, vector-borne disease, and other communicable diseases that could result from project activities.

Booming Green Liberia, Inc. will provide workers with a safe and healthy working environment, taking into account inherent risks in its particular sector and enhancing awareness levels of hazards in the project's work areas, including physical and chemical hazards.

The company will take steps to prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice, it will address areas, including:

- Identification of potential hazards to workers, particularly those that may be life-threatening;
- provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances;
- training of workers; documentation and reporting of occupational accidents, diseases, and incidents;
- and emergency prevention, preparedness and response arrangements.

6.9.3 Mitigation Measure for Occupational Health and Safety (OHS)

The Company, will set a corporate minimum work age that complies with national law and Performance Standard and develop a corporate policy against employing, using or benefiting from child labor.

Occupational health and safety (OHS) refers to the range of endeavors aimed at protecting workers from injury or illness associated with exposure to hazards encountered in the workplace or while working. Hazards may arise from materials (including chemical, physical substances and agents), environmental or working conditions, or work processes (including tools, machinery and equipment).

Occupational health and safety practices include the identification of potential hazards and responses including design, testing, choice, substitution, installation, arrangement, organization, use and maintenance of workplaces, working environment and work processes ongoing training to eliminate or minimize any risks to workers.

The company is dedicated to designing an OHS policy for its workers. However, projects can also increase the potential for community exposure to risks and impacts arising from equipment accidents, structural failures, and releases of hazardous materials.

Community may also be affected by impacts on their natural resources, exposure to diseases, and the use of security personnel.

The company will ensure Community is not exposed to any pollutants and that security guards are adequately trained.

6.10 Mitigation Measure for Pollution from Solid and Liquid Waste

Wastewater expected to be generated by the company from camps and other facilities will be minimized. This waste water will be channeled to well-constructed septic tanks that will be treated regularly. The sound handling and disposal of solid wastes generated from the production process is another important aspect which is given due consideration. The mitigation measures for sound handling and disposal of the solid wastes involves packing materials production, reuse and safe disposal way. The solid waste will be disposed in the designated area following safe disposal methods.



6.10.1 Positive Socioeconomic Impacts (Expected Benefits)

The major social-economic impacts of the project are expected to emanate from its overall objectives. Hence, the following are the main positive expected socio economic impacts of the proposed project.

6.10.2 Creation of Job Opportunity

Like in other parts of the country, the majority of the populations of the project area are falling within the working age category. Logging activities involve labor; therefore, employment opportunities will be created (45-50) in the project area. In addition during construction and operation phase, it is expected that employment will progress. This is a direct impact but may also have indirect positive impact by creating job opportunity for those who engage in providing services like shops, restaurants and other services.



Table # 6: Summary of Environmental Impacts and Mitigation measures

Potential Consequence	Source of Impact	Potential for Occurrence and Areas Affected	Predicted Significance	Proposed Mitigation or Management Measure	Residual Consequence
Soils Increased sediment load in water bodies (drains and natural streams).	Erosion from Earth works in the vicinity of water courses. Erosion caused by increased runoff from tracks and the earthworks themselves.	Clearance of vegetation And earthworks will increase erosion potential and runoff rates, and hence potential for sediment load in watercourses.	Potential for slight effects.	<p>Management</p> <ul style="list-style-type: none"> Wherever possible, keep access tracks, earthworks and excavations at least 50 meters from water courses to minimize soil disturbance near, and the risk of erosion into, water courses. Design of access tracks, earthworks and excavations to include temporary culverts and appropriate drainage (e.g. frequent turn-outs to dissipate water into densely vegetated bush) to prevent washouts. <p>Mitigation</p> <ul style="list-style-type: none"> Re-vegetation of all bare and disturbed soil. 	No significant Consequence.



Potential Consequence	Source of Impact	Potential for Occurrence and Areas Affected	Predicted Significance	Proposed Mitigation or Management Measure	Residual Consequence
Pollution of soils and small water courses.	Spillages, discharges.	Several activities could, if not controlled, give rise to Various sources of pollution, primarily associated with the handling of oils and lubricants, and staff sanitation.	Potential for slight to major effects.	<p>Management</p> <ul style="list-style-type: none"> • Strict standards for the fuelling and servicing of machines and vehicles. • Containment of oils etc and preparation and implementation of spill clean-up plans. • Requirement for toilets or earth pit latrines at each work site. <p>Mitigation</p> <ul style="list-style-type: none"> • Removal and remediation of any contaminated soils in a designated site. 	No significant consequence.
Changes to soil quality.	Spillage, run-off, discharges	Several activities could, if not controlled, give rise to pollution or uncontrolled run-off.	Potential for slight to major effects	<p>Management</p> <ul style="list-style-type: none"> • Minimization of areas disturbed in the construction of replacement infrastructure. <p>Mitigation</p> <ul style="list-style-type: none"> • Strict waste management rules and spill clean-up plans. 	No significant consequence
Potential Consequence	Source of Impact	Potential for Occurrence and Areas Affected	Predicted Significance	Proposed Mitigation or Management Measure	Residual Consequence
Water					



<p>Increased sediment Load in streams.</p>	<p>Erosion from earthworks in the vicinity of water courses. Erosion caused by increased runoff from tracks and the earthworks themselves</p>	<p>Clearance of vegetation and earthworks will increase erosion potential and runoff rates, and hence potential for sediment load in water courses</p>	<p>Potential for Slight effects.</p>	<p>Management</p> <ul style="list-style-type: none"> • Wherever possible, keep access tracks, earthworks and excavations at least 50 meters from water courses to minimize construction activity near, and the risk of erosion into, water courses. • Design of access tracks and earthworks to include temporary culverts and appropriate drainage to prevent washouts. <p>Mitigation</p> <ul style="list-style-type: none"> • Re-vegetation of all bare and disturbed soil. 	<p>No significant consequence</p>
<p>Deterioration in water quality due to pollution.</p>	<p>Spillage, run off, Discharges</p>	<p>Several activities could, if not controlled, give rise to various sources of pollution, primarily associated with the handling of oils and other materials, controlling run-off and staff sanitation.</p>	<p>Potential for Minor or major effects.</p>	<p>Management</p> <ul style="list-style-type: none"> • Wherever possible, keep access tracks, earthworks and excavations at least 50 meters from water courses • Provision of staff sanitation facilities. • Monitoring of water courses prior to, during and at end of construction. <p>Mitigation</p> <ul style="list-style-type: none"> • Spill containment and clean up measures • Remediation of any contaminated water. 	<p>No significant Consequence.</p>



7.0 Environmental Management Plan

Environmental management is concerned with implementation of the measures necessary to minimize or offset adverse impacts and to enhance beneficial impacts. Unless the mitigation and benefit enhancement measures identified in the ESIA are fully implemented, the prime function of ESIA, which is to provide a basis for shaping the project so that overall environmental performance is enhanced, cannot be achieved.

In order to be effective, environmental management must be fully integrated with the overall project management effort at all levels, which itself should be aimed at providing a high level of quality control, leading to a project which has been properly designed and constructed and functions efficiently throughout its life. Hence, the overall goal of the Environmental Management Plan (EMP) of **the Company's** logging project is to minimize adverse impacts resulting from its activities by implementing and monitoring the proposed mitigation and enhancement measures.

Under this section, the way specific mitigation and enhancement measures will be implemented and monitored at the pre-felling and operation phases to overcome possible impacts of the project are outlined.

7.1 Pre-felling Phase

Prior to the cutting of blocks, boundary lines, construction and installation of equipment, plant, etc. environmental management plan should take into considerations the following recommendations:

- Ensuring that all government and concerned agency requirements and procedures related to ESIA are completed;
- Selecting of technologies, equipment and processes that minimize adverse impacts and enhance beneficial impacts;



- Preparation of detail forest management plan taking into consideration the number of blocks and annual coup to be approved by the FDA. The plan will incorporate specific features aimed at minimizing adverse impacts and enhancing beneficial impacts, and
- Preparation of contract documents which contain appropriate clause to allow control of impacts arising from the project implementation.

The implementation of above recommendations will be monitored by the Environmental Protection Agency of Liberia and other stakeholders. As the promoter and responsible organ of managing and minimizing environmental impacts due to the proposed project, **The Company** will be responsible for handling of the recommendations during the implementation of the project.

The company shall create an Environmental Health and Safety (EHS) Department and shall be headed by a Manager. Thus, the EHS Manager shall be responsible to oversee implementation of all of company's environmental and occupational health and safety programs.

The Region Environmental Protection organ as a regulatory body will ensure participation of affected bodies in the project design/plan and monitor that the project is designed in line with the national and regional environmental laws.

7.2 Construction Phase

During construction phase of the project, environmental management plan should take into account the following recommendations:

- Maintaining trees of ecological importance while clearing lands for the commencement of logging purposes.
- Top soil removed during building construction will be reused for landscaping.
- Creating awareness on the value of conserving biodiversity in general and plant species in particular among the workers engaged in logging activities.
- Proper handling wastes generated from camps and other sites,

Reduction of vehicular speed, creation of speed break, regular maintenance of equipment to reduce dust and other emissions, All wastes generated from the project area will be managed properly. Solid wastes will be disposed of in designated area.

- The construction activities are the major source of dust emission and air pollution. However, it can be managed by:
 - Discarding construction wastes in an appropriate or authorized waste management manner.
 - Preventing the generation of air pollution during the project period.
- Health and risk management should be done to avoid unnecessary impact on human health. First aid service will be provided on site, in case of serious treatment,
- They will be transported to nearest health facilities or emergency center.
- The monitoring of recommended measures and ensuring its implementations during the project life span will be carried out by the EPA in collaboration with the Environmental Health and Safety Department of the company.

7.3 Operational phase

During operational phase of the project, environmental management plan should take into account the following recommendations:

- Material Safety & Data Sheet (MSDS) will be available for many products to add to the information on the product label about the risks to the environment and how to control them,
- Replacing dusty toxic chemicals products with liquid or granular products of equivalent effect,
- Avoid leaks of fuel and drift of spray chemicals during application and preparation,
- All spray operators must wear suitable and intact personal protective equipment and clothing,
- Equip storage facilities for fuel oil, etc. with secondary containment bonding to contain spills and leaks; and



- Provide workers safety features such as showers, protective clothing, and spill cleanup kits.
- Operators, employees and or visitors that work with or get in contact with machinery that produce high noise pollution must be supplied with protective gear gadgets.

The objectives of the environmental management program at this phase of the project are: protection of the environment from environmental degradation and other pollutants, protection of workers from work area health hazard, efficient use of ground water sources, waste management, and improve the environmental performance of the company.

The Environmental and Safety officer, will be responsible for regular conducting of internal environmental management and monitoring activities. He/she will monitor all activities of the project against the plan to ensure proper implementation of recommended measures. It is expected that the local EPA's agent may follow up on the implementation of the activities against environmental laws.

Institutional Arrangement

For proper environmental management and monitoring purposes, the arrangement of concerned institutions and key actors, which will have decisive roles to ensure effective and efficient implementation of the monitoring program are essential.

The management of the proponent along with appropriate regulatory authorities would share the responsibility to supervise and coordinate all of the environmental protection measures outlined above, and to monitor the project according to existing environmental laws, regulations, and standards to organize and supervise environmental protection measures and monitor the impacts of each component of the project.

The officer will work under the guidance and supervision of the management of the proponent and in conjunction with the local environmental protection bureaus according to the requirement of the law pertinent to the pollution control, environmental impact assessment, labor and public health. The environmental and safety officer will be entrusted to take responsibility for implementation of environmental monitoring for the whole project. He/she will stipulate the monitoring techniques to be used and the appropriate standards, and quality control



measures. The proponent will compile all the relevant monitoring data and prepare regular monitoring reports.

7.4 Environmental Monitoring Program and Parameters

Environmental monitoring and data collected through it may be used not only as a guide to performance measure, but also as a source of credibility and trustfulness in the relationship with the regulatory authorities. Therefore, conducting monitoring will be of paramount importance. The monitoring targets are:

Effluents: The water quality of the project area should be monitored for potential contaminants.

Soil: Periodical analysis of soils from the fruit and vegetables field should be undertaken to monitor nutrient status.

Workers' safety: Periodic check of the safety of workers is important to prevent on-job accidents and employees health hazards.

8.0 Project Closure & Decommissioning

8.1 Project Closure

This project has a timeframe under which it ceases to exist; after the selective harvesting of timber. The possibility of continuity cannot be ruled out as the community and the company may develop another Business Plan. It therefore, recommended that the pulling out process is done with full knowledge of all stakeholders with the EPA, FDA and the Communities in the lead.

This Closure process must follow the initial procedures below:

- A letter of Intent to close operations down must be written by the Company served to the EPA, FDA, Communities and relevant stakeholders six months prior to closure actions;
- Company must create awareness in the communities for closure plan;
- Joint assessment of its facilities and the environment to identify those facilities that will be useful to the communities
- Organize joint stakeholders' meeting to conclude on the joint assessment team's findings, go back if need be;
- Finalize findings and prepare Decommissioning Plan.

8.2 Decommissioning

All installations and infrastructures identified section 8.1 and found not to be useful to the communities, even those that they want but EPA identified to cause future environmental hazards must be marked and properly removed. The Company must observe and follow the proposed procedures below:

- Mark all structures designated for removal
- All safety rules as provided in this Environmental Impact Statement, ESIS and observe straight adherence including all MSDS for all chemicals that were handled and used by the Company;
- Close all wells, hand pumps, pits and pit latrines with safe/top soil;
- No dumping metals, scraps, plastics garbage into any pit;
- Collect all metals, zinc, empty cans and plastic materials for disposal and hired EPA's certified wastes disposal entity for proper disposal;
- Decommissioning must include the active participation of the Private evaluator;
- Apply and obtain certificate of Decommissioning Process from the EPA before commencing work.

9.0 Conclusion & Recommendations

9.1 Conclusions

The objective of the government of Liberia is for the promotion of the forestry sector through which it will stimulate rapid development through its contribution to the development of the export base and rural development. The Government is constantly on the lookout to identify constraints to the development of the sector and advise on the best course of action to facilitate investment in the sector.

The government of Liberia has been actively working to create an investment climate that encourages investors through the creation of a friendly and conducive investment climate.

The private sector development on forestry has contributed to the above objectives in the following ways:

- Generation of foreign exchange. Liberia's export of forest products is one of the leading sources of foreign exchange earnings;
- The sector would create employment for thousands of workers, contributing millions in wages to the rural economy;
- Provision of new opportunities for forestry professionals and experts to develop technical skills and careers in modern logging technology that is environmentally sound;
- Contribution to the government's objective of widening the tax base;
- Contribution to rural stability through provision of jobs, incomes, public services and amenities to villages surrounding logging sites;
- Contribution to the development of other commercial activities in areas adjacent to logging projects areas; construction, building blocks, restaurant, farming, etc.;
- Development of local expertise through on-the-job training of personnel;
- Contribution to reducing rural-urban migration.

In view of the above facts, it is clear that the project has clear social and economic benefits and will contribute to the reduction of poverty.



Some of the project products will be exported and thus generate foreign exchange revenue, and contributing to promotion of economic development in the country.

The main adverse environmental impacts (potentially) that will arise from issues associated with **the company** during the project period will be minimal. Impacts will be related to the use, handling and maintenance of heavy equipment and petroleum products. The management of all of the above is intended to provide a safe occupational health and safety conditions for contractors and employees of the company. Mitigation measures are available for all of the anticipated environmental impacts and will be implemented during the project life span. The company shall mainstream the environmental management issues in its overall environmental management system.

Generally, the project will have a positive impact on the environment, although there are some temporary adverse impacts during the project implementation process.

On balance, the project has overall beneficial effects. To properly manage those environmental impacts and to tackle unforeseen situations that could occur during the Project lifecycle, the company shall adhere to Environmental Protection Agency of Liberia monitoring regime and work on proposed mitigation measures so that recommended mitigation measures are implemented and remain effective.

9.2 Recommendations

Considering the studies and interviews conducted in the contract area, it is recommended that:

- the company should assist the local community by offering employment opportunities.
- the proponent should develop environmental management system at its company level that will ensure that the company is in compliance with EPA regulations
- the company shall implement the environmental plan as enshrined in this ESIA by collaborating with relevant agencies, allocating adequate budget and recruit appropriate local experts.

- that all employees, contractors, visitors to the company respect and abide by the cultural practices of the **Zuzohn** Community Forest (ZCFMA);
- that the company assists in the provision of basic social services and infrastructure (schools, clinic, hand pumps, roads & bridges, etc.)



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Appendix 1

Map of the Zuzohn Community Forest (ZCFMA) Management Contract Area, Grand Bassa County

