GeoData (Sierra Leone)

Enabling Decision Making with Technology

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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT –MIRO FORESTRY (S.L.) LTD.

Submitted
To

Miro Forestry S.L. Ltd.

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EXECUTIVE SUMMARY

Introduction

MIRO FORESTRY (SL) LIMITED is a green-field and profit-oriented forestry group that aims to supply sustainable value-added timber products to local and regional markets, which grows mainly Eucalyptus and Acacia for the future production of transmission poles, plywood, biomass, charcoal and sawn timber. It is registered as a private limited liability company under the laws of Sierra Leone. The company currently operates within a land area of 29,980 hectares leased in 2011 for a period of 50 years from the Chiefdom Council of Yoni Chiefdom in Tonkolili district, northern Sierra Leone.

The company intends to acquire additional land areas from neighbouring communities in Yoni and Masimera Chiefdoms in Tonkolili and Port Loko districts respectively to expand on their original leasehold. It earlier conducted an Environmental, Social and Health Impact Assessment (ESHIA) Study for its operations in their leased land in Yoni Chiefdom in order to meet the Environment Protection Agency's national requirements for securing an EIA license. In compliance with the same regulations, the EPA advises the company to conduct similar studies on the new areas in order to extend the EIA Licenses to cover the new intended areas for lease.

MFSL contracts the services of GeoData SL to conduct the related investigations for the purpose of extending the EIA licenses to cover the new areas. GeoData SL therefore conducts new investigations on the new areas and produces this ESHIA document for public disclosure and submission to EPA for the extension of the EIA licenses.

The ESHIA presented in this report was guided by general best principles, practices and guidelines regarding tree plantation establishment; national legislations, regulations, standards and guidelines for projects of this nature; Environmental Impact Assessment Procedures Document (EPD 2004); Part III, Section 17 of the Environmental Protection Act, 2000; and the Terms of Reference (ToR), which was agreed between the MFSL and GeoData SL.

The objectives are as follow:

1. To appropriately assess relevant environmental issues
2. To identify potential environmental impacts associated with the development and operational phases of the project
3. To develop mitigation measures for the amelioration of environmental impacts identified in (ii) above
4. To give interested parties / stakeholders the opportunity to address any relevant issues

In the development of this document, GeoData SL obtained information from the review of the existing ESHIA on the old leased areas, desk review of related documentation, obtained from MFSL, secondary data obtained from relevant documentation in stakeholder institutions, community consultations, stakeholder engagements and ground-truthing visitations to old and new leased sites, Rapid Rural Appraisal surveys conducted in new leased areas, and analysis of soil and water samples collected at the new leased sites.

Legislative and Policy Framework

The document reviews national legislations governing environmental management issues in so far as establishment and operations of a forestry company are concerned is found in Acts and Regulations of the various government line ministries or institutions. Such legislations include:

- The Environment Protection Agency Act, 2008 as amended in 2010
- The Forestry Act, 1988
- The Forestry Regulations, 1989
- The National Protected Area Authority Act, 2012
- The National Lands Policy (2015)
- The Factories Act, 1974
- Voluntary Guidelines on Responsible Governance of Land Tenure

The document also reviews the relevant international environmental requirements, including the conventions to which Sierra Leone is a signatory and party. They include; United Nations Convention on Biological Diversity (UNCBD), United Nations Convention to Combat Desertification/Land Degradation (UNCCD/LD), Convention on the International Trade of Endangered Species (CITES), and the Stockholm Convention on Persistent Organic Pollutants. Finally, it discusses the World Bank Environmental, Health and Safety Guidelines for Forest Plantations Operations, and specifically on Sustainable forestry practices, Emissions to air, Wastewater, Hazardous materials, Solid wastes and Noise.

Potential Impacts and Mitigation actions

This exercise obtained baseline ecological, physical and socioeconomic statuses of the study area, including a detailed socioeconomic profile of the communities around the new leased land areas.

Chapter six of this document reports on potential impacts of the operations of MFSL on the communities and the environment in general, and discusses mitigation actions for the amelioration / prevention of the potential impacts. The impacts have been characterized into those that affect the biophysical environment, ecological and those which affect the socio-economic environment. For each impact, a brief description is provided as well as an analysis of its significance. The impact rating process is designed to provide a numerical rating of the various environmental impacts identified by the use of the Input-Output model. This gives the project proponent a greater understanding of the impacts of this project and the issue which needs to be addressed by mitigation and also gives the regulators information on which to base their decisions.

The socio economic survey conducted by GeoData SL in the communities around the new lease area reveal that the community members view the operations of Miro Forestry SL

Ltd as beneficial, a means of development, a good company and have added value to their lives, it is anticipated that there are a wide range of environmental, social and health impacts that may be caused by the operations of the company. Impacts were assessed in terms of anticipated effects of the company's operations on the receiving socio-economic environment, on the directly affected households and land leasing families at the community and district level, and impacts on the national economy and international level (where applicable). The assessment is based on data collected during the socio-economic survey carried out for the ESIA and the findings of focus group interviews and community consultation meetings.

The company has an important impact on the local economy of the Yoni Chiefdom, Tonkolili District and the national economy generally mainly through the payment of taxes and surface lease rent, agreed reforestation fees to the consolidated fund, local job creation, corporate social responsibility work, local capacity building, as well as infrastructure (bridges, feeder roads) and service provision to land leasing communities. Concurrently, it is likely that the company has indirectly contributed to towards population migration into the broader company operational areas (in particular Mile 91), pressure on available arable land and an associated pressure on local services and infrastructure.

This overview of socioeconomic assessment shows that residents in the land leasing chiefdoms are predominantly farmers doing subsistence farming and low living standards and quality of life in the chiefdom. It is in this context that the company can make significant contribution through the provision of services and infrastructure and socio-economic investment at the chiefdom level and by extension at district level. Since 2014, Miro has contributed to local and national development and it is anticipated that the continued operations will support local economic development for as long as they are in operation in the chiefdoms.

Against this background, it is likely that the operations of the company in the new leased areas will increase the magnitude of impacts discussed for the original lease areas. However, it is anticipated that this extension will not result in any new significant negative social impacts but rather significant positive social impacts. It is anticipated that the overall company impact will predominantly be of a cumulative nature.

In terms of contribution to mitigation to climate change, Miro Forestry (SL) Ltd current stock of standing forest is 4,100 ha (end of 2017 and adding over 1,500 ha every year until their standing forest is about 12,000 – 14,000 ha by 2024. Thus, the company will be providing over 12,000 – 14,000 ha of carbon sink that would absorb the excess carbon from the atmosphere in Sierra Leone. With this quantity of forest cover, the company will be increasing the vegetation cover, productivity of the soils and soil organic carbon content of the soils around the entire land area that has been leased to the company. This will contribute greatly to mitigating the effects of climate change in the Tonkolili and Port Loko Districts and by extension the land area in the country. This is positive in terms of the impact of the company's operation in the country.

CHAPTER 1

1.0 INTRODUCTION

1.4 Overview

MIRO FORESTRY (SL) LIMITED is registered as a private limited liability company under the laws of Sierra Leone. It operates within a land area of 29,980 hectares leased in 2011 for a period of 50 years from the Chiefdom Council of Yoni Chiefdom in Tonkolili district, northern Sierra Leone. The company is a green-field and profit-oriented forestry group with the aim to supply sustainable value-added timber products to local and regional markets, which grows mainly Eucalyptus and Aacia for the future production of transmission poles, plywood, biomass, charcoal and sawn timber. As of 2017, the company has developed towards an ultimate scale of approximately 12,500 hectares of planted standing timber.

In compliance with the regulations of the Environment Protection Agency Act of 2008 as amended in 2010, MFSL Limited earlier conducted an Environmental, Social and Health Impact Assessment Study for its operations in their leased land in Yoni Chiefdom in order for the company to meet the EPA-SL's national requirements for securing an EIA license. Due to certain complications, however, not all of the leased land area has been available for the company's operations. The company therefore intends to acquire additional land areas from neighbouring communities to expand on their leasehold. In order to fulfill the EPA regulations for the extension of the EIA Licenses to the new intended areas for lease, the EPA advises the company to extend the previous studies to the new areas. The new areas have been grouped into three sites, with each of the new site having a core area that the communities would lease to Miro and there are possibilities to extend those core areas.

The ESIA document for the original leased areas, which has been approved and on the basis of which the EPA granted EIA Licenses to Miro was prepared by Environmental Consulting Services. MFSL has subsequently secured the services of GeoData SL to conduct related investigations on the new areas for the purpose of extending the EIA

licenses to cover the new areas. Table 1 gives a breakdown of sizes, core areas and number of communities in the new areas.

Table 1:

SITE	AREA OF BOUNDARY (ha)	CORE AREA (ha)	No. of Communities
1	4,200	1,200	7
2	2,600	600	5
3	1,200	1,200	2
4	6000	6000	10

Breakdown of total area, core area and number of communities in the sites comprising the new lease

GeoData SL therefore conducts new investigations on the new areas and incorporates the findings into the existing ESIA to produce a final ESIA that covers both old and new leases for public disclosure and submission to EPA for the extension of the EIA licenses.

1.5 Objectives

Specifically, the objectives of the ESIA are as follow:

1) To appropriately assess relevant environmental issues
2) To identify potential environmental impacts associated with the development and operational phases of the project
3) To assess the social situation in the area to ascertain the extent of any potential social impacts
4) To develop mitigation measures for the amelioration of environmental and social impacts identified in (3) above
5) To give interested parties / stakeholders the opportunity to address any relevant issues

This ESIA seeks to present the proposals and the results of specialist assessments in a clear and unbiased manner and has been produced to accompany the application referred to above. The study was guided by:

- Part III, Section 17 of the Environmental Protection Act, 2000
- Environmental Impact assessment Procedures Document (EPD 2004)

- National Legislations, regulations, standards and guidelines for projects of this nature
- The Terms of Reference (ToR), which was agreed between the client and consultant for this assignment.
- General best principles, practices and guidelines regarding tree plantation establishment.

The study was conducted during the months of October and November2017.

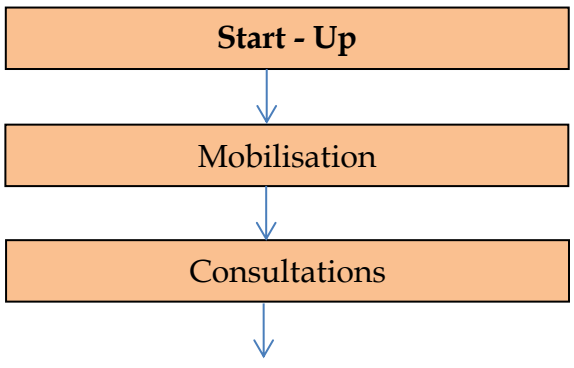
1.6 Methodology

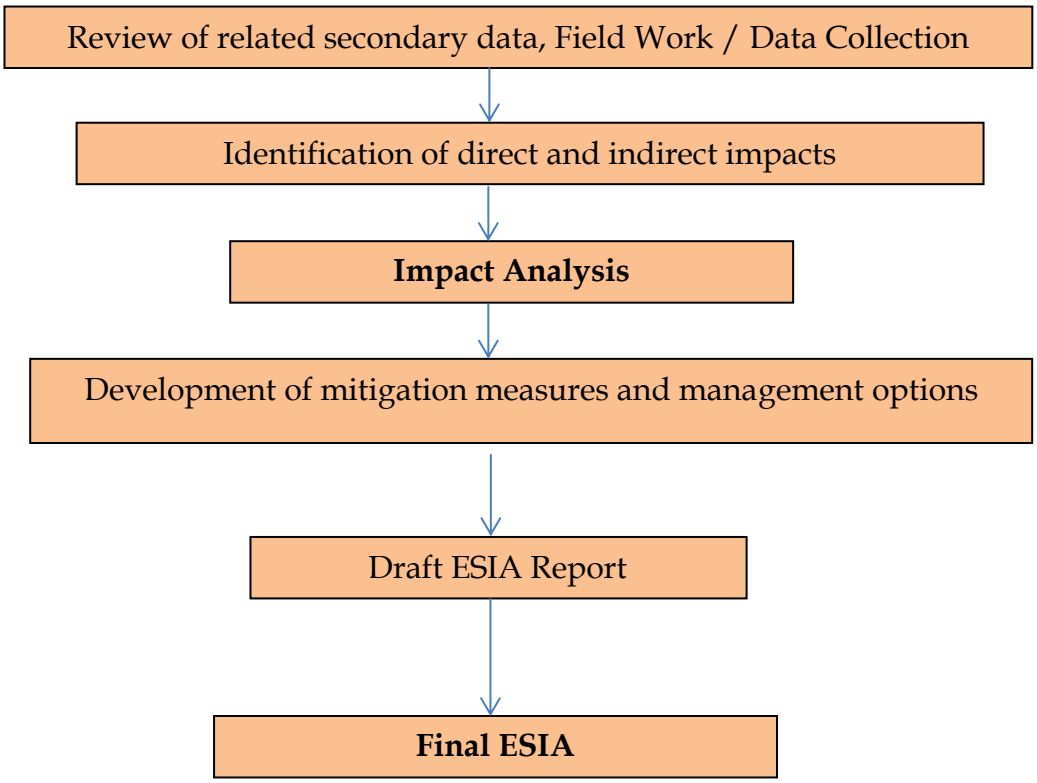
The methodology used to obtain information contained in this report was consistent with the technical approach and methodology outlined in our technical proposal for this assignment. It included:

- Information obtained from the review of the existing ESIA on the old leased areas
- Desk review of related documentation, obtained from MFSL
- Secondary data obtained from relevant documentation in stakeholder institutions
- Community consultations, stakeholder engagement and ground-truthing visitations to old and new leased sites
- Rapid Rural Appraisal surveys conducted in new leased areas.
- Analysis of soil and water samples collected at the new leased sites.
- Application of GIS technology to develop related maps.

The following is a schematic layout of the methodology used in this assignment;

Figure 1: Schematic layout of methodology





CHAPTER 2

2.0 PROJECT BACKGROUND & DESCRIPTION

2.1. Background

Miro Forestry (SL) Limited ("MFSL" or the "Company") is a profit-oriented forestry company operating in Sierra Leone to supply sustainable value-added timber products

to local and regional markets. The Company primarily invests in fast-rotation tree species, including various Eucalyptus species, teak, acacia mangium, Gmelina and pine for the future production of transmission poles, plywood, wood biomass, charcoal and sawn timber for the local market. The Company currently leases 29,980 hectares of land directly from the Government, Chiefdom and Individual land owners.

The lease is negotiated for a period of 50 years with the option of renewal for another 50 years. The company pays a rental fee of US$2.5/ha/annum, US10.50 for every hectare of land that is planted, and 5% of its net profit to the community. The current lease area is predominantly degraded farm bush – originally forested area converted into farm bush through long term exploitation (over 100 years) by slash and burn agricultural practices.

MFSL planned to plant 250 hectares of land in 2014, and 700 to 1500 hectares in subsequent years. As of 2017, the company has developed towards an ultimate scale of approximately 12,500 hectares of planted standing timber.

The company intends to acquire additional land areas from neighbouring communities to expand on their leasehold. The new areas are within a boundary of 14,000 hectares, with a core area of 9,000 hectares, largely within Yoni chiefdom in Tonkolili district and extending into Masimera chiefdom in Port Loko district in the northern region of Sierra Leone.

Figure 1 is a map of the new lease area proposed for the extension of planting of timber in Yoni and Masimera chiefdoms in Tonkolili and Port Loko districts respectively. Blocks D and E are in Yoni chiefdom. Block F is in Masimera chiefdom.

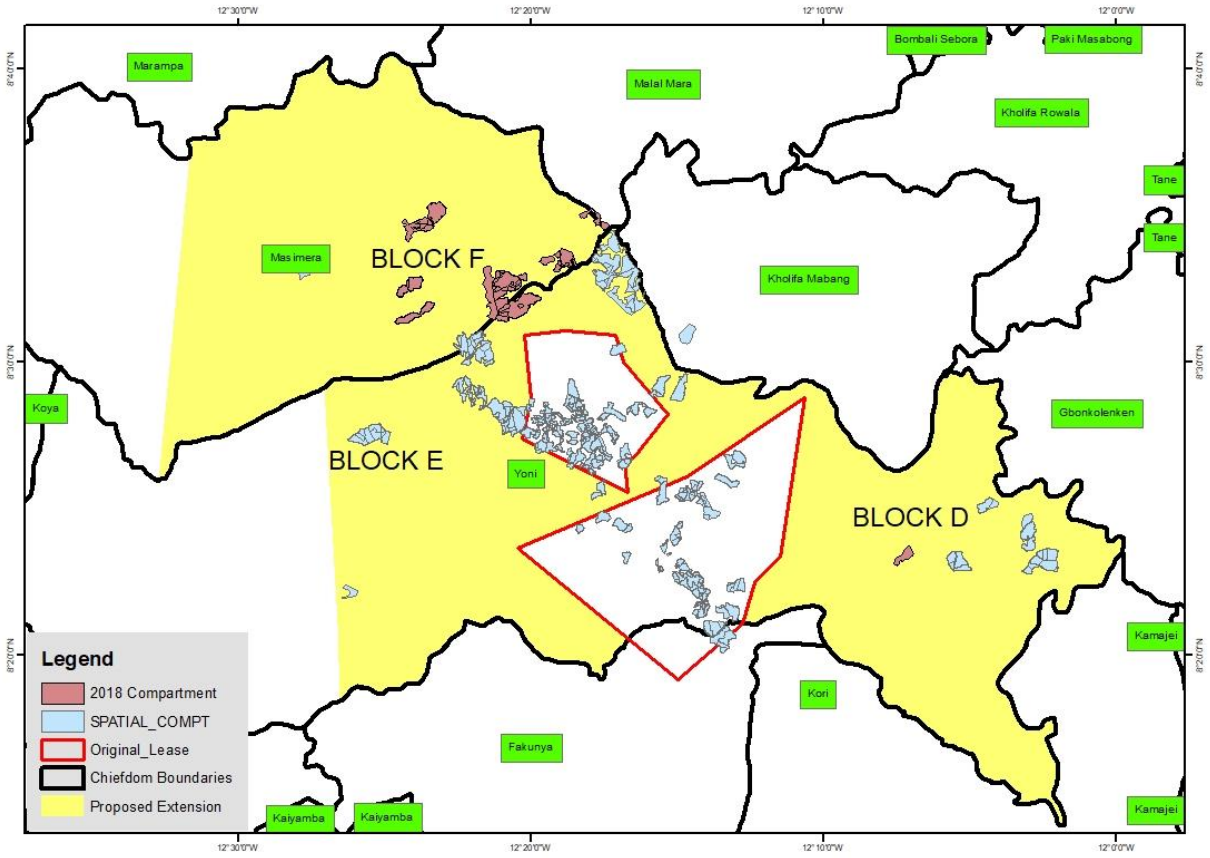


Figure 2.1: Map showing the project area of MFSL

2.1.3 Objectives of the project

Although it is a profit-oriented company, MFSL seeks to improve the livelihoods of the land owning communities and contribute towards the alleviation of poverty in their operational areas. The specific objectives of MFSL's social interventions are as follow:

a) To contribute to the improvement of the economic and social lives of the land owning communities.
b) To improve the livelihoods of communities through social development programmes.
c) To provide employment opportunities to the land owning communities.
d) To help and improve the health and sanitation of the land owning communities.

2.1.6 Company profile

Miro Forestry Limited is now registered in the United Kingdom with UK Companies house, at the following address:

Miro Forestry Company
117 George Street
London W1H 7HF
United Kingdom
General Enquiries
info@miroforestry.com
+44 (0)203 675 0994

In Sierra Leone, it is registered with Registration Number 984/2011, with a registered address as:
/o B&J Partners Solicitors,
2nd Floor,
16 Wilberforce Street
Freetown

CHAPTER 3

3.0 LEGISLATIVE AND POLICY FRAMEWORK

3.1 Introduction

The operations of MIRO FORESTRY (SL) LIMITED would be influenced by several policies, laws, regulations and multi-lateral environmental conventions Sierra Leone has signed up to specific to areas of environmental management, and the establishment and operations of forestry plantations in Sierra Leone.

Principally, the Sierra Leone Environment Protection Agency Act, 2008 and its 2010 amendment require an Environmental Impact Assessment for projects that would have a significant impact on the environment. Conversion of land to forestry plantations and its ancillary activities are listed in the First Schedule of the Sierra Leone Environment Protection Agency Act, 2008 and its 2010 amendment as requiring an Environmental Impact Assessment. The First Schedule states that an EIA Licence is required for projects whose activities involve or include among others substantial changes in renewable resource use (e.g. conversion of land to agricultural production, forestry or to pasture land, rural development, timber production). Thus, there is a statutory requirement for conducting an EIA for this project.

Similarly, provisions in a number of national legislations and their regulations as well as international conventions Sierra Leone has signed up to have relevance to the establishment and operations of this project. An overview of all such legal instruments and the competent authorities vested with the mandate to implement these instruments is provided in this Chapter.

3.2 National Legislation

Legislation governing environmental management issues in so far as establishment and operations of a forestry company are concerned is found in Acts and Regulations of the various government line ministries or institutions. Such legislations include:

- The Environment Protection Agency Act, 2008 as amended in 2010
- The Forestry Act, 1988
- The Forestry Regulations, 1989
- The National Protected Area Authority Act, 2012
- The National Lands Policy (2015)
- Renewable Energy Policy, 2016
- The Factories Act, 1974
- Voluntary Guidelines on Responsible Governance of Land Tenure

These documents are available locally or online and can be obtained from the institutions to which the Acts refer for consultation by potential users of the land and communities on whose lands the company's operations are going to be impacted and have an effect on the environment.

3.3 Extracts from the Acts pertinent to the use of the environment for establishment and operations of Miro Forestry (SL) Limited.

3.3.1 The Environment Protection Agency Act, 2008 and its 2010 Amendment.

This Act was enacted by the President and Members of Parliament as a legal instrument on the 11th September, 2008 and amended on the 23rd July, 2010. The Act established the Sierra Leone Environment Protection Agency to provide for the effective protection of the environment and for other related matters. Following the enactment of this Act, a National Environment Protection Agency Board was established within the Agency. The Board facilitates coordination, cooperation and collaboration among Government Ministries, Departments and Agencies, Local Councils and other Civil Society Organizations in all matters relating to environmental protection. The Agency, subject to this Act, is also the focal point for the implementation of the multi-lateral environmental conventions Sierra Leone has signed up to.

3.3.1.1 Projects Requiring an Environmental Impact Assessment (EIA) License

According to this Act, an EIA Report is demanded for certain types of project activities. The EIA Report should be submitted to the Agency and after a review has been done by the Agency, the Agency would submit its review to the Board. The Board may approve or disapprove the issuance of an EIA License if it envisages that the company's activities would have a significant adverse effect on the environment and the communities where it is carrying out its operations.

Projects requiring an EIA are those as given in the First Schedule of the Act, whose activities involve or include the following with respect to the conversion of land to forestry plantation:

- Substantial changes in renewable resource use (e.g. conversion of land to agricultural production, forestry or to pasture land, rural development, timber production;
- Substantial changes in farming and fisheries practices (e.g. introduction of new crops, large scale mechanization or use of chemicals in agriculture;
- Exploitation of hydraulic resources (e.g. dams, drainage and irrigation projects, water basin development, water supply);
- Infrastructure activities (e.g. metallurgical plants, wood processing plants, chemical plants, power plants, cement plants, refinery and petro-chemical plants, agro-industries);
- Waste management and disposal (e.g. sewage systems and treatment plants, landfills, treatment of plants for household and hazardous waste).

3.3.1.2 Other Sections of the EPA Act, 2008/2010 Relevant to the Operations of the Company

Subject to the Sierra Leone Environment Protection Agency Act, 2008 and as amended in 2010, other conditions relevant to guide the operations of the company are also provided in this Section.

Section 34 states that where (1) (a) the terms and conditions of a licence are not being complied with or have been contravened; or (b) there is substantial changes in the operations of a project resulting in an adverse effect on the environment, the Executive Chairperson may, after consultation with the Board, (i) cancel the licence; (ii) suspend the licence for such a time as he/she thinks appropriate; or (iii) impose additional or modified conditions for the licence. (2) The Executive Chairperson shall notify the holder of a licence which has been cancelled, suspended or on which additional conditions have been imposed, of such cancellation, suspension or imposition of additional conditions. (3) The Executive Chairperson may, in addition to subsection (1) require the holder of the licence to take measures to abate such adverse effects on or remedy any damage to the environment where necessary. (4) Any person aggrieved by a decision to cancel or suspend a licence may, within thirty days of the notification of the cancellation or suspension appeal to the High Court.

Section 35 (1) also states that EIA Licences are not transferable. Section 35 (2) further states that where prior to the issue of a licence in respect of a project the ownership, control or management of that project changes, the previous owner and the new owner shall notify the Executive Chairperson in writing within fourteen days of the transfer of ownership, control and management. Section 35 (3) states that upon notification pursuant to subsection (2), the new owner shall be deemed to be the applicant for a licence and subsection (4) states that where after the issue of a licence in respect of a project the ownership, control or management of that project changes, the previous owner and the new owner shall notify the Executive Chairperson of the transfer within fourteen days of the change of ownership, control or management.

3.3.1.2 Compensation

The President, as amended in the EPA 2010 Act, has the authority as stated in Section 33 to prescribe fees for licences issued under this Act. This is to guarantee payment of compensation for any damage, resulting from the operations of the company/project, or to guarantee payment for the preventive measures for rehabilitation where necessary.

3.3.2 Forestry Policy and legal Framework relevant to Miro Forestry (SL) Limited Operations

3.3.2.1 The Forestry Act, 1988

This Act was approved by Parliament, signed by the President and came into operation on the 1st July, 1988. In this Act, the Chief Conservator of Forestry, with the directives from the Minister of Agriculture, Forestry and Food Security, is responsible for the implementation of the Act and its Regulations. He therefore has the mandate of promoting and assisting the practice of forestry in agricultural, pastoral and other areas of the country in order to ensure the continued local supply of forest products and the protection of soil and water resources.

Part 1 of this Act provides a definition of a "Concessionaire" as a holder of a forest utilization concession or a forest plantation concession. Miro Forestry (SL) Limited clearly falls under this definition and as such can be referred to as a concessionaire.

3.3.2.2 Details required for Concession Areas

The initial operation of a forestry plantation is normally initiated by the concessionaire securing an agreement with the Minister, by extension the Government, and the land owning families. Part IV, Section 13 (1) states that the Minister may enter into an agreement with any person for a concession to utilize any area of national forest classified for production forestry. Section 13 (3) of Part IV states that every concession agreement shall specify:

(a) the boundaries of the concession area;
(b) the customary and other rights affecting the concession area
(c) the right granted to the concessionaire;

(d) the type and size of the wood conversion and processing facilities to be operated by the concessionaire and the schedule of their operation;
(e) the quantity of logs, if any, that may be exported and the conditions under which they may be exported;
(f) a programme for the training and employment of Sierra Leoneans in all phases of the operation;
(g) the payment, in addition to any fees imposed under this Act, which the concessionaire agrees to pay in respect of operations pursuant to the concession agreement;
(h) the amount of the bond or other security that the concessionaire agrees to guarantee his performance under the concession;
(i) the compensation to be paid by the concessionaire for any failure to fulfill the terms of agreement.

3.3.2.3 Details of the time limits in a Concession Agreement

The Forestry Act, 1988 provides time limits for forest plantation concession agreements. Part IV, Section 15 (1) states that a forest utilization concession shall be valid for a period not exceeding ten (10) years, except that such period may extend to twenty five (25) years if the concession agreement provides for an integrated wood based industry that converts substantially all of the forest produce extracted under the concession into the most highly processed products for which the different kinds of produce are technically and economically suitable.

However, Part IV, Section 15, (5) also states that a forest plantation concession shall be valid for a period equal to the estimated optimum growth cycle of the forest vegetation to be planted and to an additional period determined in accordance with the provisions of Section 15.

In this Act, Part IV, Section 16, subsection (3) indicates that a forest plantation concession shall be subject to the provisions of Section 13 except with respect to payments which

shall be governed by subsection (3). And subsection (3) of Part IV, Section 16 states that a forest plantation shall be subject to the following payments by the concessionaire:

(a) with respect to the forest produce felled, taken or extracted in the initial clearance of the land, all fees payable under this Act or regulations made hereunder, subject to refund of the reforestation fees if approved planting is accomplished on schedule;

(b) the amount of rent payable under Section 10 (20 with respect to the land

(c) With respect to the felling or extraction of forest produce planted by the concessionaire the Mano River Union Training Fee and reforestation fee prescribed under Section 17 subject to refund of the reforestation fee if approved reforestation fee of works are accomplished but no other fee shall be payable in respect of such produce unless payment of such fee is specified in the concession agreement.

3.3.2.4 Reforestation Fee

The Act places serious emphasis on preservation of our forestry resources in the country and thus has ruled in Section 17 that any concessionaire permitted to operate plantation forestry shall be liable to pay reforestation fee.

This regulation may not apply in this case as the company is planting on completely deforested or degraded land. The company may, however, pay a reforestation fee to the Forestry Division as an offset fee to their activities. The fee shall be agreed upon by the company and the Ministry of Agriculture, Forestry and Food Security (Forestry Division).

3.3.3 The Forestry Regulations, 1989

Section 32 of the Forestry Act, 1988 confers upon the Minister of Agriculture, Forestry and Food Security, to make regulation that gives effect to the Forestry Act, 1988.

In Part 11, Section 1, the Forestry Regulation requires any person or company operating a private forest to develop a management plan that shall be approved by the Chief Conservator of Forest. Section 8 (1) of the Regulation requires the owner of any private forest to prepare a annual logging plan to be submitted to the Chief Conservator of Forests and the logging plan shall specify (i) the blocks or block proposed for logging for the year; (ii) the system of felling to be employed in the felling compartment and the minimum girth limits where selection felling is employed; (c) the sequence of felling compartments; and it shall be an offence to carry on operations without a current logging plan approved by the Chief Conservator of Forest.

In Part 11, Section 4, the regulation requires the management of any company, firm or corporation shall cause to be conducted on the approval of the Chief Conservator of Forest a hundred percent stock inventory of the Forest Resources within the areas of the concession or permit and shall make such results available to the Chief Conservator of Forest. Part 11, Section 5 (i) also requires any company or firm operating a private forest to submit to the Chief Conservator of Forest before the 3rd day of every month a Forest Product Returns in a form specified in the Fourteenth Schedule of the Regulation. Failure, according to Section 5 (ii), on the part of companies or firms to comply to this regulation shall cause the Minister to suspend the licence of the firm or company until all returns that are in arrears are made good.

Part 11, Section 6 states that any company or firm operating a private forest shall provide the Chief conservator information of the total area exploited or logged during the preceding year, together with a map showing such area and logging progress. Section 7 also stipulates that the concession area to be divided into blocks and felling compartments not later than six months of the grant of the concession. The annual logging plan shall also be communicated to the Chief Conservator for his approval before the beginning of each year's operation not later than the 1st day of February in every year according to Section 8. In this same Part, Section 9 specifies minimum girth limits especially in a case where the girth limits for any logging have not been specified in a logging plan.

Part 111 of the Regulations details the licensing fees and stumpage fees as set out in the Fifth Schedule. Royalty fees to land owning families and Chiefdom Administration are also detailed out in Part 111, Section 3 and 4 with respect to all merchantable timber felled or extracted in any national Forest, community forest or unclassified or private forests. The distribution of royalties shall be 50% to land owning families, 40% to the Chiefdom Administration and 10% to the Paramount Chief. A reforestation fees as set out in the Fifth Schedule shall also be paid.

All royalties and fees shall be adjusted annually to accommodate for inflation and other market fluctuation according to the following formula:

$$\text{Current royalties for 1 cu ft} \times \frac{\text{Current Selling Price for 1 cu ft} - \text{Previous Selling Price for 1 cu ft}}{\text{Previous Selling Price for 1 cu ft}} + \text{Current royalties for 1 cu ft}$$

Survey of timber prices shall be carried out by the Chief Conservator prior to making adjustments and all logging companies and sawmills shall be required to submit audited accounts to the Chief Conservator against the last day of February each year.

The Forestry Regulation is also specific on the transport of wood fuel. Part VII, Section 18 states that no person shall transport more than 100 kilograms or 50 kilograms of charcoal in a single load unless under the authority of a permit issued under Regulation 19. Regulation 19 requires that an application should be made for the production of charcoal as set out in the Fourth Schedule of the Regulation and a payment of a licensing fee of fifty Leones per quarter. A licensing officer may issue a permit to transport fuel wood or charcoal upon completion of the application.
Section 21 (2) states that a permit to produce charcoal for local use shall be in the form set out in the Sixteenth Schedule and shall be valid for one burn. Upon application to produce more than two cords intake per kiln the licensee shall pay the following fees:

Cords	Le
3-55	200.00
5 – 20	500.00
Over 20	1,500

Section 21 (5) states that approved reforestation measures shall be undertaken by the charcoal producer in the area under charcoal production. In this case, however, as Miro is planting in completely deforested or degraded and producing charcoal in their degraded lease areas, this regulation may not apply.

Section 22 (1) of the Regulation states that no person shall export charcoal except when authorised by issuance of a permit.

Section 22 (2) requires that upon application for the export of charcoal as set out in the Nineteenth Schedule and a payment of a license fee of five hundred Leones per ton, a licensing officer may issue a permit to export charcoal as set out in the Fifteenth Schedule.

Part VII of the regulations details the wood fuel transport permits as stated below:-

- No person shall transport more than one hundred kilograms of fuel wood or fifty kilograms of charcoal in a single load except under the authority of a permit issued under regulation 19.
- Upon application, a licencing officer may issue a permit to transport fuel wood or charcoal.
- A permit to transport fuel wood or charcoal shall be in the form set out in the thirteenth schedule
- A permit to transport fuel wood or charcoal shall be valid for such period not exceeding one year as may be stated therein provided payment is on a quarterly basis.
- A permit to transport fuel wood or charcoal shall be subject to the following conditions, in addition to any other conditions that the licensing officer may enter therein-

a) The permit holder may only transport fuel wood acquired from persons and in places specified in the permit

b) The permit holder shall maintain a register in which hall be recorded the quantity and sources of all fuel wood transported daily

- No person shall produce charcoal except under the authority of a permit.
- Upon application in the form set out in the Eighteenth Schedule and stating whether for export or domestic use and the payment of a license fee or not more than two cords of fuel wood, a licensing officer may issue a permit to produce charcoal.
- A permit to produce charcoal for local use shall be in the form set out in the Sixteenth Schedule and shall be valid for only one burn.
- Upon application to produce more than two cords intake per kiln the license shall pay the fees.
- Permit for kilns larger than 5 cords per charge can only be issued in a fuel wood surplus area as determined by the Chief Conservator.
- Approved reforestation measures shall be undertaken by the charcoal producer or wood supplier in the area under charcoal production.
- No person shall export charcoal except under authority of a permit.
- Upon application in the form set out in the nineteenth schedule and payment of license fee per ton a licensing officer may issue a permit to export charcoal as set out in the fifteenth schedule.

3.3.4 The National Protected Area Authority (NPAA) and Conservation Trust Fund (CTF) Act, 2012

This Act was signed as a legal document on the 5th October, 2012 and established the Authority and Conservation Trust Fund. The mandate of the Authority/Conservation Trust Fund is to promote biodiversity conservation, wildlife management, research, provide for the sale of ecosystem services in the National Protected Areas and to provide for other related matters.

3.3.4.1 Sections of the NPAA/CTF Act, 2012 relevant to the operations of Miro Forestry (SL) Limited

In Part 111, Section 12 (2), of the Act, it states that the Authority, without prejudice to the generality of subsection (1) has responsibility to (a) ensure the protection of natural ecosystems and threatened biodiversity in Sierra Leone including the establishment and maintenance of representative and sustainable samples; (b) oversee the management of local and private nature reserves and sanctuary throughout Sierra Leone including zoos and wildlife, rescue and rehabilitation centres; (c) supervise the management of wildlife outside conservation areas; (d) regulate wildlife conservation and management throughout Sierra Leone in accordance with the Wildlife Conservation Act, 1972 (Act No. 27 of 1972); (g) develop and implement wildlife conservation education programmes throughout Sierra Leone; (h) promote biodiversity research; (n) prepare detailed inventory and mapping of fauna and flora; (o) establish a detailed biodiversity monitoring programme including a GIS unit that would store and disseminate data on the status of biodiversity in Sierra Leone; (p) carry out other functions and programmes as may be necessary for the attainment of the objects of the Authority including- (iii) development of national biodiversity and conservation policies in line with international best practices; 9iv) preparation of national strategic action plans for the conservation of key biodiversity species such as Pygmy Hippopotamus; (viii) overseeing the implementation of CITES; (xi) promoting policies for enabling by local forest edge communities to participate and co-manage national resources inside and outside National Protected Area;

3.3.5 The National Lands Policy (NLP), 2016

The National Lands Policy approved by Cabinet in November, 2016 manifests the aspiration of Government's efforts to address the major issues related to land management and administration in Sierra Leone. The aspiration of this policy is to move towards a clearer, more effective and just land tenure system that shall provide for social and public demands, stimulate responsible investment and form a basis for the nation's continued development.

Specifically, it enunciates Policy Statements in respect of the key components of the National Land Policy such as access to land and tenure, land use, regulation and the management of special land issues, land administration structures, land laws and the Constitution.

The vision for the Sierra Leone Land Policy is to have an effective land tenure and management system that will provide for clearly defined ownership forms and rights, tenure security, effective and transparent land administration, and, foremost, ensure equitable access to land for all citizens and stimulate responsible investment for the nation's continued development.

3.3.5.1 The Guiding principles of the NLP as it relates to Miro Forestry (SL) Limited

The following principles have guided the shaping of this National Land Policy (NLP) and will shape its implementation. The National Land Policy has been shaped around the following guiding principles and Miro Forestry (SL) has to take cognizance of these principles:

- Principles of development
- Political principles and conflict sensitive principles

- Socio-economic principles
- Economic principles
- Principles of consultation and participation
- Cultural principles
- Gender equality principles
- Administrative principles/implementation strategy principles
- Monitoring and evaluation and policy adjustment principles

3.3.5.2 The Guiding Principles of the NLP as it relates to Access to Land for Responsible Investment for companies such as Miro Forestry (SL) Limited

Chapter 6.4 of the NLP states that Government shall create an enabling environment to attract responsible investments (both domestic and foreign) in accordance with established laws and procedures without exceptions. Government shall adopt measures to ensure that investors act responsibly, respect human and land rights, do no harm to food security, local livelihoods and the environment. The following implementation strategies shall be adopted during the implementation of the Policy:

a) Non-citizens shall not be granted interest in land greater than leasehold for 50 years in respect of all land in Sierra Leone; the exact term to be determined in accordance with the investment objectives of the non-citizen;

b) Land area to be acquired for any single investment shall generally not exceed 5000 hectares. Additional land may be acquired in accordance with Guidelines to be developed;

c) Government and all agencies involved in attracting responsible investments, both local and foreign, shall take measures to:

i. Support a community-led land bank scheme for responsible large-scale investments, with among others, clearly defined rules on participation and decision-making;

ii. Set up clear and transparent procedures and criteria to ensure the full participation of all relevant stakeholders, landowners and land users in the systematic or ad hoc identification of land suitable for responsible investment or for establishing of land banks for the purpose of allocating land to investors;

3.3.6 The National Renewable Energy Policy, 2016

The purpose Policy sets out Government principles, objectives and strategies for renewable energy. It furthermore commits Government to many enabling actions, to ensure that renewable energy becomes a significant part of its energy portfolio over the next fifteen years.

The Policy statements of the Policy are as follows:

- GOSL will Government intends to strategically develop the renewable energy resources in the future in a systematic way. The policy challenge for the Government will be to provide sufficient incentive for the renewable energy sector to develop, grow and to be sustainable in the long term.
- GOSL will effectively harness non-fuel wood biomass and bio energy resources and integrate them with other energy resources
- GOSL will promote the use of efficient bioenergy conservation technologies
- GOSL will ensure the use of wood as a source of electricity and shall be re-emphasized in the nation's energy mix
- GOSL will take measures to reduce the rate of deforestation and land degradation and minimize threats on climate change in the use of biomass resources
- GOSL will encourage agro based industries to produce electricity from their wastes
- GOSL will promote improved production and efficient use of fuel wood and charcoal.

The Policy objectives as far the bioenergy sector is concerned are as follows:

i. Promote non-fuel wood biomass as an alternative energy resource, especially in the rural areas, and promote its usage for remote and off-grid power generation.

ii. Promote efficient use of agricultural residues, municipal wastes, animal and human wastes and energy crops as bioenergy sources.
iii. Reduce health hazards arising from the combustion of biomass fuel, especially fuel-wood combustion.
iv. Promote efficient cooking technologies and alternative cooking fuels like biochar, briquettes etc.
v. Conserve the forest resources of the nation.
vi. Reduce greatly the percentage contribution of fuel wood consumption, to the domestic, agricultural and industrial sectors of the economy.
vii. Arrest the ecological problems of desert encroachment, soil erosion and deforestation.
viii. Facilitate the use of alternative energy resources from fuel wood specifically to increase the share of efficient charcoal production in line with the regional/ECOWAS target.
ix. Increase the use of biofuels as a component in blended fuels sold at fuel pumps.
x. Assess the volume of litter and manure from cattle farms that can be used in biogas generators or burned in incinerators.

The measures to be adopted to ensure the policy works are as follows:

i. Developing extension educational and outreach programs to facilitate the general use of new biomass energy technologies.
ii. Promoting Research and Development in bioenergy technology and cooking technologies and fuels.
iii. Establishing pilot projects to produce biomass energy conversion devices and systems.
iv. Providing adequate incentives to local entrepreneurs to produce biomass energy conversion systems.
v. Training of skilled manpower and providing basic engineering infrastructure for the local production of components and spare parts for biomass systems.
vi. Cultivating fast growing tree species needed to accelerate the regeneration of forests.
vii. Developing appropriate technologies for the utilization of alternative energy sources from fuel wood.
viii. Developing appropriate and affordable efficient wood stoves and promoting the introduction of more resource efficient alternatives in line with regional/ECOWAS target.

ix. Encouraging the establishment of private and community wood-lots for supply of fuel-wood in the short-term.
x. Establishing micro-credit facilities for entrepreneurs, especially for women groups, for the establishment and operation of commercial fuel wood lots and the production of renewable energy devices and systems.
xi. Developing an appropriate pricing structure and feed-in tariffs to encourage substitution from fuel wood to renewable fuel types.
xii. Establishing training programs on the use, maintenance and fabrication of efficient wood stoves and other renewable energy technologies.
xiii. Organizing systematic public enlightenment campaigns on the problems of desertification and soil erosion arising from deforestation.
xiv. Disseminating the renewable energy technologies to fuel wood through extension programs, pilot projects etc.

3.3.7 The Voluntary Guidelines on Responsible Governance of Tenure of Land, Forestry and Fisheries

The Committee on World Food security, to which Sierra Leone is an active member, adopted the Voluntary Guidelines on Governance of Tenure (VGGT). FAO has since 2013 set out to support Sierra Leone in strengthening the security of forest tenure rights for local communities and indigenous people, promoting sustainable management of forest resources and investment in forest-based enterprises for poverty reduction and improved food security.

The promotion and consolidation of forestry plantations has to be in accordance with the principles of VGGT advocating tenure security on land, fisheries and forests for all, women and men, youth and vulnerable and traditionally marginalized people. As enshrined in principle 3, 4, 5 and 6 of the VGGT (annex 1), establishment of forestry plantations should be equally based on the principles of equity in the access to resources, peoples participation in the management of natural resources in a holistic manner, gender equality in the access to forest resources and benefits realized from the management. Decisions on the management of designated forest resources should basically be in consultation with participating stakeholders especially the local

community members. Collective participation in decision making should be highly promoted to ensure that all the affected members are actively participating and benefiting from the resources.

3.3.8 The Factories Act, 1974

This Act was signed by the President on the 22nd May, 1974 and the date of commencement was on the 30th May, 1974. It deals with the health and safety measures as they concern any worker in a place of work that can be considered as a factory. The interpretation of a "factory" in Part 11, Section 3 as any premise where persons are employed in manual labour for the purpose of making gains makes it applicable to the operations of Miro Forestry (SL) Limited.

Part IV, Section 17 makes provision for the establishment of a Factories Appeal Board and has the duty of hearing and determining any appeal submitted by factory owners, thus giving right where it is due. Factories shall be registered. The Act protects the workers through demands for all aspects of cleanliness, reports of all injuries, accidents, diseases and death. The Act also provides for inspections and prescribes offences. The necessary environment conditions of the Act are therefore stated or highlighted below.

Powers of Inspectors

Section 14 of Part IV of this Act states that an inspector shall, in executing this Act, have the power to do the following:

- To enter, inspect and examine a factory and its environs at any time, as long as he has reasonable cause to believe that explosives or any inflammable materials are stored or used;
- To take with him during an inspection, a police officer, if he has a reasonable cause to expect any serious obstruction during the execution of his duty;
- To require the production of all documents and to examine and copy them in pursuance of this Act;

- To make necessary inquiries and examinations to ascertain whether the provisions of the Act are complied with;
- To prohibit the use of any machinery, if he is reasonably of the opinion after examination, that it is not in good and safe condition.

If anyone wilfully delays or obstructs the inspector in the exercise of any of his duties under this Act, then such a person shall be guilty of an offence and be liable to a fine not exceeding twenty leones or to imprisonment for a term not exceeding one month or both. The owner of the factory shall also be guilty of such an offence and be liable to punishment in like manner, even though he has not caused the obstruction.

Rules for the implementation of the Factories Act, 1974

As stated in Section 16, the Minister may make rules for the effective implementation of this Act as such rules may provide:-

- For the safety of persons employed in such trades and occupations as may be declared to be dangerous trades;
- For imposing obligations for the better safeguarding of persons against accidents from dangerous parts of any machinery;
- For the construction and maintenance of fencing to the dangerous parts of any machinery;
- For the proper maintenance and safe-working of raising and lowering;
- For prescribing the duties of inspectors appointed for the purpose of this Act;
- For prescribing the qualifications to be possessed by engineers and other persons, for them to be placed in charge of, or entrusted with the care or management of any specified machinery;
- For the appointment of persons to hold enquiries under this Act, and prescribing powers and duties of such persons;
- For the fixing of penalties not exceeding a fine of one hundred Leones or imprisonment for a term of six months or both such fines and imprisonment for the contravention of any rule.

Appeal to Board Following Decision of Chief Inspector

If the holder of the lease, or any other person of the factory is aggrieved by a decision of the Chief Inspector, under the provisions of this Act, then Section 18 states that a person may within fourteen days from the date of such decision send to the Board through the Chairman and to the Chief Inspector written notice of his intention to appeal against a decision stating the grounds of the appeal. On hearing the appeal, the Board may confirm, verify or reverse the decision of the Chief Inspector and this shall not be questioned in court.

Safety, Security and Welfare of Employees

Part V of this Act deals with the aspect of health and stipulates that every factory shall be kept in a clean state and free from effluent arising from any drain, sanitary convenience or nuisance. This part of the Act also states that for the overall safety of all employees, the Factory must not be overcrowded, must be effectively ventilated and provided with suitable lighting systems. Every care must be taken by the Factory holder to secure the health, safety and welfare of all employees.

As indicated in Section 38, it is incumbent on the company to notify the District Inspector in writing of any accident or death in the Factory. It is also stated in Section 39 that all factory contracted diseases identified by a medical practitioner must be brought to the notice of the Chief Inspector in Freetown.

Where injury immediately results in death, Section 40 states that the site of the accident must be left undisturbed after the removal of the corpse until inspected by a police officer or an inspector.

On receipt of the report of an accident, the inspector shall, if he considers it necessary or if directed by a higher authority, immediately proceed to the scene of the accident, as indicated in Section 41, and shall make enquiry, the inspector is free to use any one under

oath, any document, and forward fees for giving evidences, as may be fixed by the Minister.

Any person, who, without reasonable cause, fails to comply with the terms of summons of the inspector, or refuses to be examined or to answer questions other than that which may incriminate him, or anyone who obstructs an Inspector or any person acting under his directions in the execution of his duty under Section 41, shall be guilty of an offence.

The owner of every factory, according to Section 45, must within 24 hours report in writing to an Inspector every dangerous occurrence caused by any machinery or electrical abnormality. Section 26 of Part VI stipulates that there shall be kept posted in prominent position in every Factory:

- The prescribed abstract of this Act;
- The address of the Chief Inspector and of the nearest Inspector
- Printed copies of any regulations made under any Part of this Act which are for the time being in force in the Factory; or the prescribed abstracts of such regulations.

Offences and Penalties

Part VIII of this Act deals with offences, penalties and legal proceedings. Section 47, subsection 1 of this part, states that in the event of any contravention of the provisions of this Act or any Regulation or Order made there, the occupier or owner of the Factory, shall, be guilty of an offence under the Act.

Regarding offences for which there are no penalties provided, Section 48 stipulates that any person guilty of an offence under this Act for which no express penalty is provided by or under the Act, shall be liable to a fine not exceeding fifty Leones or to imprisonment for a term not exceeding one month or both. If the contravention for which he was convicted continues, he shall be guilty of a further offence and liable to a fine not exceeding ten Leones for each day on which the contravention is continued.

Section 50 states that if anyone is killed, or dies, or suffers any bodily injury, in consequence of the occupier or owner of a factory having contravened any provision of this Act, the occupier or owner of the factory, shall without prejudice to any other penalty, be liable to a fine not exceeding two hundred Leones or to imprisonment for a term not exceeding three months or to both.

All offences committed under this Act shall, Section 56 states, be prosecuted in a magistrate court.

3.4 INTERNATIONAL ENVIRONMENTAL REQUIREMENTS

3.4.1 United Nations Convention on Biological Diversity (UNCBD)

This convention, whose main objectives are to preserve biological diversity and rehabilitate all degraded areas, was ratified by Sierra Leone on 12th December, 1994. All signatory states are obliged to effect the prescribed undertakings which include:

- Development of national biological diversity strategic plans;
- Establishment of protected area;
- Prevention, control and eradication of invasive species;
- Halt, prevent and reduce the loss of biological diversity;
- Provision of educational facilities

3.4.2 United Nations Convention to Combat Desertification/Land Degradation (UNCCD/LD)

The United Nations Convention to Combat Land Degradation (UNCCD) entered into force on December 26, 1996 ninety days after the fiftieth ratification was received. The Government of Sierra Leone (GoSL) signed and ratified the UNCCD on September 25, 1997.

The Government of Sierra Leone (GoSL) is very much committed to the objectives and obligations of the UNCCD as evidenced and demonstrated in several national, macro-and-sectoral policies and strategies. The GoSL is aware of the threats of land degradation imposed on the economy, environment, livelihoods and food insecurity of her citizens.

The overall objective of the convention is to combat land degradation and to mitigate the effects of land degradation through effective action at all levels.

The convention recognizes the importance of land restoration measures such as afforestation, reforestation, forest management, restoration of degraded lands and soil carbon enhancement can play in removing carbon from the atmosphere while significantly contributing to the achievement of sustainable development goals.

With the ratification of this convention by of GoSL, it is obligatory on the part of all companies and organizations to implement to its fullest land restoration measures to achieve the objectives of the convention.

3.4.3 Convention on the International Trade of Endangered Species (CITES)

The requirement of this convention became effective in Sierra Leone on the 16th January, 1995. The convention seeks to eliminate and/or reduce trade in certain species inclusive of those that are considered endangered. By this convention, a list has been produced comprising species that require protection against trade. The majority of the species listed in CITES are those also considered y the International Union for the Conservation of Nature (IUCN) as endangered and threatened. CITES also takes cognizance of species not necessarily threatened but which require trade control to protect them from being threatened or endangered.

3.4.4 The Stockholm Convention on Persistent Organic Pollutants.

This Convention was adopted on the 22nd May, 2001 in Stockholm and Sierra Leone became a signatory on the 27th August, 2001.

Persistent Organic Pollutants (POPs) are chemicals that are persistent bio-accumulators found in fatty tissues. They are bio-magnified through the food chain, and adversely affect health and the environment.

This convention recommends the elimination or restriction of production and use of all internationally produced POPs (i.e. Industrial chemicals and pesticides) The chemicals to be eliminated are Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzen (HCB), Mirixtexaphene, Polychlorinated Biphensylsis (PCBs).

The convention also seeks to continue minimization and, where feasible, ultimate elimination of the release of POPs, such as Dioxins and Furans. Stockpiles and waste containing POPs must be managed and disposed of in a safe, efficient and environmentally friendly manner with regards for international rules, standards and guidelines.

3.5 WORLD BANK REQUIREMENTS

3.5.1 World Bank Guidelines

Operational Policy (OP) 4.36 applies to all World Bank investment operations that potentially have impact on forest, regardless of whether they are specific forest sector investments. The policy provides for conservation of critical natural habitats and prohibits World Bank financing of any commercial harvesting or plantation development in critical natural habitats. It also allows for proactive investment support to improve forest management outside critical forest areas with explicit safeguards to ensure that such World Bank financed operations comply with independent certification standards acceptable to the World Bank, or operations with an agreed upon, time-bound action plan to establish compliance with these standards.

The Bank does not finance plantations that involve any conversion or degradation of critical habitats, including adjacent or downstream critical natural habitats. When the bank finances plantations, it gives preference to sitting such projects on non-forested sites

or lands already converted (excluding any lands that have been converted in anticipation of the project). In view of the potential for plantation projects to introduce invasive species and threatened biodiversity, such projects must be designed to prevent and mitigate these potential threats to natural habitats.

To be acceptable to the bank, a forest certification system must require: a) compliance with relevant laws; b) recognition of respect for any legally documented or customary land tenure and use rights as well as the rights of indigenous peoples and workers; c) measures to maintain or enhance environmentally sound multiple benefits accruing from the forest; f) prevention or minimization of the adverse environmentally impacts from forest use; g) effective forest management planning; h) active monitoring and assessment of relevant forest management areas; and the maintenance of critical forest areas and other critical natural habitats affected by the operation.

The objectives of OP 4.36 include:

1. The management, conservation, and sustainable development of forest ecosystems and their associated resources are essential for lasting poverty reduction and sustainable development, whether located in countries with abundant forests or in those countries with depleted or naturally limited forest resources. The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests.
2. Where forest restoration and plantation development are necessary to meet these objectives, the assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank also assists borrowers with the establishment and sustainable management of environmentally appropriate, socially beneficial, and economically viable forest plantations to help meet growing demands for goods and services.

The Scope of this Policy applies to the following types of Bank financed investment projects:

(a) Projects that have or may have impacts on the health and quality of forests
(b) Projects that affect the rights and welfare of people and their level of dependence upon or interaction with forests
(c) Projects that aim to bring about changes in the management, protection, or utilization of natural forests or plantation, whether they are public, privately, or communally owned.

Environmental Assessment

The EA (under OP 4.01) is the World Bank's officially recognized system for determining what areas constitute critical forests or natural habitats. An EA should examine the positive and negative environmental impacts of the project; compare these with feasible alternatives (including a "no-project" option); and recommend measures to prevent, minimize, mitigate, or compensate for adverse impacts, and to improve the environmental conditions and impact management performance. The EA should focus attention special attention on developing guidelines and procedures for identifying and measuring conservation and sustainable- use objectives. The document should be prepared according to World Bank guidelines, as set out in OP 4.01.

In particular the assessment could examine the following key components:

- Assess the key environmental concerns in the forestry sector;
- Identify and describe critical forests or critical natural habitats;
- Assess critical ecosystems and recommend a program for their conservation and management;
- Develop quantitative indicators and a baseline for monitoring changes;
- Assess threats to cultural heritage (archaeological, religious, and cultural properties and resources) ;
- Assess the impacts of the project on the natural environment;

- Impact analysis;
- Field visits;
- Background information from other publications and electronic databases;
- Consultations with experts;
- Stakeholders workshops;
- Public consultations;
- Environmental Management Framework.

3.5.2 Forest Certification System

In addition to the requirement in paragraph 11, a forest certification system must be independent, cost-effective, and based on the objective and measurable performance standards that are defined at the national level and are compatible with internationally accepted principles and criteria of sustainable forest management. The system must require independent, third-part assessment of forest management performance. In addition, the system's standards must be developed with meaningful participation of local people and communities; indigenous peoples; non-governmental organizations representing consumer, producer, and conservation interests; and other members of civil society, including the private sector. The decision-making procedures of the certification system must be fair, transparent, independent, and designed to avoid conflicts of interest.

3.5.3 Consultation and Disclosure Requirement (World Bank Policy on Disclosure of Information).

The World Bank requires clients to identify and consult groups in forest areas likely to be affected by World Bank-financed investment projects in and beyond the forest sector.
The disclosure requirements set out in Environmental Assessment (EA) Policy (OP 4.01) apply to all projects affecting forests. Aside from the required EA documentation, there is no freestanding document that is automatically required for all projects affecting

forests. However, many forest-related projects will generate freestanding reports (such as Forest Management Plans), which should be made publicly available as a matter of good practice. This is important for good forest governance and good development outcomes, and full disclosure of forest related information should be encouraged wherever feasible. Additional requirements apply whenever such projects involve Involuntary Resettlement.

3.5.4 World Bank (WB) Environmental, Health and Safety Guidelines for Forest Plantations Operations

Miro operations may involve the manufacture of plywood, sawn logs, electricity poles and finger joints. The following section provides a summary of EHS issues associated with the manufacture of plywood, sawn logs, electricity poles and finger joints products along with recommendations for their management.

Environmental issues associated with board and particle-based product manufacturing include:

- Sustainable forestry practices
- Emissions to air
- Wastewater
- Hazardous materials
- Solid wastes
- Noise

3.6 Sustainable forestry practices

Where round logs rather than wood waste are used as the source of fibre (in particular for plywood and OSB, the major environmental impact of manufacturing concerns the management of forest resources. These impacts can be reduced through the use of more recycled or recovered fibre in board manufacturing.

3.7 Emissions to air

Board and particle-based product processes can give rise to a variety of emissions to air according to the different processes. Pollutants resulting from combustion processes including particulate matter (PM), nitrogen oxides (NOx), carbon monoxide (CO) and sulphur oxides (Sox may arise from utility boilers, hot gas generators and thermal fluid heaters. Aldehydes (including formaldehyde) and other volatile organic compounds (VOCs) are released where wood is heated in particle dryers, veneer dryers and presses, and when pressed board cools. VOCs are also released in the manufacture and application of decorative coatings for boards. Wood dust arises from mechanical operations such as chipping and chip grading, and from cutting and sanding of pressed board. Board manufacture is very energy intensive and if energy systems are based upon fossil fuel rather than wood waste, these plants can be significant emitters of greenhouse gases.

CHAPTER 4

4.0 ECOLOGICAL & SOCIO- ECONOMIC BASELINE

4.1 History of the project area

The project's new lease areas are located in Yoni and Masimera chiefdoms in Tonkolili and Port Loko districts respectively. Tonkolili district is referred to as the midpoint district of Sierra Leone because of its central location in the middle of the country, bordering 6 out of 11 other districts that constitute the country. In the north, it is bordered by the northern region districts of Bombali and Koinadugu; in the east, by the Eastern region district of Kono; in the southeast by the Eastern region district of Kenema and

Southern region district of Bo; in the south by Southern region district of Moyamba and in the west by the North-western region district of Port Loko.

According to the new redistricting and re-regionalisation, Tonkolili district is in the Northern region of Sierra Leone and Port Loko district is in the North-western region.

Yoni chiefdom is the largest of 11 chiefdoms in Tonkolili district, occupying a land area of 1,223 Sq. Km; and a total population of 111,932, of which 54,131 (48.4%) are males and 57,801 (51.6%) are females – a sex ration of 93.7. The other chiefdoms include; Kholifa Mabang, Yoni, Malal, Kholifa Rowalla, Konike Sanda, Sambaia Bendugu, Kalasongoia, Kafe Simira, Tane, Gbonkolenken, and Konike Barina. Yoni chiefdom is sub-divided into 12 sections, namely; Foindu, Malompor, Masengbeh, Gaindema, Yoni, Mamaka, Macrogba, Patifu, Ronietta, Mayera, Malanchor, and Magbafth.

The total population of Tonkolili district is 530,776, and of Sierra Leone is 7,075,641 (Housing and Population Census, 2015). Yoni's population is therefore 21.08% of Tonkolili district and 1.5% of Sierra Leone's total population. The district is about 7.5% of Sierra Leone's total population. Compared to the 2004 Housing and Population Census, the population of Yoni Chiefdom has grown by 24,305 (27.7%) and Tonkolili district has grown by 183,579 (52.8%), showing annual growth rates of 2.1% and 4.1% respectively. Yoni chiefdom shows a drop in percentage of the district total by 4.12% from 25.2% in 2004 to 21.08% in 2015.

Masimera is the fouth largest chiefdom in Port Loko district, about 674.02853 Sq.Km in size. According to the 2015 Housing and Population Census, Port Loko district has the second highest population in the country (614,063) after the Western Urban district which comprises the capital, Freetown. This is about 8.7% of the national population. Masimera Chiefdom is the sixth most populous chiefdom in the district having a total population of 40,861, which is about 6.6% of the total district population.

Compared to the 2004 Housing and Population Census, the population of Port Loko district increased by 35%, showing annual growth rates of 3.2%.

The people of Yoni and Masimera chiefdoms predominantly belong to the Temne ethnic group with ancestral origin associated to Fouta Jalou in present-day Republic of Guinea. This ethnic group is believed to have migrated from Ethiopia through Guinea to Sierra Leone hundreds of years ago. In Sierra Leone, they settled along the estuary of the Rokel River and Port Loko Creek, which forms the largest natural harbor in the African continent. The Temne ethnic group is believed to have settled in Sierra Leone before the arrival of the Portuguese sailor, Pedro da Cintra in 1462, the explorer who claimed to have discovered the territory he named Serra Lyoa, now called Sierra Leone.

The indigenous people of Yoni and Masimera chiefdoms are predominantly Muslims by religious denomination. Less than 5% are Christians or belonging to other religious denominations. The Temne people in general have been farmers from centuries, although they were involved in trade with the European settlers in Freetown. They have been predominantly dry rice farmers, which they mix with a variety of secondary crops such as corn, millet, cassava, groundnut and potatoes. The system of agriculture practice has been crop rotation, in which they plant groundnuts, cassava and other crops on the previous year's rice farm. The cultivation of inland valley swamps for rice production has also been prevalent in this area over a very long time; in fact for centuries, according to some respondents in the socio-economic survey.

Land tenure in the chiefdom has been traditionally the customary type of ownership, in which the paramount Chief is the owner / custodian of the land. All transactions in community and family lands must be approved by the paramount Chief. But the system of communal land ownership is now very prevalent. In this system, the land is owned by the community / village and the village head / chief is the custodian of the land.

he Temne culture is typically African, which revolves mainly around the chieftain, the secret societies (in the case of all chiefdoms in Port Loko and Tonkolili districts, the Poro

society for men and Bondo society for women). The most important events are related to the coronation and funerals of Paramount Chiefs, initiation and graduation of new secret society members. These are usually colourful ceremonies, charcterised with feasting, and masquerade singing and dancing.

4.2 Present Status of the proposed project site

The project is proposed to be extended to three newly leased sites, two of which are located in Yoni chiefdom and one in Masimera chiefdom. See figure 1 above. The new leased lands are currently awaiting development for plantation agriculture as in the lease agreement with Miro Forestry Ltd.

4.3 Geographical Environment

4.3.1 Location and accessibility

The proposed project areas, which are the new leased areas, are located mainly in Mamaka, Mayera and Foindu sections. The communities owning the land are as follow:

	Community / Village	Section	Chiefdom
1	Patfumayagbo	Foindu	Yoni
2	Mafala	Foindu	Yoni
3	Manjehun	Foindu	Yoni
4	Mabilla Banna	Foindu	Yoni
6	Rogbogban	Mamaka	Yoni
7	Masanki	Mamaka	Yoni
8	Robisbana	Mamaka	Yoni
9	Mashenkra	Mamaka	Yoni
10	Mayira	Mayira	Yoni
11	Mayolla	Mayolla-Thatha	Masimera
12	Yanabay	Mayolla-Thatha	Masimera
13	Kombabonk	Mayolla-Thatha	Masimera
14	Rosint Lol	Katick	Masimera
15	Marainday	Katick	Masimera

16	Rosar	Katick	Masimera
17	Robaylla	Katick	Masimera
18	Mathorthe	Katick	Masimera
19	Makuserry	Katick	Masimera
20	Masimera	Katick	Masimera
21	Chai-Turay	Katick	Masimera
22	Mabilabana	Foindu	Yoni
23	Maranda	Foindu	Yoni

Table 4.3.1: Land Owning Communities

4.3.2 Climate

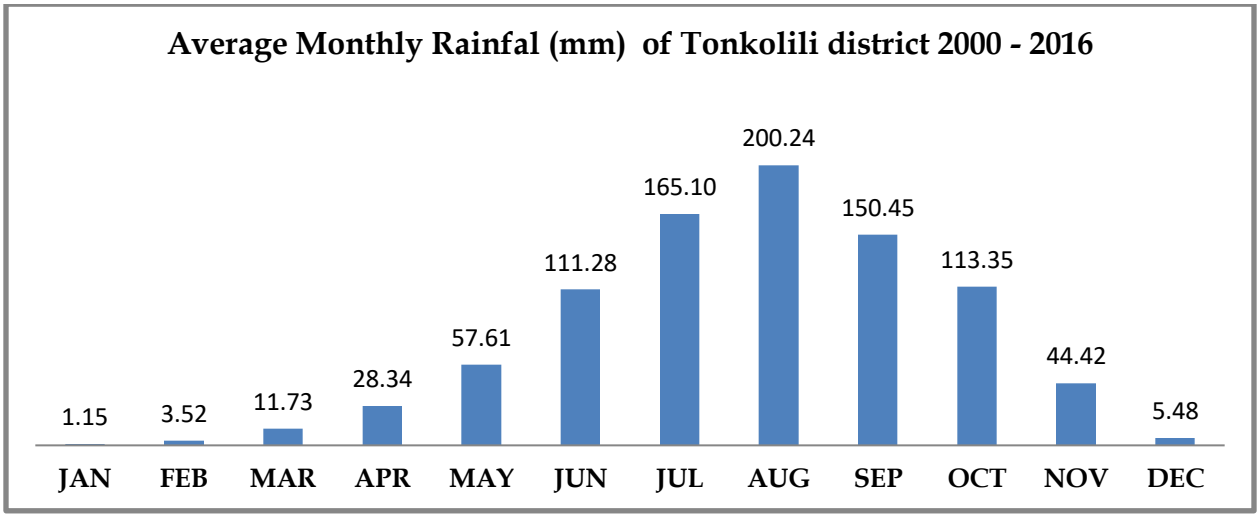
We obtained climate data covering the study area from the Meteorology Department in Freetown. The department collates monthly rainfall and temperature data for all districts. Monthly rainfall data was available for Tonkolili district covering January 2000 to July 2017. Climate data for Tonkolili district is almost the same as Port Loko district, especially for the neighboring and border chiefdoms of Masimera and Yoni in Port Loko and Tonkolili districts respectively. Monthly temperature data was available January 2003 to December 2012. The rainfall and temperature data for Tonkolili is used to describe the climate of the study area in Yoni chiefdom.

The climate of Sierra Leone is a monsoon type humid tropical climate with two distinct seasons. The dry season is from November to April and the rainy season is from May to October. The annual rainfall averages about 3,000 mm, ranging from a low of 2,000 mm in the North to a high of 4,000 mm in the South. Average monthly temperature ranges from 23^{o}C to 29^{o}C, but it can rise to an average maximum of 36^{o}C in the lowlands towards the end of the dry season while in the highlands the average monthly temperature could be as low as 15^{o}C at the beginning of the dry season.

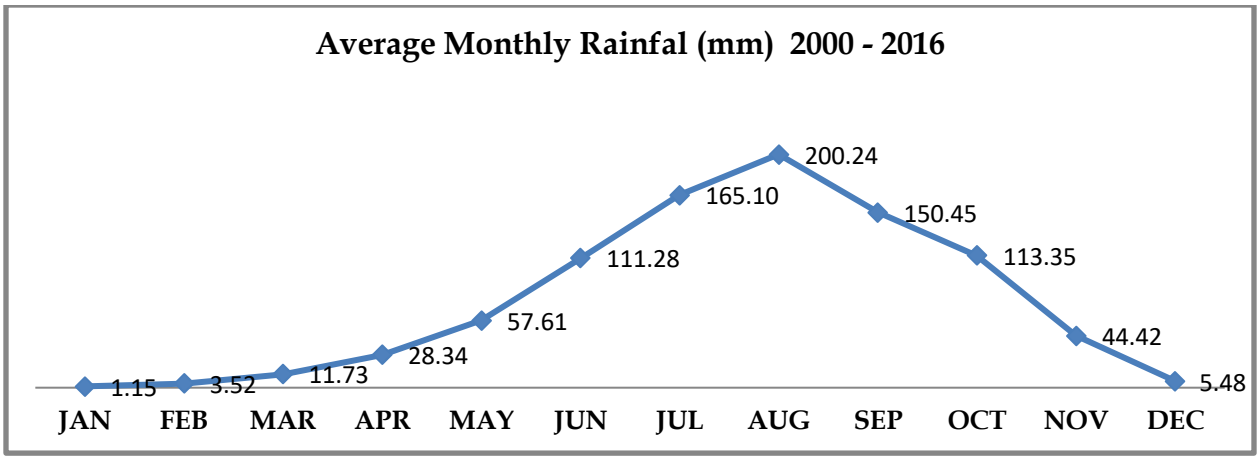
The seasonality of the weather conditions described above is primarily the result of the north south movement of a zone of discontinuity often referred to as the Inter Tropical Front (ITF). As the belt oscillates slowly across West Africa, the country is alternately

affected by southwest winds bringing moist air that often results in rains, and the northeast dry winds.

Like the rest of Sierra Leone, Tonkolili district experienced the highest rainfall in the month of August with an average monthly of 200.24 mm over the period 2000 – 2016. The rainy season is from May to October, with the average monthly increasing from 57.6 mm in May to 200.24 mm in August, and drops to 113.35 mm in October. The dry season starts from November, with the average monthly decreasing from 44.42 in November to 28.34 mm in April. The lowest average monthly was recorded in January (1.15 mm) over the period 2000 – 2016. Figures 4.3.2 (a) and (b) are a histogram and a graph of the average monthly rainfall distribution in Tonkolili district from 2000 to 2016, respectively.

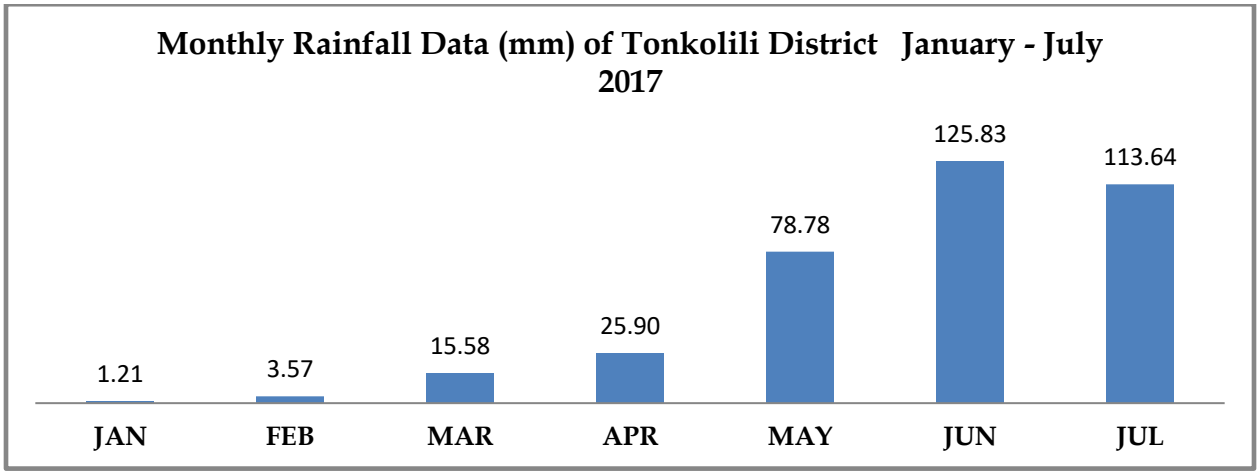


Figures 4.3.2 (a) **Histogram of Average monthly rainfall of Tonkolili district 2000 - 2016**

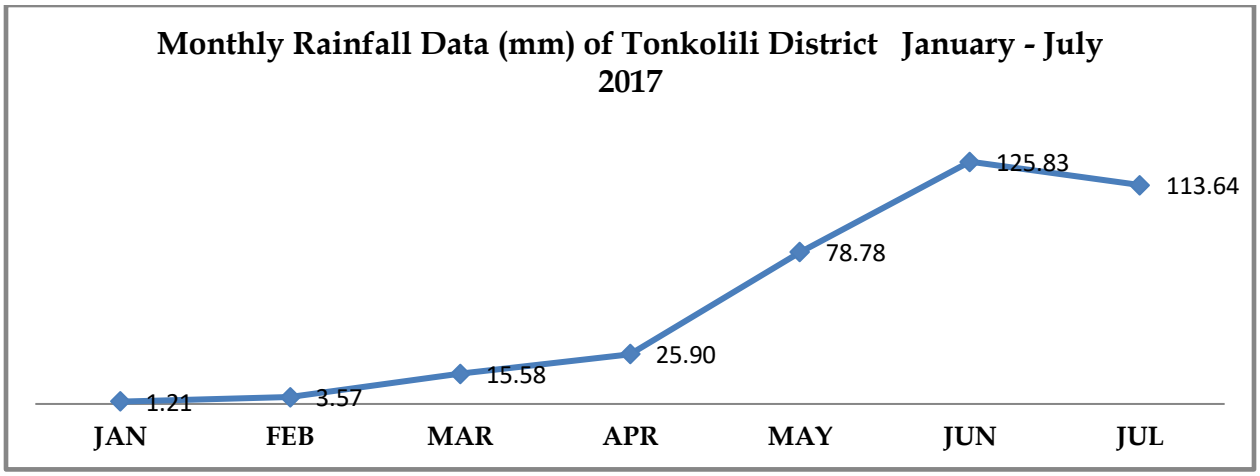


Figures 4.3.2 (b)**: Line graph of Average monthly rainfall of Tonkolili district 2000 - 2016**

For 2017, the meteorology Department provided data for January to July. Figures 4.3.2 (c) and (d) are a histogram and a graph of the monthly rainfall distribution in Tonkolili district from January to July 2017 respectively.



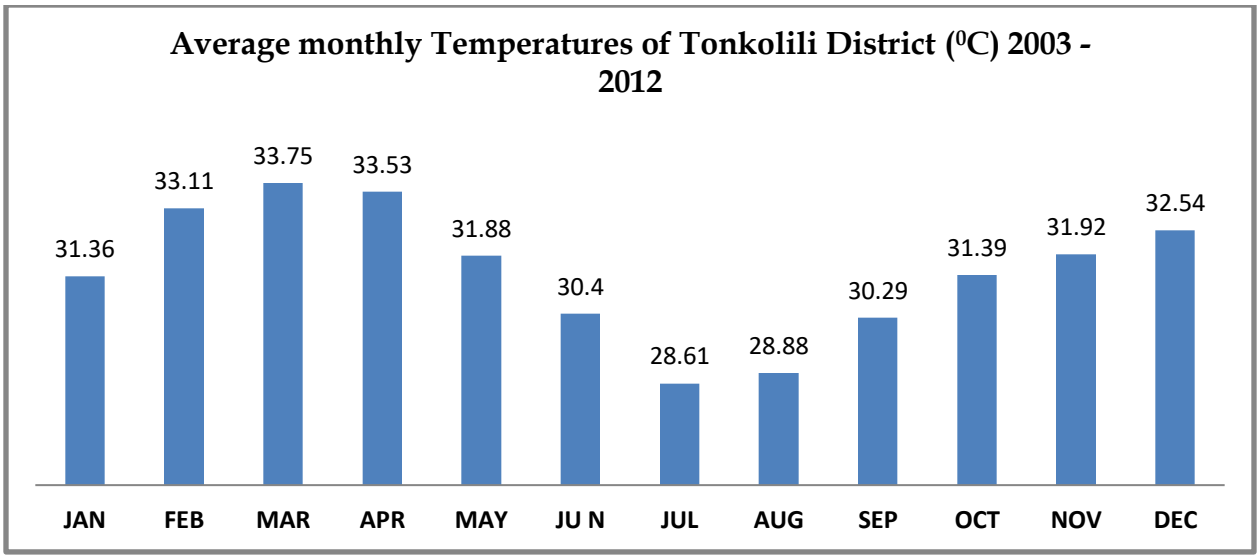
Figures 4.3.2 (d): Histogram of Monthly Rainfall Data (mm) of Tonkolili District January - July 2017



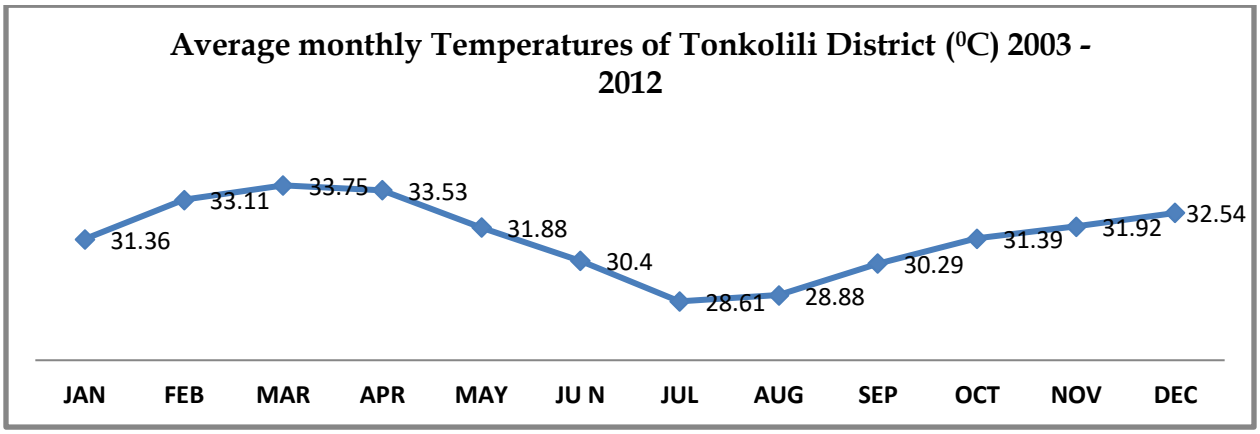
Figures 4.3.2 (e): Line graph of Monthly Rainfall Data (mm) of Tonkolili District January - July 2017

Temperature

Temperatures are higher from November to April. The highest average monthly temperature for the period 2003 – 2012 was recorded for March (33.75 ^{0}C). The average monthly temperature rises from November to December and experiences a slight fall in January. This may be as a result of the brief spell of Harmattan winds experienced in late December to early January. The Harmattan is a dry air that originates from the Sahara Desert usually featured by increased wind strength (north east winds), sudden drop in relative humidity, cloudless sky and dusty haze, stable air that prevents precipitation. Temperatures are relatively higher during the afternoons, but lower the rest of the day. This period which occurs between December and January is replaced by a dry but humid period that extends to the end of March. Figures 4.3.2 (e) and (f) are a histogram and a graph of the monthly rainfall distribution in Tonkolili district from January to July 2017 respectively.



Figures 4.3.2 (f): Histogram of Monthly Temperature of Tonkolili District January - July 2017



Figures 4.3.2 (g): Line graph of Monthly Temperature of Tonkolili District January - July 2017

4.3.3 Geology and soils

The Sierra Leone Geological Survey report described the geology underlying the study area as one composing of repeated layers of Leonean, Liberian, Marampa and the Rokel river rocks.

Soils in Sierra Leone are grouped into 12 soil associations to reflect the local soil attributes that have important bearings on land suitability, which can be easily and consistently observed and measured. The descriptions of the soil classifications in the project area

range from very gravelly ferralitic soils over colluvial gravel on western interior plains, very gravelly ferralitic soils with shallow soils on moderate to high relief hills formed from basic and ultrabasic rocks, and gravelly ferralitic and plinthic hydromorphic soils on inland terraces, depressions and floodplains.

Soils samples were obtained at five different sites within the project area and analysed for their organic carbon contents. Carbon stocks, especially soil Organic Carbon (SOC) stocks, denote overall soil quality. SOC is one of the most important constituents of soil due to its capacity to promote plant growth, recycle nutrients to maintain soil fertility, and clean and store freshwater whilst reducing downstream flooding and promoting dry season flows. SOC is therefore intrinsically connected to soil quality. Maintaining carbon stocks in soils by providing adequate fresh organic matter for decomposition (and/or preventing excessive loss) can also generate additional benefits pertaining to climate change mitigation and biodiversity conservation. A common point of all forms of land degradation is soil organic carbon content depletion, where reduced organic matter inputs and inappropriate use destroy soil structure and reduce biodiversity leading to the progressive erosion of the non-renewable mineral fraction of soil.
Soil samples were collected at the following points:

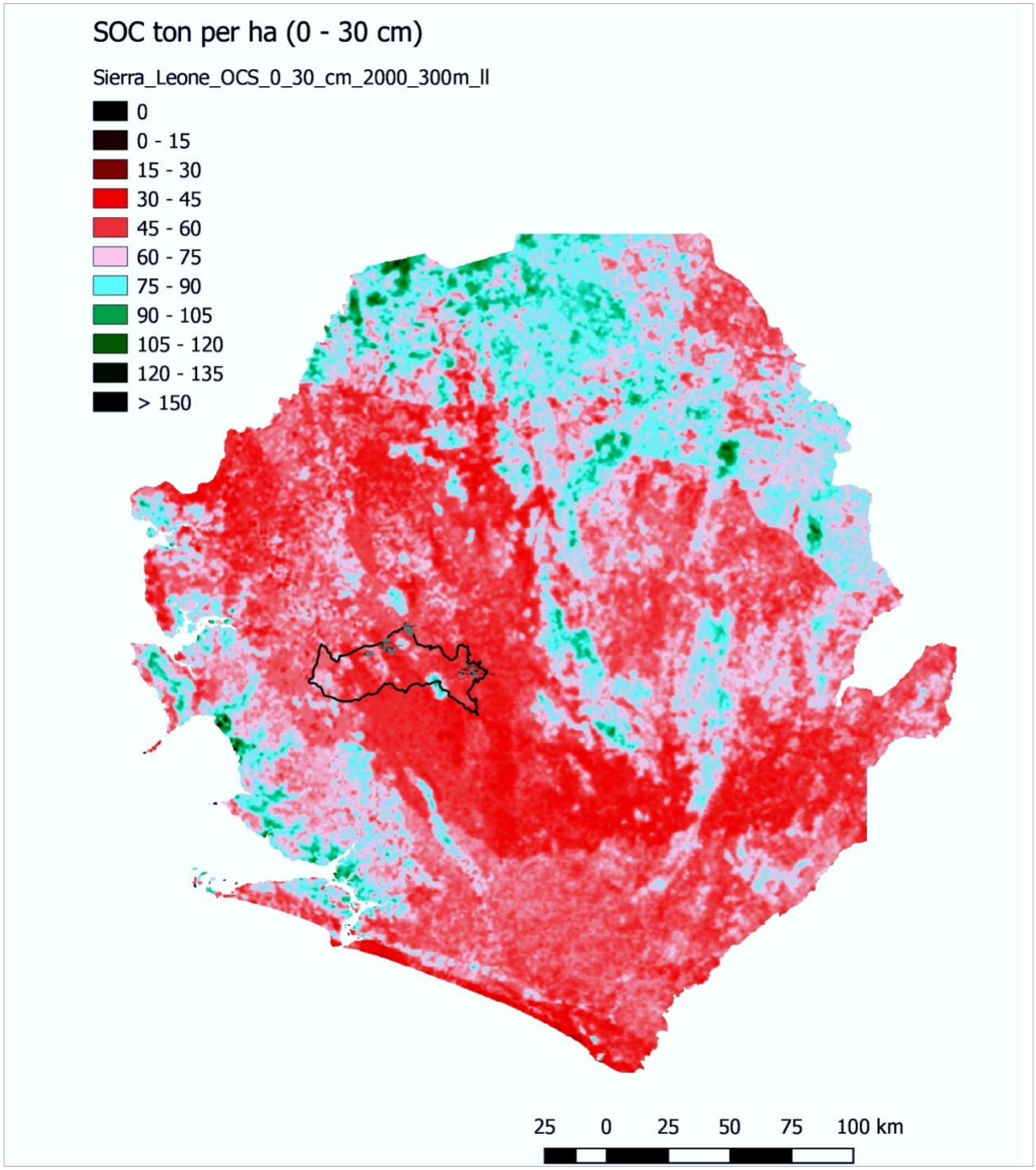
Nearest Community	**Latitude**	**Longitude**
Mayira	12^0 25 ‘ 40” W	8^0 27 ‘ 39.126” N
Robisbana	12^0 21 ‘ 48.426” W	8^0 30 ‘ 18.885” N
Rogbogban	12^0 17 ‘ 37.869” W	8^0 32 ‘ 59.068” N
Majehun	12^0 5 ‘ 17.56” W	8^0 23 ‘ 14.56” N
Mafala	12^0 2 ‘ 51.796” W	8^0 23 ‘ 4.563” N

The results were analysed at the Department of Soil Sciences, Njala University as follow:

Samples	Nearest Community	Latitude	Longitude	% Carbon
Sample 1	Mayira	12^0 25 ‘ 40” W	8^0 27 ‘ 39.126” N	1.95
Sample 2	Robisbana	12^0 21 ‘ 48.426” W	8^0 30 ‘ 18.885” N	1.28
Sample 3	Rogbogban	12^0 17 ‘ 37.869” W	8^0 32 ‘ 59.068” N	1.15
Sample 4	Majehun	12^0 5 ‘ 17.56” W	8^0 23 ‘ 14.56” N	1.92
Sample 5	Mafala	12^0 2 ‘ 51.796” W	8^0 23 ‘ 4.563” N	1.90

The study also obtained Soil Organic carbon data covering Sierra Leone, dated 2010, from the International Soil Reference and Information Centre (ISRIC). The following map shows Soil Organic Carbon Contents per hectare in cm:

Distribution of Soil Organic Carbon Contents of Soils in Sierra Leone



4.3.3: Distribution of SOC in Sierra Leone soils

4.3.4 Water Quality Assessment

Water quality assessment was done on water samples obtained at five different sites in the project area. The following parameters were considered in the subsequent analysis: levels of pH, total suspended solids, total dissolved solids, chloride, conductivity, hardness, nutrient composition and coliform count. Water samples were collected at the following points within the new leased areas in November 2017:

Nearest locality	Water sample source	Latitude	Longitude
Mashenkra	Well	12^0 21′ 48.892″ W	8^0 28′ 21.853″ N
Mayira	Bekibeki stream	12^0 26′ 7.468 ″ W	8^0 27′ 52.873″ N
Mabelabana	Stream	12^0 4′ 6.46″ W	8^0 24′ 32.241″ N
Mafala	Well	12^0 3′ 6.054″ W	8^0 23′ 18.528″ N
Rogbongba	Gbongba stream	12^0 17′ 54.528″ W	8^0 33′ 9.159″ N

a) Levels of pH:

pH levels are very measures of water quality. They can affect the corrosivity and solubility of contaminants in water. The acceptable levels for safety are between 6.5 and 8.5. Low pH levels indicate high acidity of the water, and the possibility of dissolved acidic substances such as metals. Higher pH levels indicate higher alkaline content of the water, resulting to a sleeper feel or soda-like taste. Analyses of the water samples showed the following pH levels:

Nearest locality	Water sample source	Latitude	Longitude	pH Level
Mashenkra	Well	12^0 21′ 48.892″ W	8^0 28′ 21.853″ N	5.9
Mayira	Bekibeki stream	12^0 26′ 7.468 ″ W	8^0 27′ 52.873″ N	6.1
Mabelabana	Stream	12^0 4′ 6.46″ W	8^0 24′ 32.241″ N	5,8

Mafala	Well	12^0 3′ 6.054″ W	8^0 23′ 18.528″ N	5.8
Rogbongba	Gbongba stream	12^0 17′ 54.528″ W	8^0 33′ 9.159″ N	6.0

On average, the pH levels on water samples in the study area was 5.95, indicating that they are slightly acidic. This may be partly as a result of contamination of the water sources by acidic substances including waste from the communities. In addition, tropical soils like we have here in Sierra Leone are naturally acidic and poor in nutrient due to centuries of high rainfall which has completely leached most of the nutrients from the topsoil.

b) Total Dissolved Solids (TDS)

High TDS also can indicate hardness (scaly deposits) or cause staining, or a salty, bitter taste. They can include dissolved minerals like iron or manganese. The acceptable levels are 500 mg/l.

Analyses of the water samples showed the following TDS contents:

Nearest locality	**Water sample source**	**Latitude**	**Longitude**	**TDS (mg/l)**
Mashenkra	Well	12^0 21′ 48.892″ W	8^0 28′ 21.853″ N	28.5
Mayira	Bekibeki stream	12^0 26′ 7.468 ″ W	8^0 27′ 52.873″ N	42.1
Mabelabana	Stream	12^0 4′ 6.46″ W	8^0 24′ 32.241″ N	15.9
Mafala	Well	12^0 3′ 6.054″ W	8^0 23′ 18.528″ N	60.4
Rogbongba	Gbongba stream	12^0 17′ 54.528″ W	8^0 33′ 9.159″ N	84.8

On average, the TDS content of the water samples in the study area was 46.5.

c) Turbidity

Turbidity is a measure of the clarity of water. Clarity of the water sample can indicate contamination.

Nearest locality	**Water sample source**	**Latitude**	**Longitude**	**Turbidity (NTU)**
Mashenkra	Well	12^0 21′ 48.892″ W	8^0 28′ 21.853″ N	0.12
Mayira	Bekibeki stream	12^0 26′ 7.468 ″ W	8^0 27′ 52.873″ N	0.44
Mabelabana	Stream	12^0 4′ 6.46″ W	8^0 24′ 32.241″ N	6.0
Mafala	Well	12^0 3′ 6.054″ W	8^0 23′ 18.528″ N	0.37
Rogbongba	Gbongba stream	12^0 17′ 54.528″ W	8^0 33′ 9.159″ N	0.24

The World Health Organisation (WHO) recommends a turbidity <5 NTU for safety of water for drinking. Except for the sample obtained at Mabelabana, the water samples showed a turbidity of <NTU, which are within the WHO threshold.

Total Coliform

This is a measure of the possible bacterial or viral contamination from human sewage or animal manure. When in high concentration, it can cause diarrheal diseases, cholera and hepatitis. The World Health Organisation (WHO) recommends a total coliform content of <1 coliform/100 ml for safety.

Nearest locality	**Water sample source**	**Latitude**	**Longitude**	**Total Co;iform (cfu/100 ml)**
Mashenkra	Well	12^0 21′ 48.892″ W	8^0 28′ 21.853″ N	5.0

Mayira	Bekibeki stream	12^0 26′ 7.468 ″ W	8^0 27′ 52.873″ N	3.5
Mabelabana	Stream	12^0 4′ 6.46″ W	8^0 24′ 32.241″ N	0.0
Mafala	Well	12^0 3′ 6.054″ W	8^0 23′ 18.528″ N	2.5
Rogbongba	Gbongba stream	12^0 17′ 54.528″ W	8^0 33′ 9.159″ N	3.5

Except for one of the samples which show coliform content of 0.0cfu/100 ml, the rest show coliform contents greater than 1cfu/100 ml, which are far higher than the WHO recommended level of less than 1cfu/100ml.

4.3.5 Vegetation

Details on the vegetation of the project area were obtained from secondary sources, mainly publications by Government institutions and interpretations of satellite images on land cover.

Sierra Leone was originally forested with over 60% of its land covered by closed high forest of moist evergreen and semi–deciduous types, the rest being woodland savannah of the guinea type. Today nearly 70% of its forest cover has been lost. The Forestry Division identifies large-scale deforestation as a result of uneconomical and uncontrolled shifting cultivation of farm lands as the main cause of the loss of original forest cover.

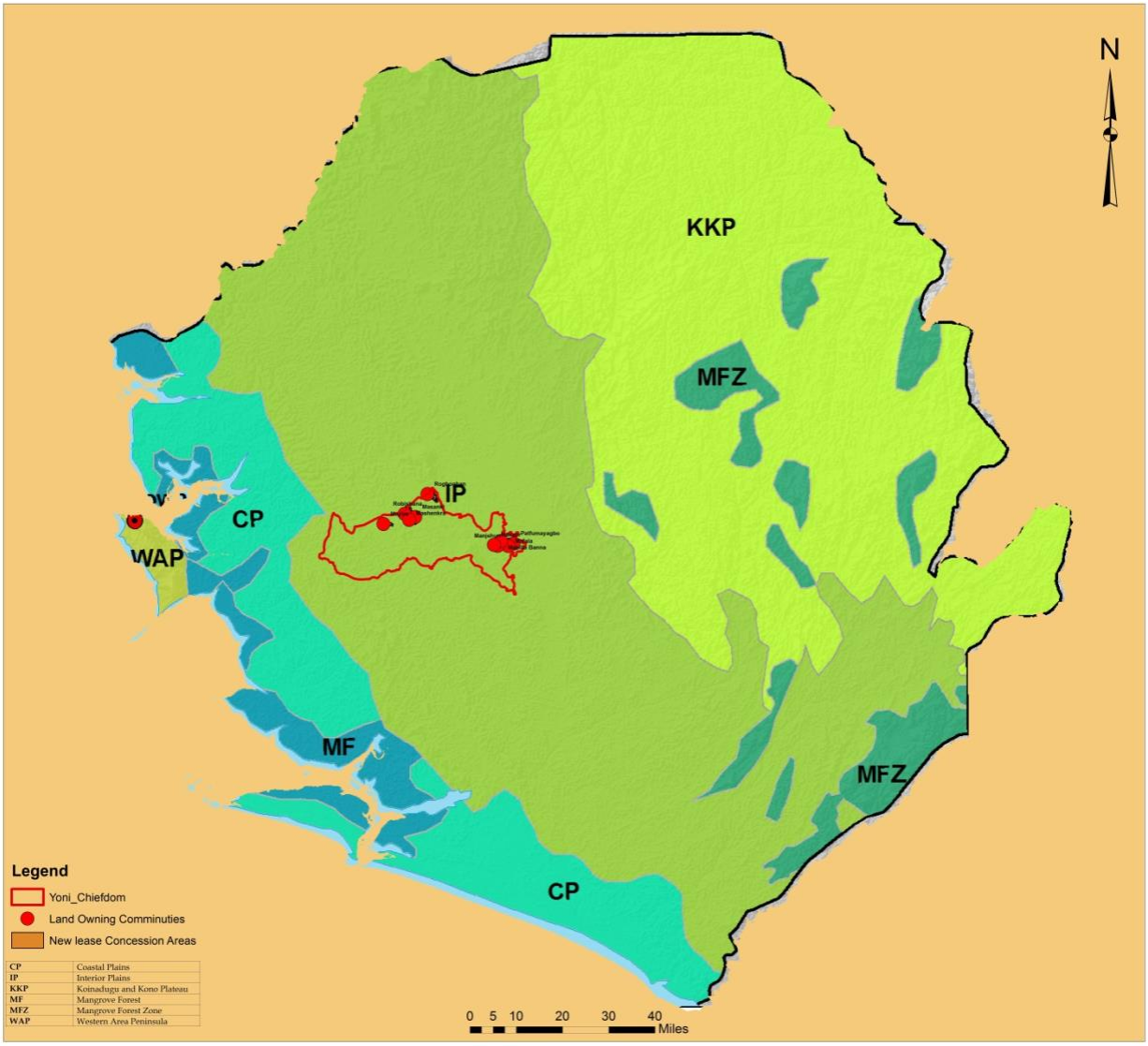
Yoni and Masimera chiefdoms are located within the Interior Plains eco-region of Sierra Leone. This eco-region is the most extensive land area of the country, extending about 31418 km^2 with an altitude ranging from 40m in the west to 200m in the east. Most of the plains have uniformly low relief characterized with gentle slopes, with original vegetation typically characterized by continuous moist evergreen forest with a multi-layered tree canopy, as part of the Guinean Upper Forest. The land cover in the concession area like most parts of Sierra Leone has changed through long term uneconomical and uncontrolled livelihood activities. Currently, about 60 – 70% of land cover in the new leased concession area presents as predominantly rain fed cropland

characterised with farm bushes constituting young secondary forests and low bushes. These include the concession areas around Mayira, Mashenkra, Robisbana, Masanki, and Rogbogban land owning communities. There are also mosaics of grasslands showing vividly in the northeast of the chiefdom around Makapr, Manjehun and Mabilla land owning communities.

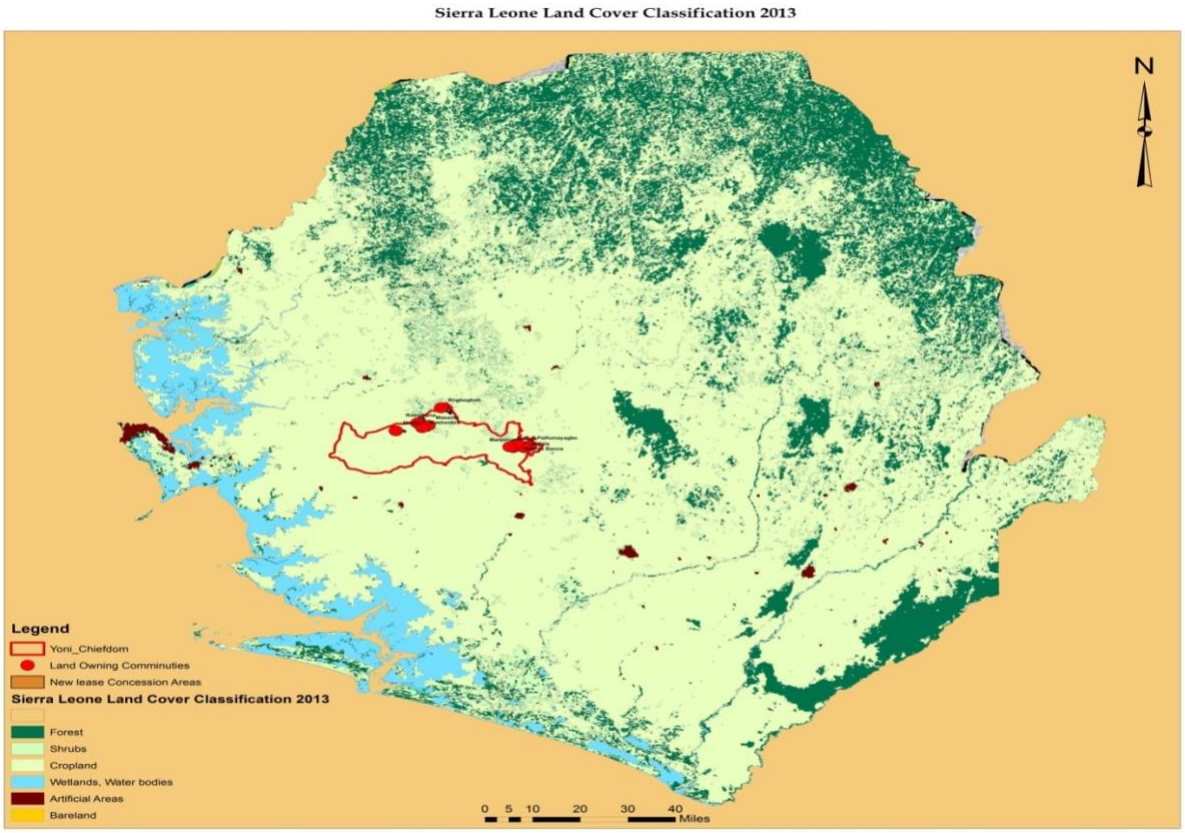
Farm bushes are transitory between grasslands and forests. They can develop into forests if left long enough (at least 10 years) to grow. But they serve as host for a wide variety of products for consumption by local communities or sale to external markets. The common products include charcoal, firewood, medicinal herbs, thatch for roofing of houses, wood for construction of houses. They are also, by their description, used for upland rice cultivation in the shifting / rotational bush fallowing systems.

The Grassland areas are characteristically large areas predominantly occupied by high elephant grasses, and in some areas they are interspersed by oil palm trees. There are Lophira trees savanna vegetation especially in the north-eastern block of the new leased area.

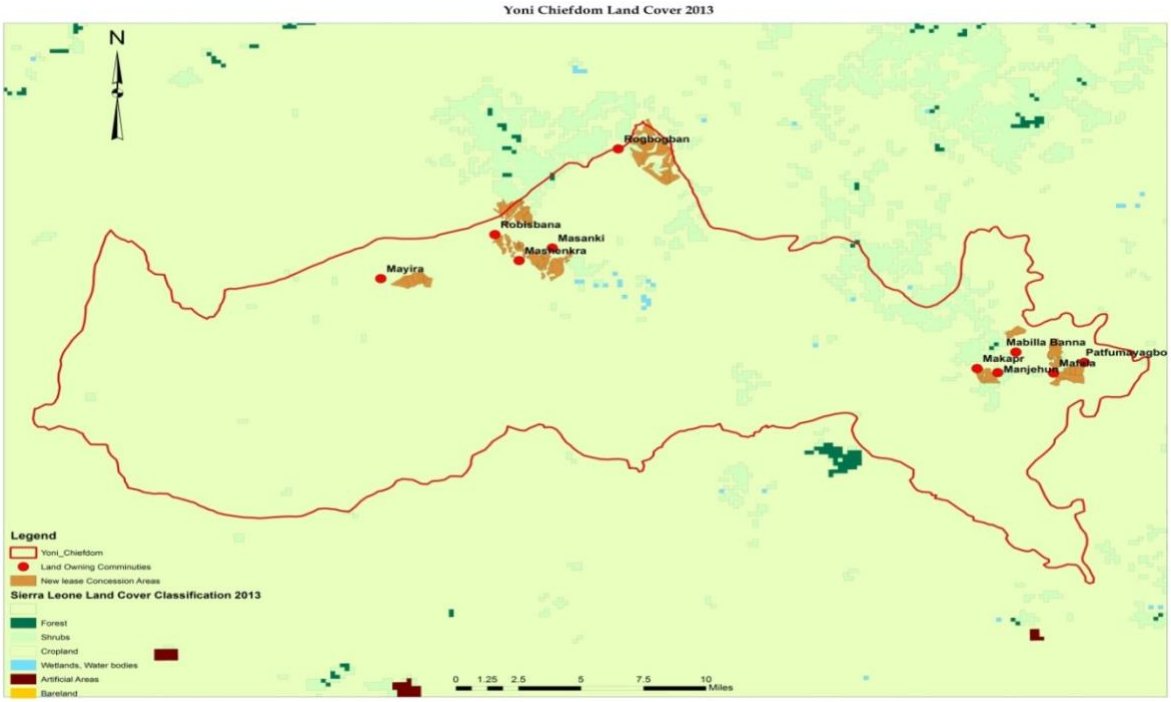
Figures 4.3.5(a) and 4.3.5(b) are maps of Sierra Leone's ecoregions and land cover classifications respectively, each showing the new leased areas in Yoni chiefdom.



4.3.5 (a): Eco-regions of Sierra Leone



4.3.5 (b): Land Cover Classifications of Sierra Leone



4.3.5 (c): Land Cover of Project area

4.3.6.1 Primates, Ungulates and Birds

Information about the biodiversity of the study area was obtained mainly from secondary research, including the National Biodiversity Strategic Action Plan, previous ESIA, previous research on habitats of the surrounding ecosystem, and interviews with the resident community on the existence of particular plant and animal species. The team considered particularly species that are of concern to the IUCN – endangered, vulnerable, and threatened species.

The studies investigated the presence of ungulates, primates and birds in the study area. In general, searches from existing literature of biodiversity studies done in the study area suggest that the ungulates found all of Least Concern according to the IUCN Red List. Past studies also confirm suggest the existence of four primates, two of which can be categorized as either Least Concern or Near Threatened on the IUCN Red List. All investigations including interviews with community resource people do not suggest or confirm the existence of endangered species of primates in the study area. There are also several species of birds suggested to exist in the study area, although no one of them can be categorized as vulnerable.

There are two main relevant studies that have been conducted on the ecosystem of the new lease land areas of Yoni and Masimera chiefdoms. These include; the ESIA studies conducted by the Environment Consulting Agency in 2014 and the Habitat and High Conservation value Assessment done on same by Unique Forestry in 2016. The reports of both investigations have been reviewed. The recent findings from other extensive pieces of research, interviews with stakeholders, and communities combined with our on-the ground verifications concludes that species encountered in the old leased areas are almost the same that can be encountered in the new leased areas. These coupled with extensive research on other related literature and interviews with the community on primates, ungulates, birds and tree species in the new leased land area present the following list, suggestive of the biodiversity status of the new leased area.

Ungulates	**Scientific name**	**IUCN Status**	**Presence in study area**
Maxwell's Duiker	*Cephalophus maxwelli*	Least concern	Likely
Black Duiker	*Cephalophus niger*	Least concern	Confirmed

Royal Antelope	*Neotragus pygmaeus*	Least concern	Confirmed
Bushbuck	*Tragelaphus scriptus*	Least concern stable	Confirmed
Red River Hog	*Potamochoerus porcus*	Least concern	Confirmed
Primates			
Sooty Mangabey	*Cercocebus atys*	Near threatened	Likely
Campbell's Monkey	*Cercopithecus campbelli*	Least concern	Confirmed
Lesser spot-nosed Monkey	*Cercopithecus petaurista buettikoferi*	Least concern	Confirmed
Green Monkey	*Chlorocebus sabaeus*	Least concern Stable	Likely
Western black and white Colobus	*Colobus polykomos*	Vulnerable	Unlikely
Olive Colobus	*Procolobus verus*	Near threatened	Unlikely
Carnivores			
Leopard	*Panthera pardus*	Vulnerable	Unlikely
Rodents			

Greater Cane rat	*Thryonomys swinderianus*	Least concern	Likely
African Brush tailed porcupine	*Atherurus africanus*	Least concern	Likely
Fire-footed Rope squirrel	*Funisciurus pyrropus*	Least concern	Likely
Giant rat		Least concern	Likely
Giant Forest Squirrel	*Protoxerus stangeri*	Least concern	Likely
Small Sun Squirrel	*Heliosciurus punctatus*	Least concern	Likely

Table 4.3.6.1: Presence of primates in the concession area

The Maxwell Duiker, scientifically known as the Cephalophus maxwelli inhabits warm lowland forests, secondary forests and farmlands, which are characteristic of the vegetation in the concession areas in Masimera and Yoni chiefdoms. The Final Report on the Assessment of HCV within the MFD concession in Sierra Leone by Unique Forestry confirmed the presence of Maxwell Duiker in the study area. We therefore infer that it is likely present in the concession areas. The same study also confirmed the presence of the Red River Hog. On description of the Black duiker, Royal antelope and Bushbuck, community people confirmed having encountered them in the past. The Bushbuck, they admitted, is frequently hunted for bush meat. Although they were not spotted during our ground visits, we therefore state that these ungulate species are likely present in the concession areas.

The Sooty Mangabey is an arboreal and diurnal primate native to tropical West Africa, inhabiting both old growth and secondary forests, and flooded, dry, swamp, mangrove, and gallery forests. These known habitats of this primate are very characteristic of the

ecology of the concession areas. Although it was not particularly encountered in our ground visits, community people reported to have encountered this primate in the past. We conclude therefore that the Sooty Mangabey is likely present in the concession areas.

The Final Report on the Assessment of HCV within the MFD concession in Sierra Leone by Unique Forestry also confirmed the presence of the Campbell's Monkey and the Lesser spot-nosed Monkey in study area which coverers the prent concession areas.

We mentioned Leopards because they hitherto existed in these areas as the concession areas fall within the distribution range of the species, and as we were informed by community sources. But it has been over decades since this species was encountered. We therefore conclude that the species is unlikely to be encountered in the study area.

Reports on previous studies on birds in Tonkolili district state the presence of about 58 bird species, which included 14 open-land species, 17 generalists, and 19 forest associated species within the local bird species assemblages. The categories of the other 8 bird species were not identified. In addition to these, Unique Forestry encountered the following:

- African Grey Hornbill
- Abyssinian Ground Hornbill
- Great Blue Turaco
- Western Grey Plantain Eater
- Green Turaco
- Large numbers of West African Pied Hornbills.

4.3.6.2 Trees

About 70% of land lease to Miro Forestry have been degraded to grasslands, 20% are wetlands and about only 10% are farm bushes. In most cases, Farm bushes are given to Miro only after harvesting the poles and going through one rotation of farming.

Previous studies have identified about 74 different species; dominant among them are light-demanding species, and fire-resistant species, such as Lophira lanceolata in areas that have been heavily degraded by slash-and-burn agriculture. There were three

prevalent species encountered across the dorminant farmbush vegetation that may be of conservation concern and importance. They are;

- Terminalia ivorensis (Combretaceae family)
- Mitragyna stipulosa, (Rubiaceae family) and
- Milicia regia (Moraceae family)

Although they were found among the dominant farm bush vegetation, these species do not dominate the composition of the farm bush vegetation. They were distributed in mosaic groups at different locations in the farm bushes, dominated by other species that are of no conservation value. The species are prone to exploitation for timber because they are recognised as high-value timber species, and therefore categorized as vulnerable (IUCN 2015).

4.4 Socio-economic Environment

The livelihood of these communities is an important parameter for investigation. It is important to establish baselines so that they can be used as bench marks for comparison. It is also important to investigate not only how the operations of MFSL will affect the livelihood of the communities, but also to help MFSL's to make informed decisions on their fulfilment of corporate social responsibilities. These investigations also include the perceptions of the communities on the lease agreement with MFSL potential benefits and threats.

For this purpose, the socio-economic investigation focuses on directly on the 10 land owning communities who leased the land to MIRO for plantation development.

4.4.1 Socio-economic profile

This section presents the socio-economic profile of the 10 land owning communities in Yoni chiefdom. It provides an overview of key socio-economic parameters of the communities: gender distribution, ethnicity, educational status, age distribution,

household size and population density, residence status, income and occupational distributions.

Our team conducted comprehensive interviews covering about 30% - 50% of households in the communities. The communities have already leased land to MIRO, referred to as the 'new leased land' throughout this report.

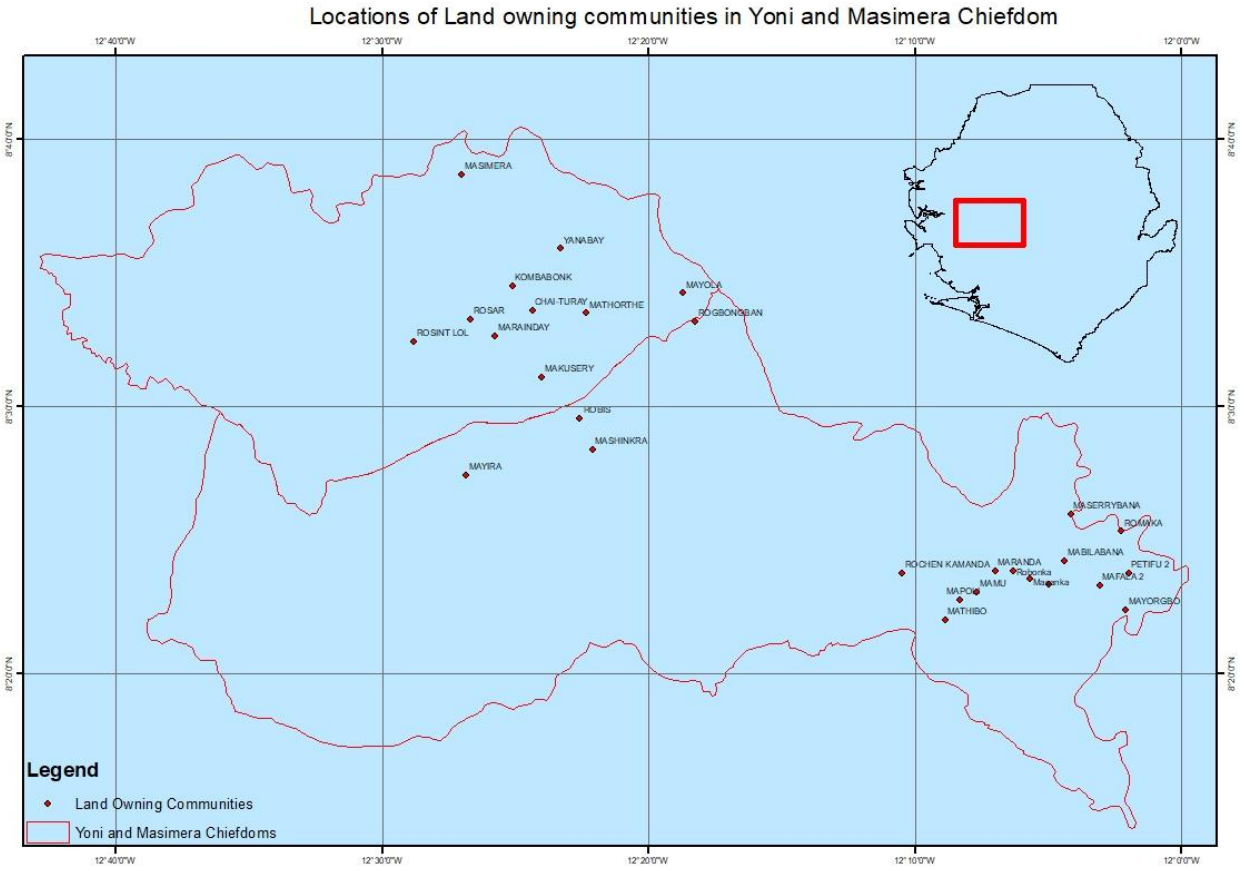


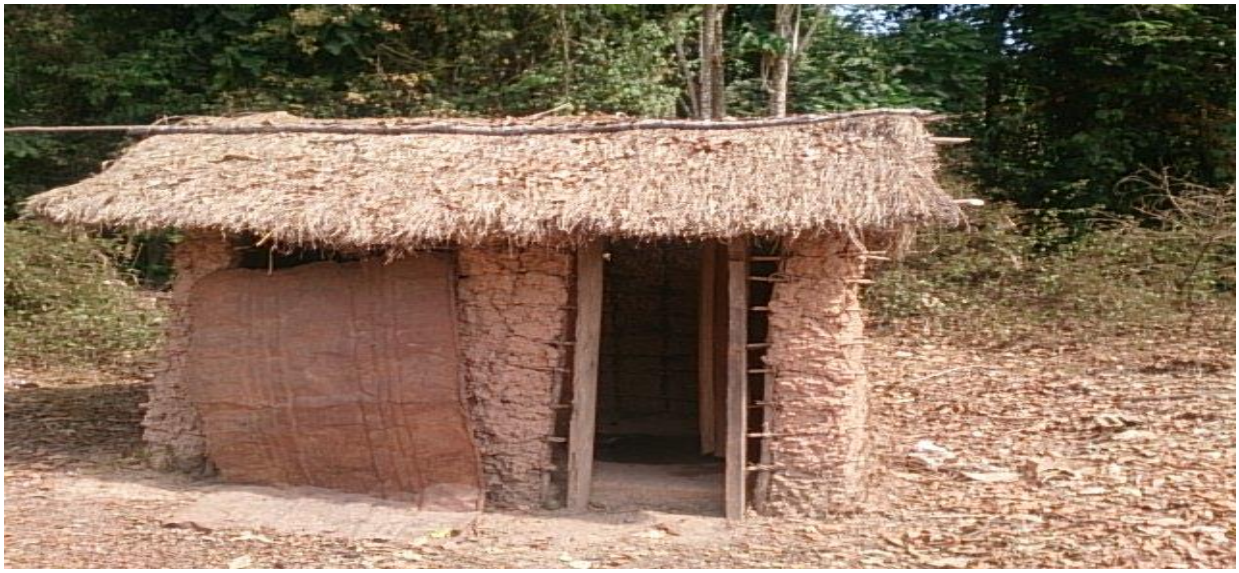
Figure 4.4.1: Map showing land owning communities in project area

4.4.2 Household Composition

Although it is difficult to obtain official statistics on the population of individual rural settlements in Sierra Leone, our analysis will be sufficiently reflective of the existing population dynamics of the project communities. The survey covered 40 households in the 10 landowning communities.

Most of the households live in houses that have either thatched or tin roofs. About 59% the houses have thatched roof, 41 % have tin roof. The walls of the houses are made of mud, wood, stones and in few cases cement. Houses in the communities, generally, are constructed with wood and mud (97%). There are very few cases houses made up of concrete cements (3%). About 71% of houses have been built 10 or more years ago. 19% of houses were built between 3 and 9 years ago. 10% were built less than three years ago. The houses are detached standalone houses with an adjacent kitchen and most cases a small structure covering the household toilet.

Local thatch roofed house at Masanki,Mamaka Section, Yoni Chiefdom



One local pit toilet at Mayira village, Mayira Section, Yoni Chiefdom used by community people

4.4.2.1 Sex distribution

The population analysis shows that the communities are made up of 60% male and 40% female. This composition is significantly different from the general trend in Yoni chiefdom and Tonkolili district, which shows 48% male and 52% female and 51% male and 49% female respectively, according to the 2015 Housing and Population Census. The population composition in Masimera chiefdom and Port Loko district is 47.3% male and 52.7% female and 47.9% male and 52.1% female, respectively. In the study area, our analysis shows a male dominance in the land owning communities, typical in majority of communities within Sierra Leone and in most part of Africa. 6.5% are 10 years and below, 23.9% are between 11 years and 20 years old, 25.4% are between 21 and 30 years, and 22.5% between 31 and 40 years. 8.0% are between 41 and 50 years, 8.7% are between 51 and 60 years and only 5.1% are above 60 years old. The population is predominantly youthful, with 72% aged between 11 years and 40 years.

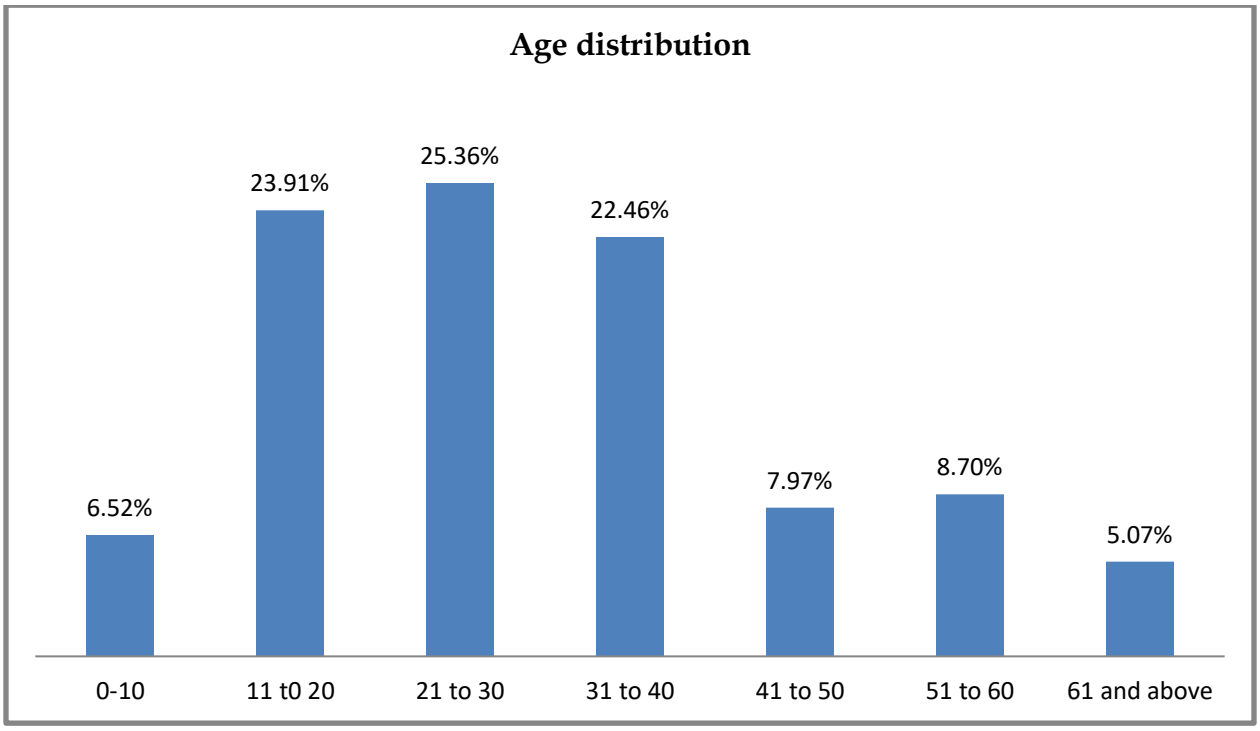


Figure 4.4.2.1: Age distribution in project area

4.4.2.2 Household size

The average household size was calculated as 6 persons per household. About 28% of households have more than 6 persons. One household had the highest number of 11 persons.

4.4.3 Educational attainment

Results from analysis of data obtained on levels of highest educational institutions attended show 53.6% of household inhabitants did not acquire any formal education. This percentage cannot read or write English, but there is a considerable percentage of about 20% of those without formal education that acquired some Quranic education in Arabic in non-formal settings. They can recite Quranic verses albeit for majority of them, they do so only for prayers. Only about 5% of those who did not acquire formal education can read or write Arabic. 25.4% attained Western education primary school level, and 10.1% attained Western education secondary school level. Only about 1.5% attained Western education tertiary level. There is therefore a high level of illiteracy in Western education in the land owning communities.

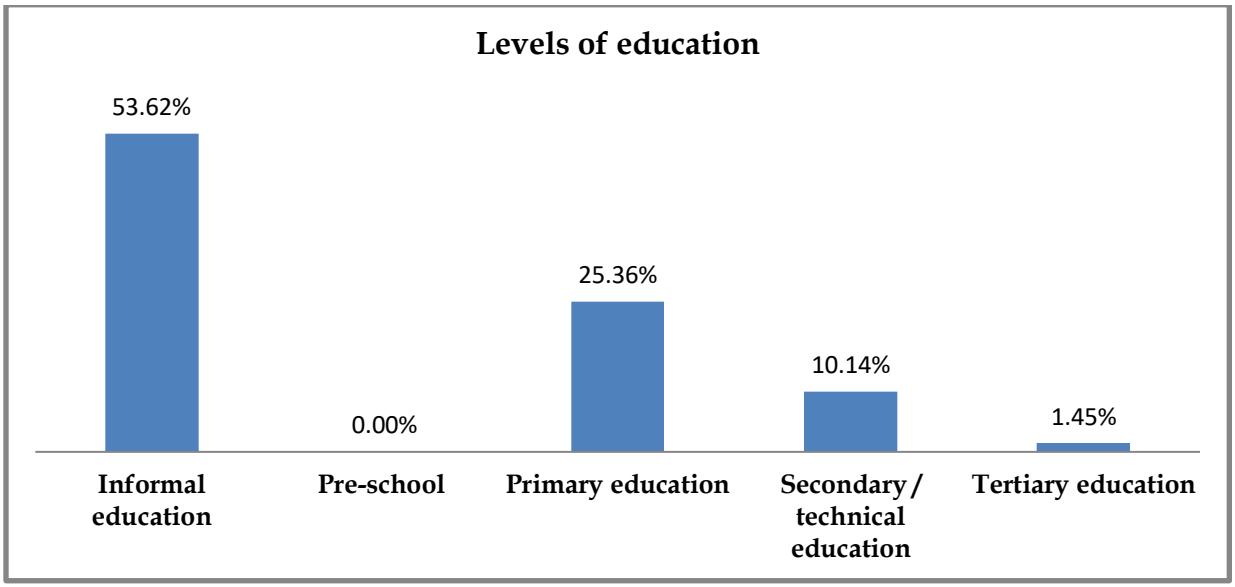


Figure 4.4.3: Levels of education of in project area communities

18 children (6.5%) aged 10 years and below were recorded amongst the total inhabitants. Of these, 5 (27.7%) were of pre-school age but none attends pre-school. Another 5 (27.7%) of them attend primary schools, the rest are not attending primary school.

The active working class of household inhabitants aged between 21 and 50 years constitute about 55.8% of the total population. 15% of these attained primary education, 5% attained secondary education and 2.5% attained tertiary education.

Primary School at Rogbogban, Mamaka Section, Yoni Chiefdom

Primary School at Mashenkra, Mamaka Section, Yoni Chiefdom

Temporal thatched school at Manjehun, Foindu Section, Yoni Chiefdom

Side View of a temporal thatched school at Manjehun, Foindu Section, Yoni Chiefdom

4.4.4 Residence status

About 85% of household inhabitants have lived in their households since birth. This shows that there is little immigration into the land owning communities, and that they are largely sedentary. This will suggest that household inhabitants have direct ownership of the land acquired by MFSL for plantation development, and would therefore have serious concerns about its mitigating and militating outcomes on their communities.

4.4.5 Employment

About two-thirds of inhabitants responded that they are farmers (65.9%); 3.6% are self-employed; 2.2% are salaried and 2.2% responded that they are unemployed. The rest would be aged 10 years or below and 17 years or below, who can be considered under-aged children not supposedly to be employed. Those who are self-employed responded that they are carpenters, masons, or petty traders.

Figure 4.4.5: Employment statuses in project communities

4.4.6 Income

The main sources of income of household inhabitants included sales of farm / agricultural products (crops, vegetables, fruits and livestock); charcoal and fuel wood, remittances from relatives, self-employment, and salary. About 85% of household income is from sales of agricultural products, livestock; about 10% from salaries and self-employment, 2% from sales of charcoal and fuel wood and 3% from remittances sent by relatives living elsewhere.

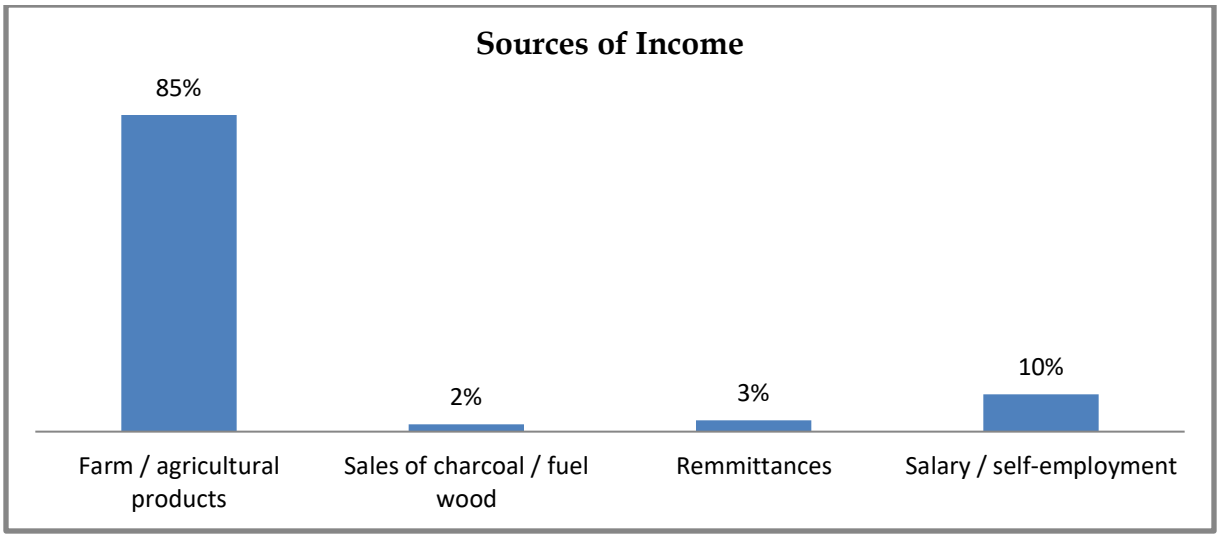


Figure 4.4.6: Sources of income of communities in project area

About 95% of the income from agricultural products is through the sales of livestock. The main crop cultivated in the communities is rice, but this is very much on subsistence basis, mostly not sufficient for the annual feeding of the farming household. Almost all the farmers responded on cultivating more than one crop. Rice is cultivated in combination with cassava, cucumber, garden eggs, pepper, okra and other vegetables on the same farm. Groundnuts are grown immediately after the harvest of rice

The average annual income of a household is just about SLL2, 500,000.00 (Two million five hundred thousand Leones), equivalent to US Dollars 329.00 (Three hundred and twenty nine US Dollars).

The income analyses do not include payments by MFSL for the leased lands.

Household inhabitants spend money on medicine from mobile drug dealers, pharmacies in the main town in the chiefdom and on treatment delivered by traditional healers. They also spend money to buy food (salt, fish, rice and other condiments not available in their households). 5% of inhabitants responded that they also spend money to pay school fees for their children who live in other towns or cities in the country.

4.4.7 Household Assets

Household possessions are good indicators of economic status. The survey listed common household items for respondents to indicate which of the items and their quantities a member of the household possess. In general, households appear to possess only few of the listed material items. About 45% of households possess at least a radio set, and 34% possessed at least one mobile phone. None of the households possess a vehicle, motorbike, bicycle, tricycle, sewing machine, or a furniture suite.

4.4.8 Land Ownership

With the exception of one household, all households responded that they own land that is part of the new lease area to MFSL. This relates to the fact that almost all of the respondents are natives of their localities and therefore have inheriting rights to portions of the land property of their communities.

4.4.9 Sanitation and Health

4.4.9.1 Toileting facilities

More than half of the households (55%) that took part in the survey have pit latrines they use as household toilets, which are also used occasionally by neighbours. 44% use community toilets and 1% defecate in the open. This latter percentage of people defecates openly behind their houses or by rivers and streams. This can be a source of contamination of the rivers and subsequently health hazards for the larger percentage of people who use the rivers and streams as sources for drinking water.

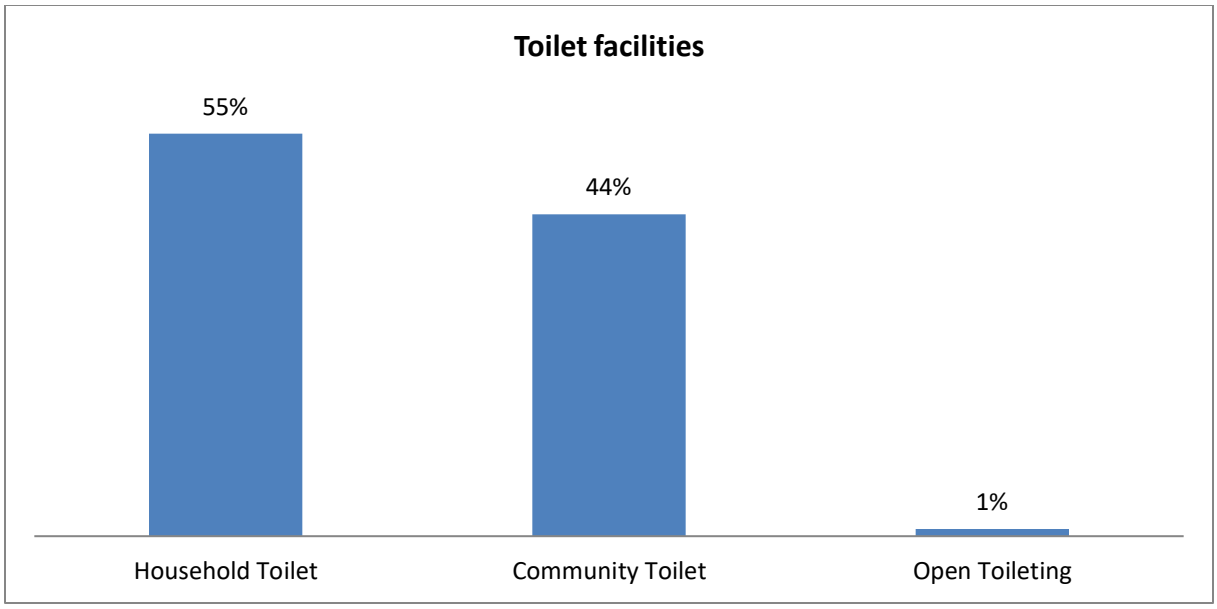
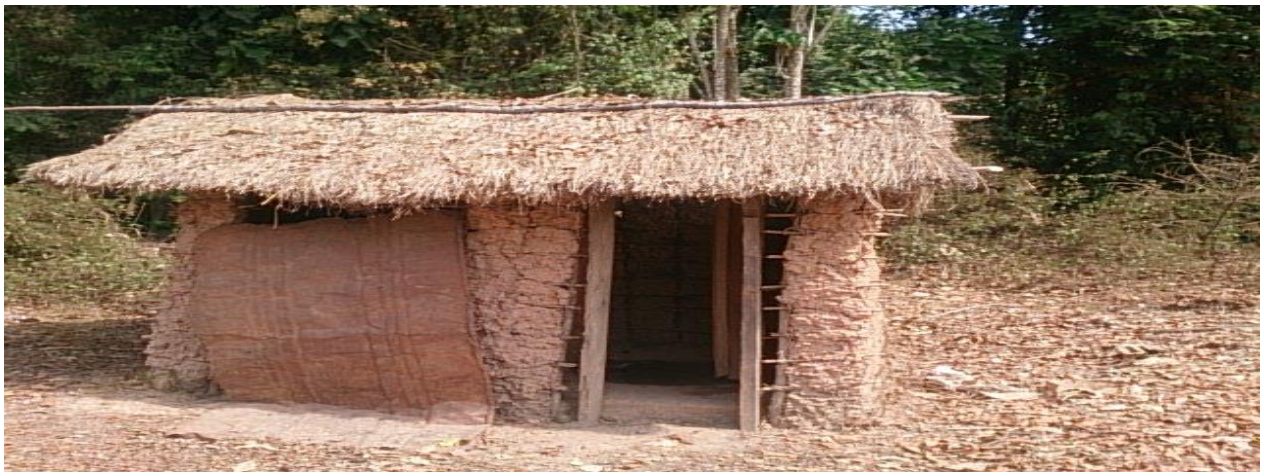


Figure 4.4.9: Toilet facilities of communities in project area



Local pit toilet at Mayira village, Mayira Section, Yoni Chiefdom used by community people

Local Bath Room and Toilet at Manjehun, Foindu Section, Yoni Chiefdom

4.4.9.2 Source of drinking water

The source of drinking water can largely determine its safety for human health. Unsafe drinking water can lead to many health hazards including cholera, typhoid disease and other stomata problems. This presents as a major concern for the health of the land owning communities. About 56.5% of household inhabitants get drinking water from wells / springs, 30.4% get drinking water from rivers and streams and only 13.1% get drinking water from hand pumps constructed in the villages for communal use.

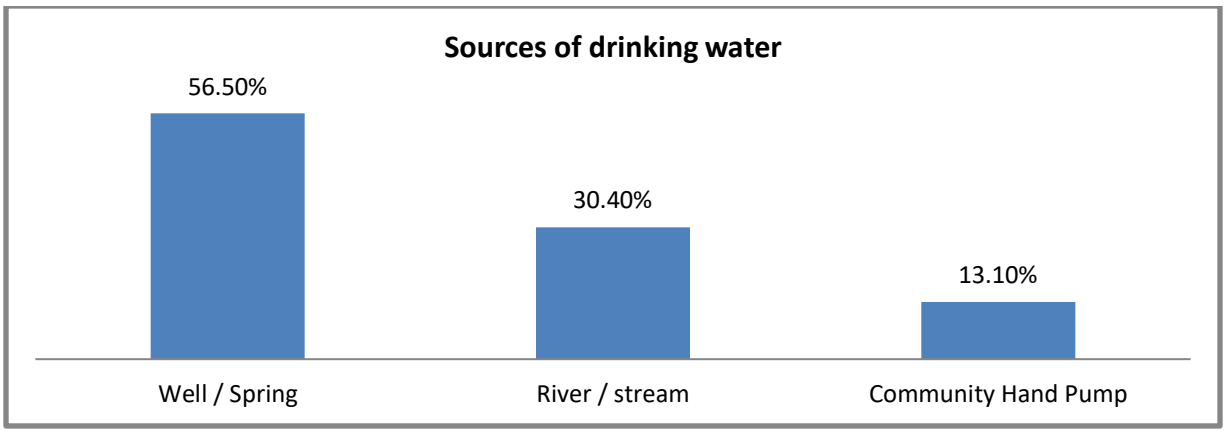


Figure 4.4.9.2: Sources of drinking water in communities in project area

Locally dug water well at Manjehun, Foindu Section, Yoni Chiefdom

Dug Out Water Well at Patfumayagbo Village, Foindu Section, Yoni Chiefdom

4.4.9.3 Source of water for washing, watering and animals

Like drinking water, wells and springs are the commonest sources for water for washing, watering and for animals. The survey shows that 56.0% of water for these purposes are sourced from wells and springs, 40.0% from rivers and streams and 4.0% from hand pumps.

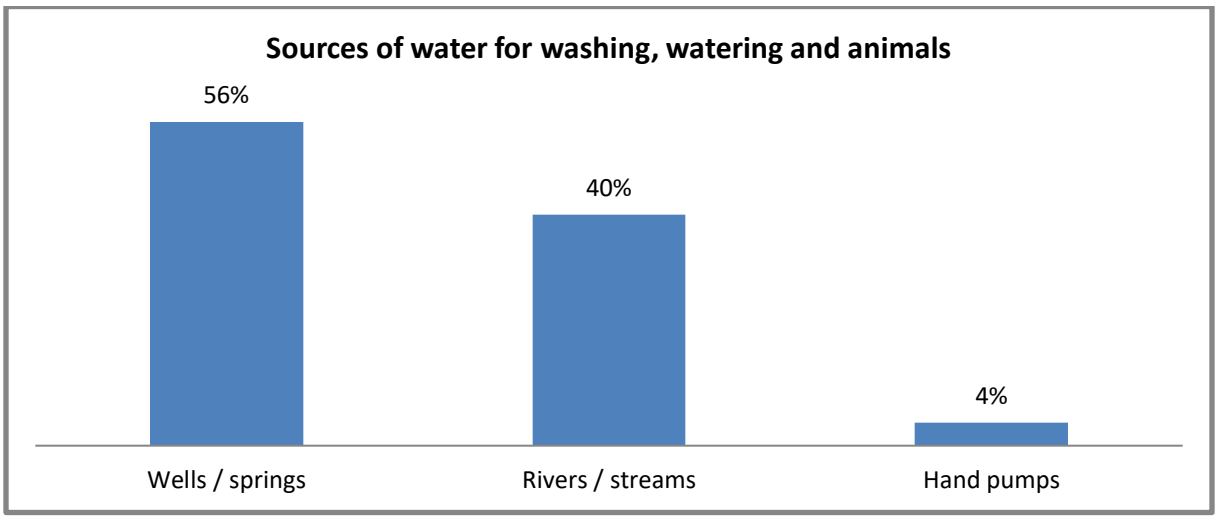


Figure 4.4.9.3: Sources of water for washing, watering and animals in communities in project area

Stream at Mafala, Foindu Section, Yoni Chiefdom used as a source of water for drinking, cooking and laundering

Stream at Patfumayagbo, Foindu Section, Yoni Chiefdom used for laundering by community people

4.4.9.4 Common ailments

The communities can encounter a wide range of ailments including, diarrhoea, skin diseases, malaria, cholera, coughs, typhoid fever, sexually transmitted diseases, eye diseases, fever and headaches, and child birth related complications. The survey however shows that malaria is the most frequent illness. This can be related to dense presence of swamps and moist vegetation around the communities. Skin diseases are next to malaria, which might be related to the well, spring and river sources of water for washing.

People in the land owning communities would attend to both traditional healers, mobile drug dealers and nearby Primary Health Care Units and Pharmacies in circumstances of ailments. In all situations, they would first seek help from traditional healers, and then visit the PHUs in serious circumstances. For less serious circumstances they would visit nearby pharmacies to by medicines. The entire land owning communities do not have PHUs or pharmacies; they would travel on average one and half mile to access a PHU or a pharmacy.

Health Center constructed by the Government of Sierra Leone at Patfumayagbo Foindu Section, Yoni Chiefdom

4.5 Source of energy

All the households who took part in the survey responded that they use fuel wood as the main source of domestic energy. Fuel wood is obtained from nearby bushes. The use of forests to produce fuel wood for energy and cooking has been identified as one the main drivers of loss of forest cover and conversion of forests to agricultural land.

4.6 Impact of MFSL on the communities

The survey investigated the current impact of MFSL on the communities and their expectations in the long future. All the respondents confirmed their awareness of the operations of MFSL in their communities and in Yoni chiefdom in general. All of them indicated that they perceive the operations of MFSL as something beneficial to their households and to their communities. They indicated that the most common immediate benefits they have received from MFSL are: 1) Provision of employment to community people, and 2) construction of community roads and bridges. There were no reports from respondents on negative impacts of MFSL on their individual households and on their communities.

Most of the lands that have been leased to MFSL were not being used for agricultural or other purposes. 92% responded that they have other land areas for agriculture that excludes the portions they have leased to MFSL. 8.0% of respondents (encountered in Rogbogban) do not have other portions of land to use for agriculture or other purposes. In the lease process, however, MFSL goes through a lot of processes to ensure that there is enough land beside what has been given for agriculture and community development within every community they develop. If there is no available land outside areas given to MFSL, they do not develop the given land.

On the issue of how much they would earn from the use of 1 hectare of land per year, if the land was not leased to Miro, they responded with a money figure of average Le 500, 000.00 per year. But this may not be continuous for the same piece of land because of the shifting and rotational system of agriculture they practice. They however stated that they believe that the overall benefits of the project outweigh any foreseeable loss of income from the land lease.

In general, the land owning communities perceive MFSL as agents of development who will help their communities by providing them more community facilities such as clean water supply, better roads and bridges, clinics, and schools as long as they fulfil their promises.

4.7 Social services / facilities

Only 3 out of the 10 land owning communities have primary schools. There are no secondary or tertiary institutions in the communities. Pupils in the other 7 communities attend schools in other communities outside the land owning communities. On average, they travel about 1.5 Km to access the nearest primary or secondary school.

There are no Primary Health Care Units (PHUs) in the land owning communities. Residents in the land owning communities travel over an average distance of 1.5 Km to access the nearest PHU outside their communities.

Health Center constructed by Government of Sierra Leone at Patfumayagbo Foindu Section, Yoni Chiefdom

Primary School at Mashenkra, Mamaka Section, Yoni Chiefdom

Primary School at Rogbogban, Mamaka Section, Yoni Chiefdom

Road upgrade and maintenance done by Miro Forestry SL Ltd leading to Manjehun, Patfumayagbo, Mabilla Banna, Yoni Chiefdom

CHAPTER 5

5.0 STAKEHOLDER PERSPECTIVES

5.1 INTRODUCTION

The involvement of key stakeholders in the ESIA process is crucial for its reliability and validation. Stakeholder engagement should be seen as a continuous process and not on a one-off basis. The information in this section is based on both the expert knowledge of the consultants acquired from repeated ESIA processes over the years, and consultations with stakeholders enlisted below.

5.2 Key Stakeholders

The key stakeholders involved are:

a) Forestry Division, Ministry of Agriculture, Forestry and Food Security
b) Environment Protection Agency
c) Ministry of Local Government and Rural Development
d) Ministry of Labour, Employment and Social Security
e) Ministry of Lands, Country Planning and Environment
f) Tonkolili District Council
g) Yoni Chiefdom Administration
h) Masimera Chiefdom Administration
i) Land Owners
j) Community members
k) Vulnerable groups
    a. Youth groups
    b. Women's groups

5.3 Stakeholder description and concerns

This section gives brief descriptions of stakeholders and summary perspectives / concerns of the project

a) **Forestry Division, Ministry of Agriculture, Forestry and Food Security**
   - Safeguarding areas for biodiversity conservation and protection
   - Forest management harvesting plans
   - Other forestry issues
   - Involvement in public disclosures

b) **Environment Protection Agency**
   - Compliance with the ESIA process
   - Compliance with all EPA regulations
   - Involvement in public disclosures
   - Issuance of EPA Licenses

c) **Ministry of Local Government and Rural Development**
   - Involvement in the process of lease agreements in order to protect the rights of local community
   - Collaboration with local authorities on the protection of the rights of the land owners
   - Involvement in public disclosures

d) **Ministry of Labour, Employment and Social Security**
   - Issues relating to the occupational health and safety of workers
   - Compliance of employers to employment conditions as stipulated in the Social Security Act

e) **Ministry of Lands, Country Planning and Environment**
   - Demarcation and survey of community land holdings

- Involvement in the registration of leased lands
- Involvement in public disclosures

f) Tonkolili District Council

- Involvement in all meetings relating to socio-economic issues for the communities
- Involvement and witnessing lease agreements
- Ensuring compliance to lease agreements by the company, land owners and the local authorities

g) Yoni Chiefdom Administration

- Lease agreements
- Land demarcation and survey
- Protecting rights of land owners
- Enforcing community bye-laws and regulations
- Involvement in public disclosures

h) Land Owners

- Lease agreements and compliance to the agreements
- Involvement in land demarcation and survey
- Job opportunities
- Access to social services and other economic opportunities provided by the company

Conclusion

The perspectives of the groups of stakeholders have been clearly stated above. The Government Ministries are interested in the protection of the law as it respectively relates to them, such as the protection of biodiversity of forests and compliance with conservation and forestry acts on the part of the Forestry Division (MAFFS); Compliance with EPA regulations and procedures (EPA-SL); land demarcation and surveys (MLCPE); protection of the rights of local communities and their full involvement in lease negotiations and agreements (MLGRD); community rights and

involvement, and bye-laws (YCC) local council in all land lease agreements and protection of the rights of both the communities and investment partners, and abidance with royalty payments to the council (TDC), job opportunities and access to social services and other economic opportunities provided by the company for land owners and the local communities.

CHAPTER 6

6.0 IMPACT ASSESSMENT AND MITIGATION

6.1 Introduction

Miro Forestry SL Ltd is currently operating a total lease area of about 21,000 ha in the Yoni chiefdom, Tonkolili district in Sierra Leone. However, not all of the 21,000 ha is available for the company's operations.

The company has been approached by several neighbouring communities who are willing to offer land leases but these communities are located outside the previous lease areas. The land leasing communities for the new leased areas are: Majehun, Mafala, Mabilla Banna, Patfumayagbo, Mayira, Mashenkra, Robisbana.

Much as the socio economic survey conducted by GeoData SL in the communities around the new lease area reveal that the community members view the operations of Miro Forestry SL Ltd as beneficial, a means of development, a good company and have added value to their lives, it is anticipated that there are a wide range of environmental, social and health impacts that may be caused by the operations of the company.

The purpose of this section is to assess, based on the social, health, ecological and physical information obtained, the impacts of the operations of Miro Forestry SL Ltd in the newly leased areas. Impacts have been characterized into those that affect the biophysical environment, ecological and those which affect the socio-economic environment. For each impact, a brief description is provided as well as an analysis of its significance.

6.1.1 Impact identification

Impact identification is performed by the use of an Input-Output model which serves to guide GeoData SL in assessing all the potential instances of change to the biophysical environment, the ecology, pollution and resource consumption that may be associated with the activities of the company during the establishment and management of the forestry plantation. These activities are listed in Table 6.1.

Table 6.1: Activities identified during each different phase of the project

No	Activity
Establishment of the Forest Plantation	
1.	Securing lease land for establishment of the forestry plantation
2.	Procurement of equipments and machinery
3.	Procurement of seeds and species selection
4.	Selection of appropriate planting areas
5.	Plantation layout – Spacing decision; area survey and marking operation;
6.	Establishment of fire break lines
7.	Mapping the location of the plantation
8.	Site preparation and vegetation clearance
9.	Road construction
10.	Planting operation and fertilizer application
Forest Plantation Management	
11.	Fire Protection and Guarding
12.	Replanting

13.	Weeding
14.	Pruning
15.	Thinning
16.	Harvesting the mature forest plantation
17.	Felling
18.	Regeneration

Outputs from forestry plantation establishment activities may generally be described as any changes to the biophysical and socio-economic environments, both positive and negative in nature, and also include the product and waste produced by the activities. Negative impacts could include changes to the biophysical environment such as destruction to habitats, reduction in wildlife or reduction in surface water quantity. Positive impacts associated with forestry plantations may include carbon sequestration, construction of infrastructure, skills transfer or benefits to the socio-economic environment. During the determination of outputs, the effect of outputs on the various components of the environment (.e.g. water quantity and quality) is considered.

6.1.2 Impact rating

The impact rating process is designed to provide a numerical rating of the various environmental impacts identified by the use of the Input-Output model. This gives the project proponent a greater understanding of the impacts of this project and the issue which needs to be addressed by mitigation and also gives the regulators information on which to base their decisions.

The significance rating process follows the established impact/risk assessment formula:

Significance = Consequence x Probability

Where Consequence = Severity + Spatial Scale + Duration

And

Probability = Likelihood of an impact occurring

The matrix calculates the rating out of 147, whereby Severity, Spatial Scale, Duration and Probability are each rated out of seven as indicated in Table 7-1 below. The significance weight rating assigned to the various parameters for positive and negative impacts in this study are presented below in Table 7-1.

Table 7-1: Impact Assessment parameter ratings

Rating	Severity		Spatial Scale	Duration	Probability
	Environmental	**Social, Cultural and heritage**			
7	Very significant on the environment. Irreparable damage to highly valued habitats or eco-systems. Persistent severe damage	Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order	International The effect will occur across international borders	Permanent: No Mitigation No mitigation measures of natural process will reduce the impact after implementation	Certain/ Definite The impact will occur regardless of the implementation of any preventative or corrective actions.

6	Significant impact on highly valued habitat or ecosystem	Irreparable damage to highly valued items of cultural significance or breakdown in social order.	National Will affect the entire country	Permanent: Mitigation Mitigation measures of natural processes will reduce the impact	Almost certain/Highly probable It is most likely that the impact will occur
5	Very serious, long term environmental impairment of ecosystem function that may take several years to rehabilitate	Very Serious widespread social impacts. Irreparable damage to highly valued items	Province/ Region Will affect the entire province or region.	Project life The impact will cease after the operational life span of the project.	Likely The impact may occur
4	Serious medium term environmental effects. Environmental damage can be reversed in less than a year	On-going serious social issues. Significant damage to structures/ Items of cultural significance	Municipal Area Will affect the whole municipal area	Long term 6-15 years	Probable Has occurred here or elsewhere and could therefore occur.
3	Moderate, short effects but not	On-going social issues. Damage	Local	Medium term	Unlikely

	affecting ecosystem function. Rehabilitatation requires intervention of external specialists and can be done in less than a month.	to items of cultural significance.	Local extending only as far as the development site area	1-5 years	Has not happened yet but could happen once in lifetime of the project, therefore there is a possibility that the impact will occur.
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/without help of external consultants	Minor medium-term social impacts on local population. Mostly repairable cultural functions and processes not affected.	Limited Limited to the site and its immediate surroundings		Extreme circumstances and/ or has not happened during lifetime of the project but has happened elsewhere. The possibility of the impact materializing is very low as a result of the design, historic experience or implementation of adequate mitigation measures.
1	Limited damage to minimal area of low significance	Low-level repairable damage to	Vey limited	Immediate	Highly unlikely/None

	(e.g ad hoc soil erosion within plantation blocks). Will have no impact on the environment	commonplace structures.	Limited to specific isolated parts of the plantation blocks or lease areas	Less than 1 month	Expected never to happen

Impacts are rated prior to mitigation and again after consideration of the mitigation measures proposed. The significance of the impact is then determined and categorised into one of four categories, as indicated in the table below (Table 8) which is extracted from Table 8. This methodology is used to accommodate biophysical and social impacts.

Table 8: Significance threshold limits

Significance		
High	108-147	
Medium-High	73-107	
Medium-Low	36-72	
Low	0-36	

A neutral impact implies that it causes the area to return to a pre-project state. This is not regarded as positive, as there would be no need for this activity if the operation was not carried out.

The full impact assessment matrix for operations of Miro Forestry SL Ltd is in Appendix A. Following the establishment of the significance of each activity on each aspect, a weighting system is used to eliminate subjectivity. The weighting system is whereby all

aspects impacted on by the project are weighted from one to seven, one being the least significant and seven the most significant.

Significance	**Consequence (Severity + scale + duration)**								
	1	3	5	7	9	11	15	18	21
Probability/Likelihood	1	3	5	7	9	11	15	18	21
	2	6	10	14	18	22	30	36	42
	3	9	15	21	27	33	45	54	63
	4	12	20	28	36	44	60	72	84
	5	15	25	35	45	55	75	90	105
	6	18	30	42	54	66	90	108	126
	7	21	35	49	63	77	105	126	147

6.2 POTENTIAL ENVIRONMENTAL IMPACTS

6.2.0 Significant Impacts Identified

A summary of the impacts which have been regarded as high and medium are summarized in the tables below. Table 6.1 and Table 6.2 indicate that medium-high impacts are expected during establishment of the forestry plantation due to site clearing/vegetation cover removal, and planting operation and road construction due to noise and impacts on fauna within the lease area. After the appropriate mitigation measures are implemented, these impacts will however, be of medium-low significance. The impact due to vegetation cover removal and road construction may be of high significance but after mitigation will be of medium significance. Air quality impacts of medium-high significance may occur during site clearance/vegetation cover removal and road construction but after mitigation will be of medium-low significance. A detailed evaluation of all the anticipated biophysical impacts can be found in Appendix A.

6.2.1 Significant biophysical impacts

6.2.1.1 Biophysical impacts during establishment of the forestry plantation sites

Table 6.2.1: Biophysical impacts rated as medium-high and high during establishment of forestry plantation sites.

			Impact before mitigation							Impact Rating (after mitigation)						
Impacted Environment	Activity	Summary of Impact	Nature of Impact (Positive or Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence (7)	Probability (7)	Significance (147)	Nature of impact (positive or negative)	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)
Flora	Site clearance and road construction	Site clearance during forestry plantation block establishment may impact on flora	N	3	6	4	13	6	78	N	2	3	4	9	5	45

Fauna	Site clearance and road construction	Site clearance during forestry plantation block establishment may impact on fauna	N	3	6	4	13	6	78	N	2	3	4	9	5	45
Noise	Road construction		N	4	2	5	11	7	77	N	4	2	4	10	5	50

6.2: Biophysical impacts during forestry plantation management

Table 6.2.2 Biophysical impacts rated as medium-high and high during forestry plantation management.

			Impact before mitigation							Impact Rating (after mitigation)						
Impacted Environment	Activity	Summary of Impact	Nature of Impact (Positive or Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence (7)	Probability (7)	Significance (147)	Nature of impact (positive or negative)	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance
Flora	Weeding, Pruning and Thinning	Weeding, Pruning and Thinning may impact on flora	N	2	4	3	9	4	36	N	2	3	2	7	5	35

Fauna	Harvesting the mature forest plantation, felling and regeneration	Harvesting the mature forest plantation, felling and regeneration may impact on fauna	N	2	5	3	10	4	40	N	2	2	2	6	5	30
Noise	Weeding, pruning, thinning, harvesting and felling	Noise from these activities will impact the receptors in the area														

			N	4	3	5	12	7	84	N	2	2	4	8	5	40

6.3 All impacts identified during the establishment of the forestry plantation blocks

A detailed description of each impact environment relating to project activities is described in the next section.

6.3.1 Fauna

6.3.1.1 Site clearing and vegetation cover removal

The existing vegetation within the proposed areas for planting will be impacted on as the existing vegetation will be removed to facilitate planting. Activities will include the complete removal of vegetation and temporary disturbance to the prevailing soil structure. This activity is considered to be medium in duration as it will be required for the planting phase. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be medium-low

The partial degradation of natural vegetation and habitat for animal life in the new lease areas has already taken place within the surrounding environment due to previous agricultural and land use practices which include slash and burn farming practices, fuel wood and charcoal production before the commencement of Miro's operations. The planting of forest trees within the new lease areas in already converted natural forest lands to secondary forest areas has resulted in the permanent increase of natural habitat for reptiles, birds, frogs, insects and mammals present within the areas. Our observations as independent consultants show that the planted forest cover by Miro is increasing wildlife activity quite the reverse of previous land use activities. There is now a steady increase in wildlife activities, providing habitat to especially bushbucks, civet cats, certain birds, reptiles, frogs and insects. The impacts were temporary and site specific in extent as Miro's activities are offering some forest cover for some of the species whose habitats were completely degraded before Miro moved in. The severity of the impact was determined to be very moderate.

6.3.1.2 Flora

6.3.1.3 Site Clearance

Site clearance is limited to the blocks in the new lease areas. Miro Forestry tries as much as possible to avoid clearing thick farm bushes (anything more than two years old). Miro Forestry perceives the clearing of thick farm bushes as environmentally unfriendly and economically non-profitable because the company will spend a lot of bulldozer time clearing primary forest areas which costs money. Therefore, areas with thick bushes are converted into conservation areas and actively managed to return the areas to a semblance of its natural state.

All indigenous trees found scattered on the lease areas are not removed. Ecologically, Miro is not changing anything that hasn't been changed already by centuries of agriculture or land use recently by the accelerated felling of any standing trees for financial gain.

6.3.1.4 Construction of roads

Construction of roads will produce a higher level of activity, more debris and more noise, that will result in the reduction of flora activity and so negatively affecting ecological functioning.

6.3.1.5 Noise

The following activities during the establishment of plantation forestry blocks are identified as possible noise sources and may impact on the ambient noise level of the area:

- Site Clearance; and
- Construction of roads within the new lease area.

- The tractors and other heavy equipment that will be doing the construction of roads can be a source of continuous noise throughout the construction phase. However, from our investigation, on average the compartment blocks are more than 350m from the nearest communities. Therefore, it is very difficult to imagine that the noise from the bulldozers seriously cause noise levels to increase above IFC guidelines to affect communities at that distance.

Thus, the impact from bulldozers and other machinery is expected to be insignificant at most of the locations because the operations will be done over 350m away and during day times when predicted noise levels will be substantially lower than the existing ambient noise levels in the area during the day and night time. The noise level from the construction of roads is therefore not expected to impact on the ten new communities within the new lease areas.

6.3.1.6 Air Quality

The establishment of the forestry plantation will also involve the construction of roads and maintenance phases and at such times dust pollution will occur. Such activities will be measured, mitigated and site specific, and as such the air quality impacts will be insignificant considering the distance of 350m away from the communities in the new lease areas.

6.3.1.7 Hydrology

6.3.1.8.1 Impact of pollution of water resources

The possibility of water resources around the plantation blocks being polluted may be likely, although careful selection of plantation blocks will be done to minimize the impact of pollution on community water resources. The likely impacts will result in:

- Underground aquifers will be affected from machine debris during site clearance, road construction and during the plantation maintenance phases;
- Erosion of downstream streams or water sources;

- The upstream clean water system not being separated from the dirty water system, resulting in downstream pollution of the streams running through the plantation blocks.

6.3.1.9 Visual

Certain activities which are to take place during the forestry plantation establishment and maintenance phase will impact on the visual nature of the communities around the plantation blocks. These activities include vegetation removal/site clearance, road construction, creation of sites for stockpiling of harvested logs, sites for roughly cut logs and debris sites.

6.4 All impacts identified during the forest plantation management phase

6.4.1 Fauna

6 4.1.1 Fuel and chemicals storage and use

Spillages from fuel and chemical waste may pollute soils and water resources

6.4.1.2 Transport and roads

Transport areas should be limited to demarcated areas and existing speed limits should be adhered to prevent the generation of excess dust.

6.4.1.3 Management of the forestry plantation

Management procedures in terms of weeding, pruning thinning, harvesting the mature forest plantation, replanting and regeneration should be strictly implemented, so that no waste, debris or pollution spread from the plantation blocks into surrounding environment, reducing the ecological integrity of the sites.

6.4.2 Flora

6.4.2.1 Transport and roads

The traffic from the tractors and other vehicular activity will result in the creation of dust which will increase the deposit of dust and other materials on plant leaves. Natural dust will be created from use of the roads around the plantation sites. This will impact on the vegetation health and availability as food items as well as inhibit the ability of the plants units to provide ecological services. This activity is considered to be long term in duration as it will be required for the life of the forestry plantation. The impacts will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be moderate.

6.4.2.2 Management of unwanted logs, weeding, pruning and thinning and felling

Harvesting of mature forest plantation may sometimes result to some logs been discarded as unwanted and again in the process of weeding, felling, pruning and thinning will increase the potential of piles of unwanted materials to be piled for disposal or any other use of economic value. The pilling of such unwanted material may negatively affect soil binding and surface runoff. This activity is considered to be medium in duration as most will be required for replanting or regeneration. The impact will be site specific in extent with impacts likely to be on site. The severity of the impact was determined to be low.

6.4.3. Hydrology

6.4.3.1 Impact of pollution water resources due to upstream water mixing with dirty water

The probability of polluting ground water sources in the surroundings of the communities where forest plantation blocks will be established exists if management procedures are not adhered. The water sources for the hydrants and spring watering systems may cause the ground water sources to be polluted although mobile vehicles will

serve the purposes of fire protection and watering at both the nursery sites and transplanting sites. The impact of such activities will result in:

- Ground water sources being polluted;
- Erosion of downstream streams or rivers;
- The upstream clean water system not being separated from the dirty water system, resulting in downstream pollution of the streams running through the communities.

The impact will be site specific in extent and the severity of the impact was determined to be low.

6.4.4 Visual

Certain activities which are to take place during the management phase will impact on the visual nature of the sites. These activities include the transportation of harvested logs, firefighting machines and other important chemicals and equipments. These impacts are however going to be site specific in extent and the severity of the impact was determined to be low.

6.5 Social and Health Impact Assessment

6.5.1 Methodology

The primary goal of this assessment are to (a) identify and assess the extent and significance of potential social and health impacts associated with Miro Forestry (SL) according to defined assessment criteria; and (b) to develop measures required to avoid, minimize, reduce potential adverse effects. In this context, a positive social and health impact is defined as an improvement in the baseline social and health conditions resulting in a positive change or effect. Conversely, a negative impact represents a deterioration of the baseline social and health conditions resulting in undesirable change.

The methodology for the assessment and mitigation of social impacts as described in this differs from that used for the physical environment. This was done in order to adequately

address both positive and negative impacts associated with the Miro's forestry plantation project. Furthermore, the criteria used for assessing environmental impacts do not always apply to social impacts. Due to the intrinsic nature of social processes, the application of numerical values is often inappropriate or unrealistic. The methodology adopted for this assessment is therefore informed by international best practice for the assessment of social impacts.

It is important to note that the anticipated health impact assessment conducted here is not a comprehensive one. This is because health impact assessment is a highly specialized field which requires the implementation of control measures, analysis of the nutritional status of affected people and laboratory testing, to mention only a few requirements.

6.5.2 Impact Assessment

Impacts are identified by considering the project activities or aspects that may influence daily social processes and/or may affect existing socio-economic baselines conditions. The types of impacts and the terminology used in this assessment are discussed in table 6.4 below:

Table 6.5.2 Types of impacts

Impact Type	Description
Routine/Planned Impact	Resulting from common or regular project activities
Non-routine/Unplanned Impact	Resulting from exceptional events/emergency conditions

Direct Impact	Resulting from direct interaction between planned project activity and the receiving social environment
Indirect Impact	Resulting from indirect activities that are encouraged to happen as a consequence of the project
Induced Impact	Third level impacts caused by a change in the project environment (e.g. increased disposable income)
Cumulative Impact	Impacts that act together with other impacts 9including those from concurrent or planned future third party activities) to affect existing social processes and/or socio-economic conditions.
Impact Magnitude	**Description**
Duration	**Temporary**: Short duration; Intermittent or occasional **Short-term:** Impact is predicated to last only for the duration of the plantation establishment

	Long-term: Impact will continue for the life of the Project, but cease when the project stops operating. Permanent: Impacts that occur during the development of the project and cause a permanent change in the affected receptor or resource.
Scale	On-site or Local: Impacts that affect an area in a radius of 20km around the project site. Regional: Impacts that affect regionally important productive resources or are experienced at a regional scale as determined by political-administrative borders. National: Impacts that affect nationally important productive resources or have macro-economic effects. International/Trans-boundary: Impacts that affect internationally important

	productive resources or international protocol.
Impact Likelihood	**Description**
Low	Impact does not usually occur
Medium	Impact occurs infrequently
High	Impact occurs frequently or regularly

The criteria for assessing the significance of impacts are as follows:

- The magnitude (scale and duration) of the change to the socio-economic environment (e.g. increase in employment opportunities). Magnitude also refers to the sensitivity of the household, community or wider societal groups in terms of adaptability to changes.
- The likelihood (probability) that the impact will occur. This estimate is largely based upon experience and/or evidence that such an outcome has previously occurred.

The definitions for impact significance are described in Table 6.5 below. Definitions refer to both positive and negative impacts.

Table 6.5.2 : Definitions for impact significance

Negligible Impact	A negligible (or insignificant) impact is where people and/or their assets will not be directly affected (either positively or

	negatively) by a particular activity, or where the impact is indistinguishable from daily social processes.
Minor impact	A minor impact is one where an effect will be experienced but the magnitude of the impact is sufficiently small (with and without mitigation) in order not to significantly affect socio-economic conditions either positively or negatively.
Moderate Impact	A moderate positive impact has the potential to provide affected parties with clearly distinguishable benefits. A moderate negative impact falls within internationally accepted limits and standards with regard to reasonable living conditions and basic human rights.
Major Impact	A major positive impact is where affected households and/or communities as a whole will experience significant benefits and improved socio-economic conditions as a direct or indirect result of project activities.

	A major negative impact is one where internationally accepted limits and standard are exceeded. For some aspects there may still be major negative residual impacts after all practicable mitigation options have been exhausted. It is then the function of regulators and stakeholders to carefully weigh such residual negative factors against the positive ones such as employment, in coming to a decision on the project.

Impacts are rated prior to mitigation and again after consideration of the proposed mitigation measures. It should be noted that impact matrices act as a guide to the assessor and there may be situations and/or conditions where their rigid application is inappropriate and where stakeholder perceptions and actions play a significant role. The following impact matrix has been prepared to guide the assessment of project impacts:

Table 6..5.3 Overall significance criteria

Negative Social Impacts							
Socio-Economic Outcome	**Severity**				**Likelihood Classification**		
	Magnitude			**Severity Classification**	**Low**	**Medium**	**High**
	Duration	**Scale**	**Ability to Adapt**				

Inconvenience but with no long-term changes to livelihoods, resources, quality of life, standard of living, infrastructure and services	Short-term (< 1 year) Low frequency	Individual/ household level	Those affected will adapt easily to changes and maintain pre-impact living conditions	Low	Negligible	Minor	Minor
Negative Social Impacts							
Socio-Economic Outcome	**Severity**				**Likelihood Classification**		
	Magnitude			**Severity Classification**	**Low**	**Medium**	**High**
	Duration	**Scale**	**Ability to Adapt**				
Direct and indirect impacts on livelihoods, quality of life, standard of living, resources, infrastructure and services.	Medium term (1-6 years) Medium or intermittent frequency	Small number of households	Those affected will be able to adapt to changes in living conditions with some support	Medium	Minor	Moderate	Moderat
Widespread and diverse,	Long term (< 6 years)	Large part or whole settlement/community	Those affected	High			

direct and indirect impacts that will be difficult to reverse or compensate for	Irreversible Constant frequency		will not be able to adapt without substantial support		Moderate	Major	Major

Positive Social Impacts							
Socio-Economic Outcome	**Severity (Desirability)**				**Likelihood Classification**		
	Magnitude			**Desirability Classification**	**Low**	**Medium**	**High**
	Duration	**Scale**	**Ability to Adapt**				
Temporary benefits to individuals or households	Short Term (<1 Year) Low frequency	Individual/household level	Those affected will find it difficult to gain from benefits	Low	Negligible	Minor	MInor
Direct and indirect positive impacts on livelihoods	Medium term	Small number of households or small social groups	Those affected will be able to gain	Medium	Minor	Moderate	Moderate

, quality of life, standard of living, resources, infrastructure and services	(1-6 years) Medium or intermittent frequency		from company benefits with some support				
Widespread and diverse, direct and indirect positive impacts likely to provide benefits to whole communities and nation	Long term- (> 6 years) Irreversible Constant frequency	Large part or whole of settlement/community	Those affected will gain from company benefits and create permanent beneficial changes	High	Moderate	Major	Major

6.5.3 Mitigation

Mitigation measures for the Miro Forestry (SL) Ltd are developed to avoid, minimize, reduce, remedy negative impacts identified, and to create and/or enhance soci-economic benefits. These measures are often established through legal or best management practice standards developed by the company that are in compliance with international standards. Preferably, mitigation measures will prevent or minimize impacts through

project design and management as well as through corporate social responsibility adopted by the company.

Major negative impacts require mitigation. In some situations a major negative impact may be offset by a positive impact of similar magnitude. The relative importance of these particular impacts must then be considered in assessing their acceptability. For moderate negative impacts, the focus of specific mitigation measures is to reduce these impacts to as low as reasonably practicable. Minor impacts are generally controlled through the adoption of best practice management measures.

The mitigation of social impacts associated with the company's operations is aimed at meeting national performance standards, IFC Performance Standards and international forest industry guidelines. The hierarchy of mitigation measures for activities/events and impacts are outlined below (avoidance of impacts being the preferred option):

- Avoid/reduce at site
- Abate on site
- Abate at receptor/recipient
- Remedy/Repair
- Corporate social responsibility

6.5.4 Recommendations to Mitigate Impacts.

6.5.4.1 Combustion products

Emissions to air from standalone utility heating systems, such as thermal fluid heaters or steam boilers, should be controlled as described in the General EHS Guidelines. When the thermal needs of the manufacturing facility are based upon a (usually waste wood fired) hot gas generator which provides thermal fluid heating for the press and hot gases

for the particle dryer, then control of emissions of combustion products should be combined with control of VOCs and aldehydes as described below.

6.5.4.2 Fiber, Particle, and Veneer Dryers

Air emissions from dryers contain moisture and VOCs evaporated from the wood. Dryers are typically directly heated by hot gases arising from a wood-products and / or fossil-fuel fired hot gas generator and contain pollutants from wood combustion. Control of these emissions in OSB and particle board manufacture may be achieved by passing the dryer exhaust gases through a wet electronic precipitator (WESP). Stacks should be designed according to Good Engineering Practice (GEP) as described in the General EHS Guidelines. Board presses should be hooded. Air collected from around the presses, which will normally contain formaldehyde since this is a component of many of the resins used in board formation, should be routed to the utility plant for use as combustion air, thus destroying the formaldehyde, or to control devices such as dry or wet ESPs or wet scrubbers. Formaldehyde emissions should be reduced at source by limiting the press temperature to the minimum feasible level, and formulating resins to minimize excess formaldehyde. Board cooler emissions are typically vented to atmosphere without secondary controls.

6.5.4. 3 Dust

Many of the processes in board manufacture have the potential to create dust, be it nuisance dust, wood dust or contaminants from the wood surface. Dust can be created throughout the process including in the log yard, and during activities such as log handling, log and recycled material chipping, chip screening, veneer trimming and laying out the particulate mat to be pressed. After pressing, dust arises from cutting to length of continuously-pressed board, end trimming, edge trimming, cutting to size and sanding. The recommended measures to prevent, minimize, and control dust emissions include:

- the use of measures such as windbreaks, spraying, or binders to minimize dust emissions where outdoor stockpiles are unavoidable; ·
- handling of chips and particles by pneumatic means rather than by open conveyor or by bulk transport. Where conveyors are used they should be fully enclosed, especially at height changes;
- Enclosure of chips storage areas; ·
- Provision of dust control equipment for areas identified with high potential for dust generation (chip grading, mat layout and sawing and sanding areas). Extraction systems should lead to bag filter or cyclone separator systems as required to meet site specific requirements, and should be regularly inspected to identify and eliminate blockages preventing effective removal of dust.

6.5.4.4 Wastewater

6.5.4.4.1 Industrial Process Wastewater

The production of plywood, sawn logs, electricity poles and finger joints may include water intensive operations, including chip washing, chip steaming and softening in MDF production, and water used within the WESP. Particularly but not exclusively in manufacture of plywood, sawn logs, electricity poles and finger joints , may be washed before downstream processing, primarily to remove soil residues that cause premature wear of machining equipment. This wash water may contain high quantities of sediments and leachate from sawn logs and should be treated by settling and, if necessary, filtration, as discussed below under 'Process Wastewater Treatment' and then recycled within the process.

Also in MDF manufacture, effluents arising from chip steaming and softening before the refining stage can be reused in the process after treatment using membrane filtration systems.

WESP cleaning water is typically cleaned in a decanting system before re-use in the WESP.

The quantity of effluent arising from chip washing, MDF manufacture and WESPs should be minimized by the recycling techniques described above. Remaining effluent generation from board processes is small, with water being carried from the wet processes with wood chips or fibres and ultimately leaving the site through evaporation in the dryer.

In plywood manufacturing, logs are soaked in warm water before peeling. Such soaking ponds are often steam heated, and heating is often by direct injection to the pond. Toxic chemicals contained in wood (such as tannins, phenols, resins, and fatty acids) will leach from wood in these ponds. The leachate typically has a high BOD (150 -5000 mg/l) and COD (750 – 7500 mg/l). The same chemicals are also prone to leach from round wood and wood chip storage areas. Such areas are exposed to rain water and may be irrigated to control dust.

Recommended techniques to prevent and control leaching include: ·

- Log soaking ponds used in plywood manufacture should be lined to prevent loss of leachate to ground water; ·
- Log and chip storage areas should have impermeable surfaces, spill containment curbs, and run off from these areas should be directed to the waste water treatment facility; ·
- Log yard irrigation water should be recycled. Process Wastewater Treatment Techniques for treating industrial process wastewater in this sector include: separation of floatable solids such as wood fines using Dissolved Air Floatation (DAF); filtration for separation of filterable solids; flow and load equalization; sedimentation for suspended solids reduction using clarifiers; biological treatment for reduction of soluble organic matter (BOD); dewatering and disposal of

residuals in designated waste landfills. Additional engineering controls may be required for (i) advanced metals removal using membrane filtration or other physical/chemical treatment technologies, (ii) removal of recalcitrant organics using activated carbon or advanced chemical oxidation, and (iii) reduction in effluent toxicity using appropriate technology (such as reverse osmosis, ion exchange, activated carbon, etc.).

6.5.4.5 Hazardous Materials

The production of plywood, sawn logs, electricity poles and finger joints and other particle-based products may use large volumes of resins in the manufacturing process. These resins may contain a variety of toxic compounds. Formaldehyde is a common component of these resins but other toxic agents such as pesticides and fungicides may be included in the final product. These chemicals represent a potential hazard if spilled, and also can represent an occupational health and safety hazard if not handled appropriately.

6.5.4.6. Solid Waste

Solid waste in this sector includes wood waste (e.g. board off cuts), waste from water treatment processes, and ash from combustion of wood waste.

In order to minimize and control waste: ·

- Ash should be stored in a contained wind resistant area until it has fully cooled. Ash may be returned to the forest or to some other site for inclusion in the soil as a fertilizer and soil improver following an evaluation of potential impacts to soil and groundwater based on the ash composition3 ; ·
- Board off-cuts should be minimized by control of the pressed-board dimensions and gradual minimization of trimming margins. Remaining offcuts can be recycled as furnish in particleboard manufacture, used as the core of blockboard, or burnt in the wood waste-burning utility system; ·

- Solid wastes arising from water treatment processes, including the sludge captured by the WESP, should be burnt, providing appropriate air pollution control is adopted or disposed of as hazardous waste, as discussed in the General EHS Guidelines.

6.5.4.7 Noise

The production of plywood, sawn logs, electricity poles and finger jointsand other particle-based product plants generate significant noise primarily from debarking drums and chipping machinery (which produce the most noise), mechanical breakdown processes used for the raw timber, and sanding and cutting machinery.

The following measures are recommended to prevent, minimize and control noise:
.

- Debarking and chipping should be carried out in enclosed buildings; ·
- Noise generating machinery should be regularly maintained according to manufacturer specifications;
- Log handling facilities should be sited to minimize noise; ·Sound reducing earth banks or sound reflecting screens should be installed as necessary.

6.5.4.8 Occupational Health and Safety

Occupational health and safety impacts during the construction of board and particle-based products plants are common to those of most large industrial facilities. Occupational health and safety hazards in board and particle based manufacturing operations primarily include the following:

- Physical hazards
- Exposure to noise
- Dust inhalation

- Chemical exposure
- Explosion / fire

6.5.4.8.1 Physical Hazards

The most severe injuries in this sector are usually attributable to the failure of Lockout - Tag out systems. Robust Lockout - Tag out procedures should be devised and practiced regularly.

6.5.4.8.2 Machine Safety

Almost all board and particle board processing plants have some kind of cutting equipment, such as chippers, mills, flakers, saws and sanding equipment. In addition, process machinery such as multi-opening presses and drive systems can present risk of trapping. Injuries from this type of machinery often lead to loss of limbs and digits. Accidents often happen when machines are inadvertently switched on during maintenance and cleaning.

Recommended measures to prevent and control injuries from cutting equipment include: ·

- All cutting equipment should be fitted with safety guards capable of preventing access to moving cutting blades; ·
- All workers should be trained in the safe use of cutting equipment; · Chippers should be fitted with safety guards which prevent the insertion of body parts; ·
- All cutting equipment should be adequately contained to prevent the expulsion of blade fragments in case of blade breakage; ·
- Moving gears, chains, belts and rollers should be fully enclosed.

6.5.4.8.3 Log Handling Activities

Logs are generally unloaded from vans or heavy trucks and stacked by machines before being moved to log conveyors for transport to the debarker and chipper. Injuries due to

vehicle movement in log yards are common, in addition to injuries from logs that roll off or are dropped by handling equipment or are dislodged from log stacks.

The following measures are recommended to prevent, minimize, and control injury in log yards:

- Complete mechanization of log yard activities to reduce human contact with logs during handling and stacking activities;
- Transport routes within log yards should be clearly demarcated and vehicle movement should be closely controlled;
- Log stacks should be no higher than a safe height defined by risk assessment which should take account of site specific circumstances including stacking methodology;
- Access to log yards should be restricted to authorized personnel;
- Log decks should have stops, chains, or other guards to prevent logs from rolling down and off the deck;
- Workers should be trained in safe working procedures in log stack and deck areas, including avoidance of falling logs and planning of escape routes;
- Workers should be provided with protective steel capped boots, hardhats, high visibility jackets, eye protection and gloves;
- All mobile equipment should have audible reversing alarms.

6.5.4.8.4 Noise

The machinery responsible for most milling and sawing operations emits levels of noise that are damaging to hearing. In many cases even relatively short term exposure will lead to permanent loss of hearing acuity.

Noise reduction methodologies should be employed, with hearing protection equipment also provided if such measures fail to reduce noise levels below 85 dB(A). Ear protection

is likely to be necessary around the chipper, mills and chip grading areas and in utility plant rooms.

6.5.4.8.4 Chemicals

Where formaldehyde based resins and glues are used as a binding agent there may be an elevated exposure to formaldehyde vapour. Where wood is dried or pressed at elevated temperatures wood volatile compounds are commonly released. Exposure to these chemicals can cause severe respiratory damage if inhaled and demands special precautions in use which will be specified by responsible suppliers of this material.

6.5.4.8.5 Fire and Explosion

Explosions may present a serious hazard in areas where large amounts of finely divided combustible dust are present. The risk is particularly high in mills which use high temperature drying of chips or flakes mixed with resins or waxes, and in dust control equipment removing dry sanding and saw dust. Ducts used to extract fumes from the press area can become coated with combustible material and also represent a fire hazard. Explosion risk should be minimized by application of the measures for prevention and control of dust accumulation.

In addition, measures to prevent and control fire and explosion hazard related to dust must include:

- Regular housekeeping to ensure that dust is removed from the facility, including a biannual blow down or vacuuming of the entire facility (e.g. roof rafters);
- Use of explosion relief panels on all dust moving equipment, in dryers and in buildings;
- Installation and regular maintenance of spark detection and deluge dousing systems in dryer systems and dust control equipment;
- Eliminating all sources of ignition from the working environment, including:

- Use of electrical equipment of at least IP64 rating;
- Elimination of naked flames, such as burner flames, welding or cutting torches, matches, cigarette lighters, and heaters;
- Control of hot surfaces, such as operating internal combustion engines, frictional sparks, heated wires, glowing metals, and overheated bearings;
- Control of portable, battery powered equipment e.g. radios, mobile phones etc. ;
- Safe use of certain chemicals, for example peroxide hardening products which can be self-heating or result in spontaneous combustion;
- Electrical grounding of conveyors and dust control systems to prevent discharge of static electricity;
- Workers should be trained in emergency evacuation procedures and first line of attack fire fighting techniques.

6.6 Performance Indicators and Monitoring

6.6.1 Environment

6.6.1.2 Resource and Energy Use

Resource consumption indicators for energy, water and raw materials in this sector are also very important. Industry benchmark values have to be targeted and closely monitored for Miro Operations for continual improvement in these areas. Figures for energy, water and raw material uptake/benchmarks by the company may be provided in comparative terms over the years but these have to be established by the consultant for regular monitoring to ensure improvement.

6.6.1.3 Environmental Monitoring

Environmental monitoring programs for this sector should be implemented to address all activities that have been identified to have potentially significant impacts on the environment, during normal operations and upset conditions. Environmental monitoring activities should be based on direct or indirect indicators of emissions, effluents, and resource use applicable to the particular project. Monitoring frequency should be sufficient to provide representative data for the parameter being monitored. Monitoring should be conducted by trained individuals following monitoring and record-keeping procedures and using properly calibrated and maintained equipment. Monitoring data should be analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken.

6.6.1.4 Occupational Health and Safety Guidelines

Occupational health and safety performance should be evaluated against internationally published exposure guidelines, of which examples include the Threshold Limit Value (TLV) occupational exposure guidelines and Biological Exposure Indices (BEI) published by American Conference of Governmental Industrial Hygienists (ACGIH), the Pocket Guide to Chemical Hazards published by the United States National Institute for Occupational Health and Safety (NIOSH), Permissible Exposure Limits (PELs) published by the Occupational Safety and Health Administration of the United States (OSHA), Indicative Occupational Exposure Limit Values published by European Union member states, or other similar sources.

6.6.1.5 Accident and Fatality Rates

Projects should try to reduce the number of accidents among project workers (whether directly employed or subcontracted) to a rate of zero, especially accidents that could result in lost work time, different levels of disability, or even fatalities. Facility rates may be benchmarked against the performance of facilities in this sector in developed countries through consultation with published sources (e.g. US Bureau of Labor Statistics and UK Health and Safety Executive).

6.6.1.6 Occupational Health and Safety Monitoring

The working environment should be monitored for occupational hazards relevant to the specific project. Monitoring should be designed and implemented by accredited professionals11 as part of an occupational health and safety monitoring program. Facilities should also maintain a record of occupational accidents and diseases and dangerous occurrences and accidents. Additional guidance on occupational health and safety monitoring programs is provided in the General EHS Guidelines

6.7 Assessment of identified Social Impacts

6.7.1 Introduction

The assessment of the social impacts associated with the company's operations is discussed in this section. Impacts have been assessed in terms of anticipated effects of the company's operations on the receiving socio-economic environment, on the directly affected households and land leasing families at the community and district level, and impacts on the national economy and international level (where applicable). The assessment is based on data collected during the socio-economic survey carried out for the ESIA and the findings of focus group interviews and community consultation meetings.

The Miro Forestry (SL) Ltd has been in operation since 2014. The company has an important impact on the local economy of the Yoni Chiefdom, Tonkolili District and the national economy generally mainly through the payment of taxes and surface lease rent, reforestation fees to the consolidated fund, local job creation, corporate social responsibility work, local capacity building, as well as infrastructure (bridges, feeder roads) and service provision to land leasing communities. Concurrently, it is likely that the company has indirectly contributed to towards population migration into the broader company operational areas (in particular Mile 91), pressure on available arable land and an associated pressure on local services and infrastructure.

The company's operation has been extended to new communities in Yoni and Masimera Chiefdoms, Tonkolili and Port Loko Districts respectively. Against this background, it is likely that the operations of the company will increase the magnitude of impacts discussed above. However, it is anticipated that this extension will not result in any new significant negative social impacts but rather significant positive social impacts. It is anticipated that the overall company impact will predominantly be of a cumulative nature.

6.7.2 Stakeholder issues and concerns

The social impact assessment has taken into account the overall issues and concerns raised by stakeholders during community consultation meetings and focus group interviews. The common issues and concerns have been discussed in Chapter 5 on Stakeholders' concerns and issues.

6.7.3 Contribution to Mitigation of Climate Change

Miro Forestry (SL) Ltd current standing forest is 4,100 ha (end of 2017 and adding over 1,500 ha every year until their standing forest is about 12,000 – 14,000 ha by 2024. Thus, Miro Forestry will be providing over 12,000 – 14,000 ha of carbon sink that would absorb the excess carbon from the atmosphere in Sierra Leone. With this quantity of forest cover, the company would also be increasing the vegetation cover, productivity of the soils and soil organic carbon content of the soils around the entire land area that has been leased to the company. This is going to contribute greatly to mitigating the effects of climate change in the Tonkolili and Port Loko Districts and by extension the land area in the country and this is positive in terms of the impact of the country's operation in the country. If at a later stage, the company takes part in the sale of carbon to the world carbon trade, substantial revenue would be generated that would contribute to the revenue tax base of the country.

6.7.4 Local Economic Development

6.7.4.1 Impact description

Increased activity and population movement associated with plantation forestry establishment in the Yoni Chiefdom is likely to result in increased demand for goods and services in the area. This is also likely to result in flow of goods and service providers, both formal and informal, to the broader project area, thus contributing to local economic development. On the other hand, while construction of roads, bridges and water wells may provide opportunities for economic and business development other constrains such as access to finance, limited skills and limited private sector in the broader project area will constrain local economic development.

Chapter 4 of this report provides an overview of socio-economic baseline conditions and development needs at chiefdom level. This overview shows that residents in this chiefdom are predominantly farmers doing subsistence farming and low living standards and quality of life in the chiefdom. It is in this context that the company can make significant contribution through the provision of services and infrastructure and socio-economic investment at the chiefdom level and by extension at district level. Since 2014, Miro has contributed to local and national development and it is anticipated that the continued operations will support local economic development for as long as they are in operation in the chiefdoms.

Miro has committed to providing continued assistance to district infrastructure projects and to broadening its support for community development initiative in the Yoni Chiefdom by way of its corporate social responsibility. Current initiatives include:

- Road refurbishing programme
- Education
- Water supply

- Health awareness and environmental/conservation awareness Agriculture programme
- Local business development
- Capacity development
- Sports development
- Employee welfare, and
- Employee career development

CHAPTER 7

7.0 CONCLUSION

Miro Forestry SL Limited forest plantation project is being undertaken with due consideration of biophysical, social and economic factors, as well as the relevant legislative requirements. The socio-economic and environmental benefits of such a project are numerous as mentioned in the report. However, the moderately significant negative impacts created by the project will require planning, monitoring and mitigation during the life of the project. While none of these are considered to be fatal, the constant enagement of the land owning families by company and implementation of the mitigation measures will reduce the significance of the negative impacts.

Miro Forestry SL Limited forest plantation is essentially the most advanced forestry plantation company in the country which has a focused, technically skilled and committed management team and which contributes to the overall sequestration of carbon from the atmosphere in the Tonkolili District and by extension the whole country as well as to the socio-economic development of the Tonkolili and Port Loko Districts. One of the unintended consequences of the successful implementation of the project will be the fact that the social environment will have some residents in some communities getting employment benefits while some others in the district may not benefit as much. Miro Forestry SL Limited cannot employ everybody or create individual benefits for the entire population of Port Loko and Tonkolili districts, and the very success of the project and the local people it employs may attract negative interventions and pressures from persons and institutions with their own interest at heart.

National, regional and district leaders as well as CBOs and NGOs must interact with the management of the company to protect the company from unnecessary and unwanted negative interventions which may have as their sole purpose the creation of economic advantage for individuals to whom none is due or owing.

APPENDIX A: IMPACT MATRIX

			Impact before mitigation							Impact Rating (after mitigation)						
Impacted Environment	**Activity**	**Summary of Impact**	Nature of Impact (P or Negative	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)	Nature of impact (positive/Negative)	Spatial Scale (7)	Duration (7)	Severity (7)	Consequence	Probability (7)	Significance (147)
Flora	Site clearance and road construction	Site clearance during forestry plantation block establishment may impact on flora	N	3	6	4	13	6	78	N	2	3	4	9	5	45
Fauna	Site clearance	Site clearance														

	and road construction	during forestry plantation block establishment may impact on fauna	N	3	6	4	13	6	78	N	2	3	4	9	5	45
Noise	Road construction		N	4	2	5	11	7	77	N	4	2	4	10	5	50

Air Quality	Impact on Air quality (dust) on adjacent communities	Site clearance and vegetation removal may create dust impacting on adjacent communities	N	1	4	2	7	9	23	N	1	4		2	3	10
Hydrology	Site clearance and road	Discharge polluted water into ground/	N	2	5	3	10	3	30	N	2	5	2	9	2	18

	construction	underground water resources														
Soils	Fuel and chemicals storage and use	Materials handling, transport and the use and storage of chemicals may lead to soil pollution	N	3	2	3	8	4	32	N	2	2	3	7	4	28
	Transport and roads		N	3	2	3	8	4	32	N	2	2	3	7	4	28
	Plantation waste handling		N	3	2	3	8	4	32	N	2	2	3	7	4	28

Visual	vegetation removal/site clearance, road construction, creation of sites for stockpiling of harvested logs, sites for roughly cut logs and	These activities will have visual impact on receptors in the communities	N	2	2	3	7	4	28	N	2	2	3	7	2	16

	debris sites.															

APPENDIX B

SOCIO-ECONOMIC ANALYSIS OF COMMUNITIES WITHIN MIRO NEW LEASE AREA

QUESTIONNAIRE

Household No	
Name of Household Head	
Name of Respondent	
Type of Dwelling	
Name of Village	
section	
Interviewer's name	
Date of Interview	

SECTION 1a - Location of Community and dwelling unit

1. How far is this community from a motorable road?	a. Located along the road
	b. Located Less than 1 mile from road
	c. Located between 1and 2 miles from road
	d. Located between 2 and 3 miles from road
	e. Located more than 3 miles from road

2. How do you travel to or from this community	a. Bicycle
	b. Bike
	c. Foot
	d. Canoe
	e. Other (Specify)
3. How many houses are this compound	a. Less than 3
	b. 3 to 5
	c. 6 to 10
	d. More than 10
4. When was this house built?	a. Less than 3 years
	b. Between 3 and 10 years
	c. More than 10 years
5. If less than 3 years, where did you live before?	

SECTION 1b - Perception about MIRO Forestry

1. Do you know about the operations of MIRO Forestry in this community?	a. Yes

	b. No
2. Do you know where they are?	a. Yes
	b. No
3. Do you see the operations of the company as something good for you or any member of this hh?	a. Yes
	b. No
4. If Yes, how have the company operations been good for you or members of your hh?	
5. Have you or any member of your household been negatively affected by MIRO's operations?	a. Yes
	b. No
6. If Yes, how have you or members of this hh been negatively affected?	
7. Are you part of ownership of any land that will be leased to MIRO?	a. Yes
	b. No
8. If yes, how do you currently use that land?	
a.	d.
b.	e.

c.	f.
9. How much do you currently earn from the use of one hectare (2.5 acres) of your land?	
a.	d.
b.	e.
c.	f.
10. Do you have other land to use for these purposes apart from the one you will lease to MIRO?	
a. Yes	
b. No	
11. In the long run, do you think the land lease to MIRO will be beneficial to you?	
a. Yes	
b. No	
12. Respondent's general view about land lease to MIRO	

Section 2: Household Composition

All members of this household (children and adults): Including those who are members of the household and are away today but who normally live here. Could you please answer the following questions, starting with yourself and then moving from the oldest to the youngest household members?

Name (Initials)	sex	age	Relationship to HH	Education level: 1 = no formal education 2 = preschool 3 = primary 4 = secondary/technical 5 = tertiary	Away at School? (boarder)	Employment status 1 = salaried 2 = self-employed 3 = farmer 4 = unemployed 5 = child/elderly	Primary occupation (excluding children and the elderly)	Other skills (e.g. welding, carpentry, dress making etc)

SECTION THREE : ASSETS

Household items:

11. Which of the following items are available (in a working condition) for use by your household?

tem	
Bicycle	
Mobile phone	
Sewing machine	
Motor cycle	
Foam mattress	
Furniture suite (cushion chairs	

12. Buildings/structures (more than one option/material is possible)

No	Type of building/structure e.g. house, kitchen, storage area	Materials used		No rooms	Status of utilisation Used = 1 Not used, complete = 2 Not used, incomplete = 3
		Walls	Roof		

		Wood & mud = 1 Stones & mud = 2 Stones & cement = 3 Cement blocks = 4 Wood poles = 5 Blocks = 6	Thatch = 1 Tin = 2 Poles = 3		

13. Toilet Type

Type	Please circle
Community toilet	1
Household toilet	2
Open toilet	3

INCOME & EXPENDITURE (MONTHLY)

14. Sources

Income Source		Amount (Le)
Agriculture	Livestock sales	

	Crop, vegetables, fruit sales	
	Animal products sales	
	Palm Oil Production	
	Other (specify)	
Employment (non-farm)	Self-employment: petty trading (hairdresser, seamstress, carpenter etc), sale of handicrafts	
	Salaries, wages of resident household members	
	Charcoal/fuel wood sales	
Migrant Remittances/transfers from other households	From elsewhere in Sierra Leone	
Pensions, allowances, social welfare grants and insurance payments		
Housing and Land rent		
Other income sources (specify)		
ESTIMATED MONTHLY INCOME		

Savings

15. Does your household have cash savings? 1) Yes 2) No
16. Does your household currently have a loan? 1) Yes 2) No

Sources of financial Assistance

17. If your household is short of money, who do you ask for help? (More than one answers possible)

Sources of Assistance	Please circle

Do not ask for money	1
Sell property	2
Sell livestock	3
Relatives	4
Neighbour	5
Formal lending facility/bank	6
Informal lending facility	7
Other (specify)	8

AGRICULTURE AND LAND

18. We would like to know about the agricultural production of your household. Does your household have access to arable land that you use for cultivation? 1) Yes 2) No

19. If yes, ask the following (for each piece of land)

Plot	Main crop grown on land	Size (acres)	Distance (Miles from homestead)	Affected by Miro Activities? Yes = 1 No = 2	Ownership /Land tenure rights Belonging to household = 1 Renting from another household= 2 Sharecropping with another household = 3 Other (specify) = 5

1					
2					
3					
4					
5					
6					

20. What type of Labour do you use on your farm?
a) Family only = 1
b) Hired paid only = 2
c) Neighbours non-paid = 3
d) Family and paid labour = 4

21. Name the two main food crops used by your household
Crop 1 ……..
Crop 2……
22. Name the two main crops bartered or sold by your household (may be same as in question 21 above)
Crop
A…….
Crop
B…….

23. Where do you sell the crops listed in Question 22 ?

Location	Crop A	Crop

1 = In the village market 2 = In Mile 91 market 3 = Sell to traders who visit the village 4 = On the roadside 5 = Other (please specify)		

24. What livestock does your household have (if any)?

No livestock	0
Goats	1
Sheep	2
Pig	3
Cattle	4
Chicken/poultry (ducks, geese)	5

25. Where do your household's livestock graze?

……
……
……
……..

SOCIAL SERVICES

25. Which schools do the children of your household attend?
(More than one answer may be given)

Name of school/education institution	Level Preschool = 1, Basic = 2, Secondary, vocational/technical = 3. Tertiary = 4

26. Which ailments have persons in your household suffered from in the past year?

Illness	Please circle
Malaria	1
Cough/lung problems	2
Diarrhoea	3

Skin infection	4
Sexually transmitted disease	5
Eye disease	6
Tooth ache	7
Cholera	8
Fever	9
Birth complications (women)	10
Other (Specify)……..	11

27. Where do you normally seek help when a member of your household is sick?

Facility	Please Circle
Our lady of Gadalupe	1
MSF	2
Traditional Healer	3
Chemist/Pharmacy	4
Other (specify)…… …….	5

28. Where does your household get water from? (More than one answer may be given)

Source	**Cooking, drinking**	**Washing, watering, animals**
Dam	1	1a
Private tap at house	2	2a
Rain collected at homestead	3	3a
Communal stand pipe	4	4a
Well/spring	5	5a
River/stream	6	6a
Water sold by other people	7	7a
Other (Specify)…… …	8	8a

29. Details of Source of Water

To be completed by interviewer and Community Health Nurse

30. Which of the following energy sources (for light and/or for fuel) does your household use in the buildings where you live? (More than one answer may be given)

Source	Please circle
Charcoal	1
Candles	2
Wood	3
Other (specify)……	4

31. Please indicate whether you or another member of your household belongs to one of these:

Organisation	Please circle
Church group	
Farmer's Association	
Development Committee	
Youth Group	
Women's group	
Other (specify)	

APPENDIX C: PICTURES OF SOME FEATURES AT THE MIRO FORESTRY SL LTD CONCESSION VILLAGES.

Outside gate of Miro Forestry SL Ltd.

Inside gate of Miro Forestry SL Ltd

Road Constructed by Miro Forestry SL Ltd leading to Petifumayagbo, Foindu Section, Yoni Chiefdom

GEODATA SL LTD Officer conducting an interviewing with a resident at Mafala Village, Foindu Section, Yoni Chiefdom

Miro Forestry SL Ltd Forest Plantation along the Road to Mile 91

Miro Forestry SL Ltd Forest Plantation along the Road to Mile 91

Mosque at Manjehun Village, Foindu Section, Yoni Chiefdom

Road Constructed by Miro Forestry SL Ltd leading to Manjehun, Patfumayagbo, Mabilla Banna, Yoni Chiefdom

ADDENDUM

HABITAT AND HIGH CONSERVATION VALUE ASSESSMENT FOR MIRO FORESTRY IN THE NEW LEASE/CONCESSION AREAS IN YONI CHIEFDOM, TONKOLILI DISTRICT

(An addendum to Miro Forestry Environmental and Social Impact Assessment of the new lease/concession areas)

SUMMARY

MIRO FORESTRY (SL) LIMITED has already conducted an Environmental and Social Impact Assessment (ESIA) for their operations in the new lease areas in Sierra Leone, largely within Yoni Chiefdom, Port Loko District and extending into Masimera Chiefdom of Tonkolili District in the northern region of Sierra Leone. This assessment forms the base of this High Conservation Value Assessment as required by the Forestry Regulations of 1989.

These new lease areas were assessed against An Interpretation of Global HCVF Toolkit, also using both the HCV Resource Network documents for identification, management and monitoring of High Conservation Values.

This assessment considered the views of stakeholders and independent assessments of the lease areas. The primary consideration was to determine the presence or lack thereof of aspects that may indicate that there are areas of high conservation value in the new lease areas and elevate the status of Miro's new lease areas in terms of:

1) Community relations and protection of community resources on their land, and
2) Conservation management of natural assets as part of a conservation area network.

Having considered all the requirements for HCV identification, no High Conservation Areas were identified on Miro's new lease areas as laid out in Table 1 below.

Table 1: Summary of HCVs identified

HCV Identification within Miro Land holdings in Yoni Chiefdom, Tonkolili District and Masimera Chiefdom, Port Loko District				
HCV	**Definition**	**Present**	**Potentially Present**	**Absent**
HCV 1.1	Forest areas containing globally, regionally significant concentrations of biodiversity values			
HCV 2	Forest areas containing globally, regionally or nationally significant large landscape level forests			
HCV 3	Forest areas that are in or contain rare, threatened or endangered ecosystems			
HCV 4	Forest areas that provide basic services of nature in critical situations			
HCV 5	Forest areas fundamental to meeting basic needs of local communities			
HCV 6	Forest areas critical to local communities' traditional cultural identity			

Note: While there is potential for HCV 5 and 6, no attributes were found that could positively identify aspects of these HCV's being present, therefore the report conclusion is that these HCV's are absent.

This assessment is based on stakeholder assessment conducted by GeoData within the timeframe when the socio-economic survey was done in time. There is potential that with appropriate management of the natural assets under Miro's control there could, at sometime in the future be a change in the conservation status of some of these areas, and Miro would need to do reconsider this assessment sometime in the future when similar studies would be done.

As community needs increase for agriculture to fund social changes, sacred forests compete against agricultural expansion, and simultaneously, changes in traditions of rural society diminish the importance of sacred lands and threaten the motivation for their protection. Sacred bushes are generally small land holdings on average of about 0.1 to 0.5 hectares. We do not therefore consider the secret society bushes as issues for high conservation concern.

Introduction

MIRO FORESTRY (SL) LIMITED is a green-field and profit-oriented forestry group that aims to supply sustainable value-added timber products to local and regional markets, which grows mainly Eucalyptus and Acacia for the production of sawn timber, charcoal, plywood, biomass, charcoal and transmission poles.

It is registered as a private limited liability company under the laws of Sierra Leone. The company currently operates within a land area of 29,980 hectares leased in 2011 for a period of 50 years from the Chiefdom Council of Yoni Chiefdom in Tonkolili district, northern Sierra Leone.

The company has acquired additional land areas from neighbouring communities in Yoni and Masimera Chiefdoms in Tonkolili and Port Loko districts respectively to expand on their original leasehold. It earlier conducted an Environmental, Social and Health Impact Assessment (ESHIA) Study for its operations in their leased land in Yoni Chiefdom in order to meet the Environment Protection Agency's national requirements for securing an EIA license. In compliance with the same regulations,

the EPA advised the company to conduct similar studies on the new areas in order to extend the EIA Licenses to cover the new intended areas for lease.

The vision of Miro Forestry (SL) Limited (MFSL is to operate in a sustainable environment and to contribute significantly to the quality of people's lives in the surrounding area. As part of this objective, MFSL is committed to operating in compliance with the Principles and Criteria of the Forestry Regulations, 1989. This assessment examined the acquired compartments for the presence or absence of High Conservation Values (HCVs) using the Common guidance for Identification of High Conservation Values used by the High Conservation Value Resource Network. This HCV assessment augments various pieces of research, MFSL ongoing monitoring. Information from secondary sources was consulted to confirm the presence or otherwise of HCVs.

Information gathered during the ESIA reveals that much of the new lease areas are degraded farm bush where unregulated activities have been going on over the years and these include wildfires, cultivation, grazing and hunting. The new lease areas have been heavily cultivated due to the proximity of the forest edge communities.

Previous studies have identified about 74 different species; dominant among them are light-demanding species, and fire-resistant species, such as Lophira lanceolata in areas that have been heavily degraded by slash-and-burn agriculture. There were three prevalent species encountered across the dorminant farmbush vegetation that may be of conservation concern and importance. They are;

- Terminalia ivorensis (Combretaceae family)
- Mitragyna stipulosa, (Rubiaceae family) and
- Milicia regia (Moraceae family)

Although they were found among the dominant farm bush vegetation, these species do not dominate the composition of the farm bush vegetation. They were distributed in mosaic groups at different locations in the farm bushes, dominated by other species that are of no conservation value. The species are prone to exploitation for timber because they are recognized as high-value timber species, and therefore categorized as vulnerable (IUCN 2015).

Study Area

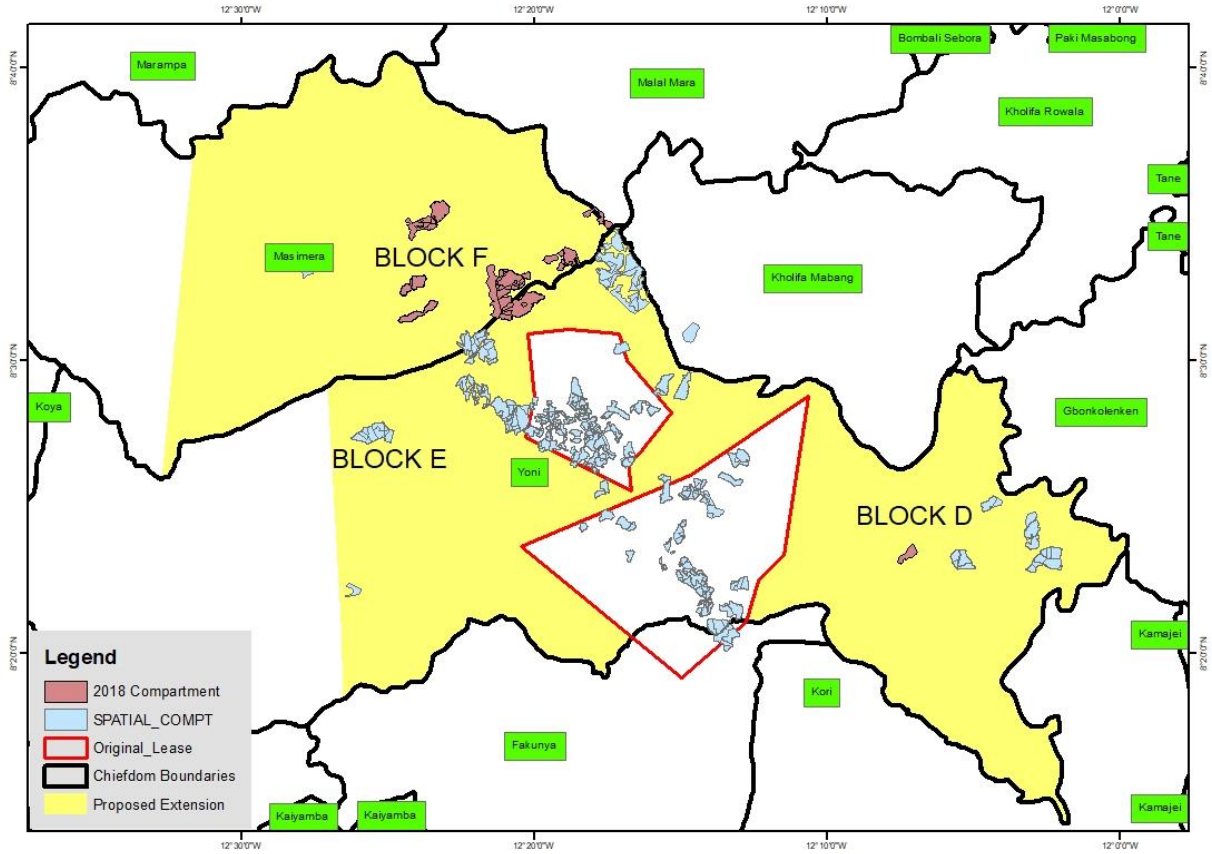


Figure 1. Map showing the project area of MFSL

Table 1: List of Land Owning Communities

	Community / Village	Section	Chiefdom
1	Patfumayagbo	Foindu	Yoni
2	Mafala	Foindu	Yoni
3	Manjehun	Foindu	Yoni
4	Mabilla Banna	Foindu	Yoni
6	Rogbogban	Mamaka	Yoni
7	Masanki	Mamaka	Yoni
8	Robisbana	Mamaka	Yoni
9	Mashenkra	Mamaka	Yoni
10	Mayira	Mayira	Yoni
11	Mayolla	Mayolla-Thatha	Masimera
12	Yanabay	Mayolla-Thatha	Masimera
13	Kombabonk	Mayolla-Thatha	Masimera
14	Rosint Lol	Katick	Masimera
15	Marainday	Katick	Masimera
16	Rosar	Katick	Masimera
17	Robaylla	Katick	Masimera
18	Mathorthe	Katick	Masimera
19	Makuserry	Katick	Masimera
20	Masimera	Katick	Masimera

21	Chai-Turay	Katick	Masimera
22	Mabilabana	Foindu	Yoni
23	Maranda	Foindu	Yoni

Previous studies have identified about 74 different species; dominant among them are light-demanding species, and fire-resistant species, such as Lophira lanceolata in areas that have been heavily degraded by slash-and-burn agriculture. There were three prevalent species encountered across the dorminant farmbush vegetation that may be of conservation concern and importance. They are;

- Terminalia ivorensis (Combretaceae family)
- Mitragyna stipulosa, (Rubiaceae family) and
- Milicia regia (Moraceae family)

Although they were found among the dominant farm bush vegetation, these species do not dominate the composition of the farm bush vegetation. They were distributed in mosaic groups at different locations in the farm bushes, dominated by other species that are of no conservation value. The species are prone to exploitation for timber because they are recognized as high-value timber species, and therefore categorized as vulnerable (IUCN 2015).

The original vegetation in the new lease areas has been degraded through intensive human activities such as settlement, agriculture, lumbering, fuel wood harvesting, charcoal production and annual bush fires, which have resulted in only a little of the original true climax vegetation remaining.

Methodology (Approach)

This report represents an analysis of the landholdings of the new lease Miro Forestry (SL) Ltd areas in the Yoni and Masimera Chiefdoms in Tonkolili and Port Loko districts respectively where Miro is operating (Figure 1). For the correct interpretation of the HCVs, the Common Guidance for the Identification of High Conservation Values was used.

1. **HCV1 - Forest areas containing globally, regionally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia)**

   For example, the presence of several globally threatened bird species within a the Sierra Leone montane forest e.g Western Area Peninsular Forest Reserve

2. **HCV2 - Forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.**

   For example, a large tract of lowland wet evergreen or moist semi deciduous forest with healthy populations of elephants, different types of antelopes, different species of rare butterflies, birds in natural patterns of distribution and abundance. Eg. Gola Rain Forest

3. **HCV3 - Forest areas that are in or contain rare, threatened or endangered ecosystems.**

   For example, patches of a regionally rare type of freshwater swamp forest in Sierra Leone.

4. **HCV4. Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control)**

   For example, forest on steep slopes, hill sanctuaries and areas protecting heading waters e.g. Kambui Forest Reserve.

5. **HCV5 - Forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health)**

   For example, key hunting or foraging areas for communities living at subsistence level in a typical forest reserve area in Sierra Leone.

6. **HCV6. Forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).**
   For example, sacred burial grounds within a forest management area in Sierra Leone

The study employed a phased approach to this assessment starting with a literature review, followed by field research with local experts, then stakeholder consultation with local stakeholders (communities, traditional council and Forestry Department professional staff), finally regional stakeholders and experts were consulted to obtain the required data for the analysis.

The approach to the HCV assessment was influenced by four key aspects: (i) WWF guidelines (ii) previously collected information, including the information available in the ESIA and from the Company's rapid environmental assessments done on the original lease area prior to commencement of Miro's operation (iii) land ownership and land use rights within the project area, (iv) and bio-geographical background as determined by field research, literature review, and stakeholder consultation.

The literature review phase was used to either identify HCV for further consideration during the field and stakeholder phases, or where evidence supported it, the elimination of HCV's for further consideration.

Field assessments where done specifically targeting areas identified during the desktop review, the areas were driven through to get an overview of the natural assets, then specific walking tracks were followed to determine the presence or absence of any HCV's.

Stakeholder consultation was done using the pre-coded questionnaire that was administered by our team of officers. Firstly, explaining the concept of High Conservation Values, then enquiring from community members to discuss whether they felt there were any HCVs within the newly leased areas.

GeoData Officer conducting an HCV interview with a resident at Mafala Village, Foindu Section, Yoni Chiefdom

Field Research Literature Reviewed

A number of field studies have been used during this HCVF analysis:

- Environmental and Social Impact Assessment (ESIA) (Environmental Consulting Services, 2015)
- Non-timber forest products (NTFP) used by forest-fringe communities around Yoni Port Loko district and Masimera Chiefdoms in Tonkolili district.

The ESIA consists of an environmental assessment and a socio-economic assessment including a stakeholder consultation. The hydrological characteristics of the area, geology, vegetation and the water quality and results of the soil study are also included in the ESIA.

Field Assessment

The field assessment review was conducted over a one week period in two phase: the Yoni Chiefdom side and the Masemera Chiefdom side to verify information from the ESIA process.

For Yoni Chiefdom, the assessment started in Mafala and ended in Mayira and for Masimera Chiefdom the field work started in Mayolla and ended in Mabilabana. The field assessment reveals that the newly leased areas in both chiefdoms are highly degraded farm bush, there is evidence of considerable loss of structure and diversity due to consistent annual wildfires and slash and burn agriculture. The areas having been farmed for agricultural crops like maize and cassava in the drier areas and rice in the Foindu Stream and its tributaries flood areas.

The areas along the Foindu Stream that may be important seasonal biodiversity areas have been farmed for tuber crops and rice for a number of years now, with the removal of wooded areas in this flood area still continuing. All other riparian zones that could be considered important for hydrological functions and water purification have been denuded of natural vegetation and are now subject to annual wildfires.

HCV Identification within Miro Land holdings in Yoni Chiefdom (Port Loko Distrcit) and Masimera Chiefdom (Tonkolili District)				
HCV	**Definition**	**Present**	**Potentially Present**	**Absent**
HCV 1.1	Protected areas			
HCV 1.2	Forest that contain outstanding concentrations of threatened or endangered species			
HCV 2	Globally regionally or nationally significant large landscape level forests			
HCV 3	Forest areas that are in or contain rare threatened and endangered ecosystems			

HCV 4.1	Forest critical to water catchments			
HCV 4.2	Forests critical to erosion control			
HCV 4.3	Forests providing barriers to destructive fire			
HCV 4.4	Forests that play a critical role in local climate regulation			
HCV 5	Forest areas fundamental to meeting basic needs of local communities			
HCV 6	Forest areas critical to local communities' traditional cultural identity			

Table 3: Summary of HCVs identification at the end of the field assessment.

Based on the field assessment and consultation it was concluded that these areas have no environmental aspects that would classify them as HCVs. What may be of potential HCV is HCV 4.4, 5 and 6.

Stakeholder Consultation

Forestry Commission District Division

From the interview with Mr. Sahr Keillie, the Deputy Director in the Forestry Departmnt and Mr. Amos Kamara and Mr. John Brima, both Forestry Officers, they stated at the beginning of the meeting that there is nothing in either the Yoni Chiefdom and Masimera Chiefdom new lease areas that have been allocated to Miro that would constitute HCV.

The riparian areas should be maintained with at least the legal buffer zones as these areas are significant for water provision and will assist in the return and retention of rare, threatened and endangered (RTE) species.

Wildfires across the district cause significant damage every year, and if Miro can pay attention to reducing the number and extent of these fires it would help in restoring and conserving some of the natural assets of the region. In this regard the use of low

hazard chemicals (herbicides) to limit wildfire spread and help reduce flammable grass biomass to encourage woody restoration is recommended.

Patfumayagbo Village, Foindu Section, Yoni Chiefdom

Following formal introductions and permission from the Chief, the officers from GeoData met with residents in their individual house holdings. The primary concerns of the village relate to loss of agricultural land surrounding their communities, although they acknowledged that they were in agreement with the Chief for having leased part of their landholdings to Miro. They requested that Miro put in place livelihood restoration measures that would alleviate some of their domestic and welfare needs as well as the educational programmes for their children.

These concerns cut across all the villages where the soci-economic questionnaires were administered in the Chiefdoms.

Environmental Protection Agency (EPA)

The EPA is unaware of any significant aspects in the new lease areas that would need consideration as HCV. The Agency would normally require plantation organizations to set aside 10% of their area for conservation and restoration. Also, riparian buffers of 15 meters from streams, 25 meters from rivers and 45 meters from major rivers be maintained.

GeoData recommends that a biodiversity offset scheme be put in place that would be viable for natural asset recovery for residents to be able to trade these assets, especially non timber forest products within these offset areas, to interested people or organizations that would cushion livelihood concerns.

CONCLUSION

During the field assessments and stakeholder consultation there was therefore no further evidence put forward to indicate aspects of conservation significance in the

categories for HCV 1.1, HCV 2, HCV 4.2, HCV 4,2 and HCV 4.4, therefore these are confirmed as being absent.

HCV 1.2 – Forest that contain outstanding concentrations of threatened or endangered species

While a number of stakeholders have requested that this area be given special attention during this report, there are no areas directly connected to Miro lease areas that contain outstanding concentrations of threatened or endangered species. Stakeholders themselves confirmed they are unaware of any aspects that would fit this HCV category either within Miro holdings or within the immediate landscape. GeoData, the authors of this report, during their field assessment and stakeholder consultation did not find any outstanding concentrations of threatened or endangered species.

However, Miro would still need to apply Best Management Practices to secure species protection. See Management Recommendations below.

HCV 3 – Forest areas that are in or contain rare threatened and endangered ecosystems

The field assessments presents as predominantly rain fed cropland charcaterised with farm bushes constituting young secondary forests and low bushes. These include the concession areas around Mayira, Mashenkra, Robisbana, Masanki, and Rogbogban land owning communities. There are also mosaics of grasslands showing vividly in the northeast of the chiefdom around Makapr, Manjehun and Mabilla land owning communities.

The vegetation has been so badly degraded that it is not possible to even actually distinguish the original vegetation type in this area. Therefore, this HCV is not present.

HCV 4.1 – Forest areas critical to water catchments

Communities interviewed confirmed that they do not use water from streams and rivers that flow through Miro lease areas for drinking. Further to this none of them consider the streams and rivers as essential for fishing or necessary for agriculture

(needed siltation control) that would warrant assigning HCV status to any of these aquatic aspects.

HCV 5 – Forest areas fundamental to meeting basic needs of local communities

All communities interviewed confirmed that there are no areas meeting the requirements of basic needs, therefore this HCV is not present.

However, communities did express concern of loss of sources of food and employment. Miro is well aware of this concern and needs to ensure their Community Projects and Corporate Social Responsibility programmes are seen to be addressing these concerns.

HCV 6 – Forest areas critical to local communities' traditional cultural identity

Secret Society bushes which often serve as cultural identity places are usually patches of forests surrounding a settlement or simply left standing amid land cleared for farming, which provide secluded areas for locales for society rituals. But as the community needs increase for agriculture to fund social changes, sacred forests are competing against agricultural expansion, and simultaneously, changes in traditions of rural society diminish the importance of sacred lands and threaten the motivation for their protection.

Locals were somehow apprehensive on information relating to secret societies in our discussions with them. Particularly, they would not indicate to us the locations of the secret society bushes. These made it impossible for us to identify and map secrete society bushes for this study. But they are generally small land holdings on average of about 0.1 to 0.5 hectares, according to locales. We do not therefore consider the secret society bushes as issues of high conservation concern.

HCV Identification within Miro Land holdings in Yoni Chiefdom (Port Loko Distrcit) and Masimera Chiefdom (Tonkolili District)				
HCV	**Definition**	**Present**	**Potentially Present**	**Absent**
HCV 1.1	Protected areas			
HCV 1.2	Forest that contain outstanding concentrations of threatened or endangered species			
HCV 2	Globally regionally or nationally significant large landscape level forests			
HCV 3	Forest areas that are in or contain rare threatened and endangered ecosystems			
HCV 4.1	Forest critical to water catchments			
HCV 4.2	Forests critical to erosion control			
HCV 4.3	Forests providing barriers to destructive fire			
HCV 4.4	Forests that play a critical role in local climate regulation			
HCV 5	Forest areas fundamental to meeting basic needs of local communities			
HCV 6	Forest areas critical to local communities' traditional cultural identity			

Table 3: Summary of HCVs identification at the end of the field assessment.

Management Recommendations

Riparian Zones

Riparian Zone management is probably one of the biggest concerns expressed by the stakeholders. Miro needs to ensure they implement prescriptions for buffer zones around the streams in the Foindu Section. The company has to afford protection of this zone in the conservation management plans as this would ensure that the original buffer zone areas are correctly placed to protect both the rivers and flood areas.

As there is evidence of concern in this regard it would be good for Miro to report on the results of stream quality tests (primarily bio-monitoring and drinking water quality) as per the ESIA recommendations.

Rare and Endangered Species

This aspect is also of significant concern among stakeholder, particularly in regard to providing habitat within the greater landscape.

Miro need to implement detailed conservation management prescriptions and these need to be enforced. While Miro has no regulatory authority to prevent destruction and hunting of these species, it is critical that the relationship with the Forestry Commission is maintained to ensure that this authority is able to act on instances of illegal activities. It is also recommended that where practical Miro link their conservation areas both internally and to any external areas of conservation value.

It is recommended that Miro develop field cards of the vulnerable species for use by supervisors and machine operators responsible for land preparation operations to enable these people to easily identify and protect these species.

As there is evidence of concern in this regard it would be good for Miro to report on the results of species identification in their annual reports and the results of their Biodiversity monitoring as and when this is conducted.

Water Quality

Although stakeholders mentioned that these streams are not meant for drinking, it is recommended that Miro monitor water parameters necessary to determine water

quality (Faecal coliforms and Total coliforms) and employees and neighbouring communities should be made aware of these results.

Fire Management

After agriculture and other illegal activities in the leased areas, wildfire has had the biggest impact on both flora and fauna. Through proper fire management planning and community awareness programmes Miro can have a very positive impact on the natural area within their new lease areas.

Erosion Control

There is always the need for erosion control in commercial plantation forestry. However, some of the soils within the new lease areas are particularly susceptible to erosion. It is likely that the soils in these areas, in particular would need to have erosion control measures put in place. Initially, this would be to address poor land use patterns by historical users (agriculturalists). Further, erosion control would also be needed to ensure that as roads are constructed these are done in a manner that limits erosion.

Community Liaison

It is very important that community programmes include fire awareness programmes, employment creation and programmes to address stakeholder concerns around reducing vulnerability of women in the community. Other community projects should be based around addressing concerns raised by communities during GeoData discussions with these communities, particularly livelihood restoration and job creation.

Appendix A. **Table 5: Presence of primates in the concession area**

Ungulates	**Scientific name**	**IUCN Status**	**Presence in study area**
Maxwell's Duiker	*Cephalophus maxwelli*	Least concern	Likely
Black Duiker	*Cephalophus niger*	Least concern	Confirmed
Royal Antelope	*Neotragus pygmaeus*	Least concern	Confirmed

Bushbuck	*Tragelaphus scriptus*	Least concern stable	Confirmed
Red River Hog	*Potamochoerus porcus*	Least concern	Confirmed
Primates			
Sooty Mangabey	*Cercocebus atys*	Near threatened	Likely
Campbell's Monkey	*Cercopithecus campbelli*	Least concern	Confirmed
Lesser spot-nosed Monkey	*Cercopithecus petaurista buettikoferi*	Least concern	Confirmed
Green Monkey	*Chlorocebus sabaeus*	Least concern Stable	Likely
Western black and white Colobus	*Colobus polykomos*	Vulnerable	Unlikely
Olive Colobus	*Procolobus verus*	Near threatened	Unlikely
Carnivores			
Leopard	*Panthera pardus*	Vulnerable	Unlikely
Rodents			
Greater Cane rat	*Thryonomys swinderianus*	Least concern	Likely
African Brush tailed porcupine	*Atherurus africanus*	Least concern	Likely

Fire-footed Rope squirrel	*Funisciurus pyrropus*	Least concern	Likely
Giant rat		Least concern	Likely
Giant Forest Squirrel	*Protoxerus stangeri*	Least concern	Likely
Small Sun Squirrel	*Heliosciurus punctatus*	Least concern	Likely