Sierra Leone

Natura Habitats

organic products grown in a sustainable habitat

ASSESSMENT SUMMARIES AND MANAGEMENT PLANS

For RSPO New Planting Procedure

Natural Habitats Group

natural-habitats.com

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ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
CCP	Community Contact Person
CO2	Carbon Dioxide
CRO	Community Relations Officer
EFB	Empty Fruit Bunches
EPA	Environment Protection Agency
ESMP	Environmental Social Management Plan
EMU	Environmental-Social Management Unit
EPA	Environmental Protection Agency
EVD	Ebola Virus Disease
FCC	False Colour Composite
FFB	Fresh Fruit Bunches
FPIC	Free Prior Informed Consent
GHG	Greenhouse Gas Emissions
GFNP	Gola Forest National Park
GoSL	Government of Sierra Leone
HIV	Human Immunodeficiency Virus
HCV	High Conservation Value
HCS	High Carbon Stock
HSE	Health, Safety and Environment
IBA	International Bird and Biodiversity Area
ICS	Internal Control System

INTEGEMS	Integrated Geo-information and Environmental Management Services
IVS	Inland Valley Swamps
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
LOA	Land Owners' Agreement
NHG	Natural Habitats Group
NHSL	Natural Habitats Sierra Leone
NFTP	Non-Timber Forest Products
NPP	New Planting Procedure
PAPs	Project Affected Persons
POM	Palm Oil Mill
POME	Palm Oil Mill Effluent
PPE	Personal Protective Equipment
RaCP	Remediation and Compensation Procedure
RBS	Rapid Botanical Survey
RTE Species	Rare, Threatened and Endangered Species
RSPO	Roundtable on Sustainable Palm Oil
SSC	Species of Special Concern
WAA2	West Africa Agriculture Number 2 Limited
WWF	World Wildlife Fund

1   OVERVIEW AND BACKGROUND

Natural Habitats Group (NHG) is a Dutch organization, dedicated to the collection, processing and trading of organic, fair trade and sustainable palm oil. The group is fully committed to the protection of the environment, the enhancement of the biodiversity and the social development of communities, farmers, and workers. All operations are settled and maintained using organic agriculture practices, and complying with fair trade and RSPO practices. The group has operations in Ecuador (RSPO IP certified) and Sierra Leone, and its headquarters are in The Netherlands.

Natural Habitats Sierra Leone Ltd (hereafter, Natural Habitats or NHSL), a subsidiary of the Natural Habitats Group ((NHG), in its aim to mainstream the use of organic practices in the production of organic and sustainable palm oil acquired in July 2014 the company West Africa Agriculture Number 2 Limited (hereafter WAA2) in Sierra Leone. WAA2 owns a land lease concession for 99 years (the land lease is 50 years with an option to extend for 21 years + 21 years + 7 years) in Makpele Chiefdom, Pujehun District, Southern Province, Sierra Leone. The land lease covers about 30.700 hectares and is within the Makpele chiefdom (41.218ha). Figure 1

NHSL is committed to achieving RSPO certification for all of its oil palm plantations, and because this concession is a new planting, it is subject to the RSPO new plantings procedure (NPP). RSPO NPP requires a comprehensive and participatory independent social and environmental impact assessment (ESIA) of the area concerned that includes the identification of all primary forest, HCV areas and local peoples' land.

NHSL commissioned an independent regulatory Environmental and Social Impact Assessment (ESIA) (Integrated Geo-information and Environmental Management Services), High Carbon Stock Assessment (HCS) and Greenhouse Gas Assessment (GHG) (Montrose Environmental) and High Conservation Value (HCV) (Digby Wells, led by Philip Patton (ALS15041PP)), to meet the requirements of the RSPO's New Planting Procedure (NPP). The assessments have been done covering the entire Makpele chiefdom as this is considered to be important, due to the proximity to the Gola Rainforest National Park. Out of the 41.218 ha, 25.293,13 ha has been identified as HCV conservation area (through the HCV assessment). From the area identified as HCVs approximately 10.185 ha has been identified as High Carbon Stock forest area by the HCS assessment. The company plans to develop up to 7.500 ha into an oil palm

plantation (hereafter refereed as Zimmi plantation) in the next five years, and to support independent smallholders in the development of 2.500 ha (within the concession area).

Værsa Partners was appointed to conduct a land use study and a feasibility study of the site and determine whether it would be economically viable. Værsa Partners team conducted a site visit from 30th November 2014 to 14th December 2014 to determine the economic feasibility of the project. The study concluded the project is feasible, and that of the total chiefdom area of 41.218 ha, consists mainly of shrub land 42,44%, forests is 29,4%, rivers is 8,1%, swamps 6,7%, open areas 5,9% with remaining land consisting of existing roads, settlements, oil palm and cultivated area.
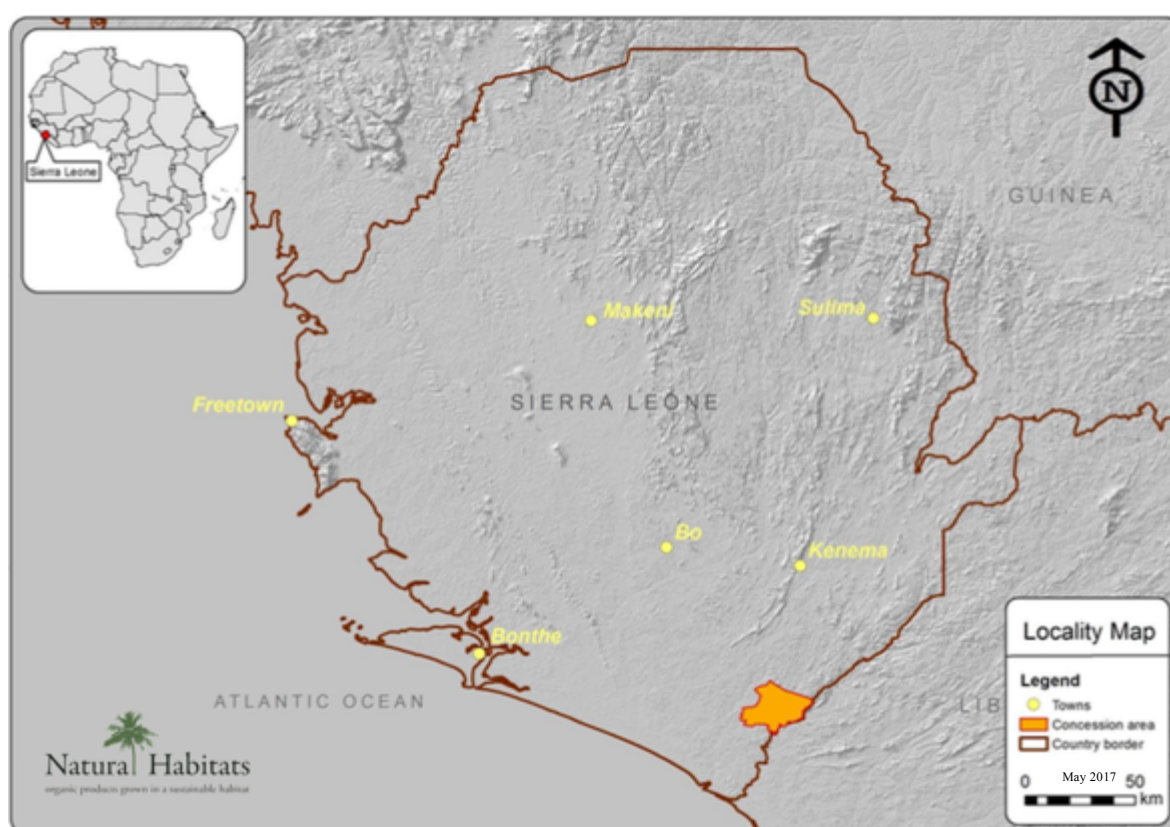
Figure 1 Location of Concession Area in Pujehun District, Southern Province, Sierra Leone

2   ASSESSMENT PROCESSES AND METHODS

2.1.1   HIGH CONVERSATION VALUE ASSESSMENT

Digby Wells Environmental was commissioned to conduct the High Conservation Value (HCV) assessment for Roundtable for Sustainable Palm Oil (RSPO) certification. The HCV Assessment for the Zimmi plantation has been peer reviewed and passed the HCVRN quality control requirements. The assessment was steered by the general guidance of HCV assessments (Brown et al., 2013) and the Pro-Forest initiative (2012) using a step-wise screening approach.

Digby Wells Environmental is a South African company with international expertise in providing environmental and social services to South African and international clients, with a focus on the mineral resources and energy sectors in Africa.

Dates of Assessment

The field investigations for the HCV assessment took place from the 19th to the 23rd of November 2015, following a screening assessment on the 19th to the 21st of October 2015. The final report was delivered in April 2016, and then approved by the HCV Network in the same month.

Assessors and Credentials

Three experts conducted the HCV assessment:

Philip Patton worked as the Manager of the Biophysical Department at Digby Wells and is an accredited HCV Assessor (ALS15041PP). He holds a BSc Hons in Environmental Science from the University of Cape Town, and a BSc in Geology and Geography & Environmental Management from the University of Port Elizabeth. His fields of expertise are the Ecology and the Ornithology. On the HCV assessment, he was in charge of the study of the Terrestrial Fauna and the Lead Assessor.

Russel Tate holds a Master's degree in aquatic health from the University of Johannesburg. His field of expertise is the Aquatic Ecology. That was his contribution to the HCV assessment.

Cristal Rowe, she is specialized in flora and wetland ecology. She achieved a BSc in Botany and Geology and a BSc Hons in Botany at Nelson Mandela Metropolitan University. Her fields of expertise are the Flora and the Wetland Ecology. That was her contribution to the HCV assessment.

Assessment Methods

Digby Wells determined the area of influence for the project and identified the HCV Management Units (MU's) inside the area. The study identified the key social and biological features; using three specialist assessments:

- Flora and Fauna;
- Aquatic Ecology;
- Ecosystem Services.

The studies for the different assessments were conducted in conjunction. The target areas were identified based on the screening assessment and aerial imagery. (Figure 2) The focus areas were chosen based on the presence of intact habitats and the propensity to meet species diversity and included the following:

- The Gola Rainforest National Park area adjacent to the concession area;
- Areas of fragmented natural forest in the concession area;
- Riparian zones and wetlands.

Vegetation: For the vegetation survey and ecosystem services identification, the method used is based on a modified Rapid Botanical Survey sampling technique. Random plots were taken throughout the focus areas to record species encountered, vegetation composition, species dominance and the presence of alien plant species. The purpose of the vegetation assessment is to ascertain the presence of HCV triggers from a vegetation and flora point of view.

Faunal: Concerning the faunal survey, desktop studies and site assessment were undertaken by INTEGEMS, the results have been used by Digby Wells to base the assessment. The bird survey made by Digby Wells is based on a transect surveys in different avifauna habitats, such as closed forest, open forest, riverine habitats, farms, and swamps. The birds encountered or noted during the survey, the birds listed in previous records and the list of rare and endangered species were used to conclude on the study. The mammal assessment is the result of sighting and the use of ecological indicators (scats, tracks and habitats such and burrows and dens).

Aquatic: The aquatic ecology assessment was based on a systematic water quality measures and a census of the availability and diversity of habitats. The methods used for the assessment are set out by Bain and Stevenson (1990), Vannote et al. (1980), and Gerber and Gabriel (2002). The assessment and description of the habitat in this study has been used to ascertain the potential presence of HCV/Rare, Threatened and Endangered (RTE) taxa.
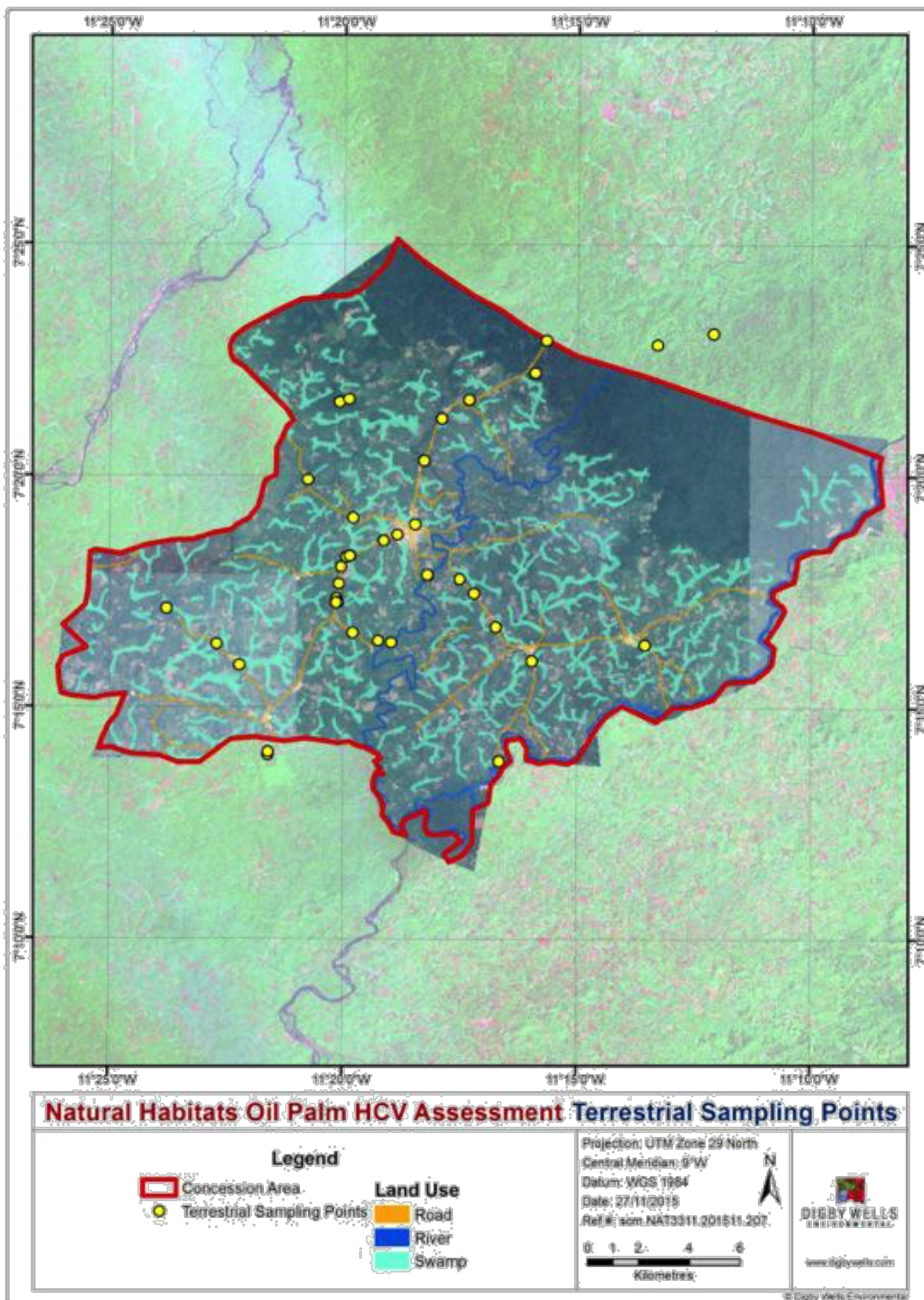
Figure 2 Terrestrial Sampling Points

2.1.2 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Integrated Geo-information and Environmental Management Services (INTEGEMS) was contracted to undertake an Environmental, Social and Health Impact Assessment (ESIA) of the development, based on the assumptions of up to 15.000 ha of organic oil palm plantations (up to 10.000 ha own plantation, and up to 5.000 ha of out growers) and processing facilities (mill and associated infrastructure).

Dates of Assessment

Scoping visits took place form the 12th to 15th June 2015, the scoping (stakeholders' consultation) workshop and advertising was held on Saturday 7th November 2015. The final report was delivered on the 4th of March 2016. In July 2016, the Environmental Protection Agency of Sierra Leone approved the license of the ESIA.

Assessors and Credentials

The INTEGEMS ESIA Project Team has been put together to have a mix of international specialists that have extensive experience in managing ESIAs for large developments, including palm oil planting and milling projects, to IFC and other international standards. INTEGEMS is supported by extensive resources and expertise from a network of associates and partners and draws upon a wide range of technical specialists and strategic partners to contribute to and collaborate on the ESIA.

Julius Mattai (Project Manager) was responsible for the management of INTEGEMS ESIA Team and the Project in terms of budgets, deliverables, client liaison and specialist co-ordination. He lead the sections of air quality, noise, GIS and geology.

Professor Aliyadeen Alghali was responsible for the overall directorship of the Project and the socio-economic studies of the ESIA.

Alpha Mansaray was responsible for quality assurance/quality control (QA/QC) and overall data and information management of the Project.

Jusufu Moiwa was responsible for assisting with the socio-economic studies of the ESIA.

Edward Aruna was responsible for the ecological (flora and fauna) and biodiversity studies.

Ibrahim Kamara and Sylvester Tucker were both responsible for coordinating all the teams and providing assistance to the ESIA Team in terms of budgets, deliverables, and client liaison and specialist co-ordination.

Dr Sharka Sannoh is responsible for the overall management and technical aspects of the Hydrology and Geohydrology specialist studies, modelling and deliverables.

Dr Eldred Taylor is responsible for the overall management and technical aspects of the air quality specialist studies.

Assessment Methods

The methodology followed by INTEGEMS is based on the EPA act 2008. That method is applicable for the project since the section 25 of the act precise that an EIA in required for large-scale agribusiness activities; this is relevant for oil palm plantation and mill. The method used is a three-step process:

Step 1: Is a scoping to determine the scope of the environmental assessment and of the factor to be considered. All the parties involved must be allowed to give their interest and concerns about the project. The result of this scoping is the definition of the Terms of Reference of the ESIA. The scoping was done in two times. A first team of four experts came from the 12th to the 15th of June 2015. The purpose of that meeting was to identify the site and understand it. On a second time, a scoping workshop was organized in Zimmi town court barray. Was invited, by INTEGEMS, to the workshop all the major stakeholders of the Chiefdom. This was an open meeting and anyone willing to participate and speak was welcome. The list of meetings and consultations can be found in Table 2.

Step 2: Is the ESIA study itself. The study is based on the Terms of Reference (following RSPO and International Finance Corporation standards. The purpose of this study is to consider all the factors required by the EPA and to consider all the interests and concerns of the stakeholders as reported during the scoping. The ESIA has also to consider the section 26 of the EPA act 2008 that indicates the area to be considered.

During the ESIA study data were collected in the following categories:

Climate	Gender relations
Air quality	Vulnerable groups
Noise	Infrastructure
Hydrology and hydrogeology	Community health and sanitation
Biodiversity (flora and fauna)	Education
Socio-economics	Land ownership and land use
Population demographics	Food security of affected community
Race, ethnicity and language	Archaeological and cultural heritage resources

The social data were recorded through interviews realized in various villages of the Chiefdom, spread in the different sections.

Step 3: Is the review of the ESIA by the EPA. The report was published in a gazette and circulated to professional organizations for reviewing. The ESIA was approved by the Environmental Protection agency of Sierra Leone in July 2016.

2.1.3 LUCC ANALYSIS

NHSL received the concession area with a nursery (19,6ha) and a plantation (216 ha) which were cleared before the HCV assessment was approved by the HCV Network. RSPO requires that for every management unit that has had clearing without prior HCV assessment, a Land Use Cover Change (LUCC) analysis must be submitted for the entire management unit.

The objective of the LUCC is to analyse and classify land use and land cover status; identify land use changes on Natural Habitats (SL) Ltd.'s concession, plantation, and nursery prior to the HCV Assessment Study.

Dates of Assessment

May 2017.

Assessors and Credentials

Philip Patton is a Director for Montrose Environmental. He is also a licensed High Conservation Value Assessor (ALS15041PP) and has conducted HCV assessments, biodiversity assessments, environmental impact assessments and audits in Europe, the Middle East and throughout Africa. Mr Patton is also an experienced ornithologist, and a registered Professional Natural Scientist (400029/14). He has over 18 years of consulting experience in ecological assessments and environmental auditing within the mining, agriculture, and renewable energy sectors as well as other similar industries. Mr Patton holds a BSc Hons in Environmental Science from the University of Cape Town, and a BSc in Geology and Geography & Environmental Management from the University of Port Elizabeth.

Assessment Methods

Remote sensing image classification is a complex process which involves many steps, including the determination of a land cover classification system, collection of data sources, selection of a classification algorithm, extraction of thematic information, and accuracy assessment. In humid tropical forest environments, such as Sierra Leone, cloud cover is a major problem in working with optical remotely sensed data. While remote sensing methods are suitable in general for the LUCC, the use of Landsat images in the tropics for the monitoring and modelling of land-cover changes has been restricted due to the influence of cloud cover.

Landsat 5 and 8 satellite images were processed using ERDAS Imagine® and ArcGIS® software and subject to on-screen analysis and differentiation for the land cover types and land uses. A multistage visual technique was used based on an on-screen interpretation to directly digitize land cover units. The Landsat 5 and 8 images were displayed as false colour composites using various bands; e.g., 3 (0,63-0,69 μm, red), 4 (0,76-0,90 μm, near infrared) and 5 (1,55-1,75 μm, mid-infrared); the combination of the selected channels was displayed on the screen according to the scheme with bands 5-4-3 displayed as red, green, and blue, respectively. Various digital image processing were employed: contrast enhancement, rationing method, and supervised classification. The image classification process involved conversion of multi-band raster imagery into a single-band raster with a number of categorical classes that relate to different types of land cover and land use.

To assist in the interpretation and to validate the final product, technicians compared images with high resolution images from Google Earth, when available. In addition, images were overlaid with other layers of information, such as population centres, roads and existing administrative boundaries and previously conducted studies of land cover change in the Project area. Ground truth data and Landsat image data were used in the training sample. The ground truth data were collected by INTEGEMS during a field work in November 2015.

2.1.4 FEASIBILITY ASSESSMENT

NHSL engaged Værsa Partners to conduct a soil, land used and agriculture feasibility assessment in the area of concession.

Dates of Assessment

The assessment team conducted a site visit from 30th November 2014 to 14th December 2014. With the final feasibility assessment delivered in December 2014.

Assessors and Credentials

Suriya Moorthy, Senior Executive Director, is Værsa Partners' Principal Consultant and heads the Agri-Business Consulting Practice in Malaysia, South East Asia, Oceania, South/Latin America, and Africa.

Deepak Singh, Principal, brings with him experience from his time at a leading Strategy Consulting firm. His experience in the Agriculture sector include new site feasibility studies, buy side commercial and technical due diligence, developing sustainability manuals, company policies and procedures for finance, human resources, procurement, yield improvement analysis, good agricultural management practices manuals and implementation.

Assessment Methods

The feasibility report was prepared based on the information gathered from satellite imagery, site analysis, data supplied to assessors and oral representations made to the assessors by the management of Natural Habitats Group, these are subject to the limitations and key assumptions given in the final feasibility report.

2.1.5 GREENHOUSE GAS ASSESSMENT

The revised Roundtable on Sustainable Palm Oil Principles and Criteria (RSPO) (2013) has a criterion 7.8 requiring that new plantation developments are designed to minimise net greenhouse gas emissions (GHG). The first indicator for this criterion entails the identification and estimation of the carbon stock and major potential emission sources of the proposed development area. The second indicator requires new developments to have plan to minimise greenhouse gas (GHG) emissions which considers the avoidance of land areas with high carbon stocks and consideration of sequestration options. A High Carbon Stock (HCS) assessment has been conducted based on HCS approach to map potential high carbon stock areas. Montrose International in global consultancy company which works with a diverse client base throughout Africa and Asia in order to facilitate sustainable business whilst enhancing local, regional, and global environmental and social integrity. Through their specialist division, Montrose Environmental, was commissioned by Natural Habitats to conduct a High Carbon Stock (HCS) assessment and produce the subsequent GHG assessment using this HCS data. The HCS and GHG assessments will support Natural Habitats to reduce greenhouse gas emissions, where possible, to work with communities in protecting and conserving viable remnant natural forest patches in the concession, and to fulfil the no deforestation requirement as a part of the company's commitment to sustainable palm oil production.

Dates of Assessment

The HCS assessment follows on from an HCV assessment that was completed in January 2016. Montrose Environmental was contracted to perform the High Carbon Stock Assessment. The field investigations for the HCS assessment took place from the 8th to the 14th of March 2017. With final report being delivered on the 10th of May 2017. Additional information for the HCS assessment was obtained from the Project's Environmental and Social Impact Assessment (ESIA) (Integems, 2016).

Following the completion of the High Carbon Stock Assessment, the Greenhouse Gas Assessment was conducted by Montrose Environmental with the same assessor as the HCS Assessment, the GHG Assessment was completed during May 2017. With the final report being delivered on the 17th of May 2017.

Assessors and Credentials

Name	ALS Licence	Organisation	Role	Expertise
Phillip David Patton	Provisional registration: ALS15041PP	Montrose Environmental	Lead Assessor for GHG Assessment and HCS Assessment	Environmental auditor, ecosystem services, conservation, and biodiversity.
Christopher Fell	Not yet registered	Montrose Environmental	Senior HCS Assessment Consultant	Forestry, community forestry, stakeholder engagement, ecosystem services assessment, conservation, and biodiversity planning.

Assessment Methods

The HCS assessment was based on the HCS Approach as developed by Greenpeace, The Forest Trust and Golden Agri-Resources Ltd., and the Version 1 of the HCS Forest Patch Analysis Decision Tree. Although the HCS survey focused on the concession, the area of influence was deemed to be the concession area and immediately adjacent area including the southern boundary of the GRNP and the leakage belt. The HCS approach combines carbon and biodiversity conservation, as well as community rights and livelihoods. Only areas that contain low carbon, such as shrub and grassland could be considered for conversion into plantations. This means that areas with young regenerating forest and secondary forest, which contain more carbon and biodiversity, are tagged for conservation.

The carbon stock map generated was then integrated with other conservation set asides identified during HCV assessment. The integrated map served as a guide to project emission from land use change and projecting GHG emission from different development scenarios. These scenarios were both modelled using RSPO's New Development Calculator Excel, in order to show the overall difference emissions, and give reasoning towards the chosen scenario. The final GHG emission estimation is based on choosing the optimum scenario for ensure a low emission development is established. The final emissions table for the chosen scenario is shown in Table 21.

3 SUMMARIES OF FINDINGS

3.1 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

3.1.1 POSITIVE AND NEGATIVE ENVIRONMENTAL EFFECTS

Table 1 With List of Potential Positive and Negative Environmental Effects

Potential Positive and Negative Environmental Effects		
Type of Impact	Positive	Negative
Nursery Development and Maintenance	Biomass generation	Loss of habitats of diverse species of flora and fauna – ecological Impacts Air pollution – open burning of the biomass Air quality deterioration and noise nuisance Water scarcity Water pollution – use of agro-chemicals and sewage generated from workers Pest infestation – presence of the biomass in stage of degradation Traffic Hazardous substances
Plantation Development		Receiving water quality deterioration and change in local hydrology Air quality deterioration Noise nuisance Solid waste management issues Loss of biodiversity Threats to resident crops Soil stability and erosion Impact on soil fertility and acidification Sanitation problems Aesthetics and visual intrusion Occupational health and safety issues Removal of cultural sites Biomass generation and CO_2 balance Ecological impacts - Loss of habitats and species Impacts on air due to the open burning of the biomass Impacts on hydrological and drainage system Water pollution due to agro-chemical usage Water and soil pollution due to hydrocarbons Water pollution due to sewage from base camps Impacts on soil – Soil erosion and degradation Pest infestation Transportation (FFB and palm oil) and traffic Waste management

Mill, Facilities and Supporting Infrastructure Construction		Occupational health and safety issues Change in topography Loss of soil resources Noise pollution Air Pollution
Plantation Operation		Biodiversity management issues Pest infestation Solid waste management issues Soil degradation Food security Occupational/public health and safety issues
Mill Operation		Air pollution Exhaust emissions from the combustion of the palm oil fibre and nutshell obtained from the process and used to fuel furnaces in order to supply electric energy for the mill. Exhaust emissions from the combustion of the stand-by fossil fuel generators. Exhaust emissions from the transportation of FFB to the mill for processing from the plantation by trucks. Exhaust emissions from the transportation of Crude Palm Oil (CPO) for export or to the market by third party trucks. Emissions into the air of methane (chiefly but also some CO_2) from the shallow ponds as a result of digestion by anaerobic and some aerobic bacteria of the POME. Possible use of Ozone Depleting Substances (ODS). Impacts on water and surface watercourses Impacts on soil Water security Water pollution and effluent management issues Impact on downstream water users Waste management issues Noise nuisance Aesthetics and visual intrusion Public health and safety issues Chemicals management Emergency situations

3.1.2 SOCIO-ECONOMIC IMPACTS TO COUNTRY, REGION, AND LOCAL COMMUNITIES

The area of socio-economic influence is considered to be 5 km around the plantation based on a review of the population and economic assets likely to be influenced by the Project. This zone covers the Sorogbema Chiefdom in the south, Gallinasperi Chiefdom in the west, Barri Chiefdom in the north-west, Tunkia Chiefdom in the North, and the Republic of Liberia in the east.

The communities in the Project area have poor access to water sources, limited sanitation services, and limited provision of power for lighting or cooking and sub-standard housing. The access and provision of basic health services are major concerns in most of the communities covered by the scoping site visit and a requisite condition for a healthy work force. Significant health threats include HIV/AIDS, malaria and cholera, intestinal worms, typhoid and dysentery. The recent outbreak of Ebola Virus Disease (EVD) has also impacted on the Project area (and the entire Sierra Leone) affecting both people and health service provision.

Agriculture is a very common occupation within the Project area. As was revealed by the farmers during the Scoping visit, areas cultivated range from about 1 acre (0,4 ha) to 100 acres (40,4 ha) in size, depending on the type of crops cultivated. Poultry (chicken and ducks), sheep and goats are the livestock reared within the Project area. These livestock are mostly reared by free range feeding, being let loose in the morning, and confined late in the evening. Fishing is mainly carried out in the Mahoi, Yebo, Mano, Majei, Konjajei, Yambase and Mosakpa rivers and, in streams at close proximity to the settlements. Hunting is limited to the use of traps and dogs rather than guns whose use is prohibited.

Artisanal mining is not a very common land use activity but is also undertaken in the Project area. Diamond is the mineral mined and the mining locations are inland valley swamps (IVS), the bed of the rivers Mahoi and Mano, river terraces (i.e. alluvial mining), and uplands. Recreational facilities in most of the settlements mainly comprise of football and athletics. Crafts persons were evident in the form of carpenters, masons, tailors, weavers (of fishing nets (Baimbay), country clothes, winnowers, baskets, hammocks, and mats).

Women are under-represented in almost all agricultural and non-agricultural employment fields. Gender parity in senior positions is particularly low. Children and women are the most vulnerable and constitute the most powerless and poorest groups in the rural communities and in the Chiefdom, especially as these bear the heaviest burden of acute poverty and deprivation. The development of the plantation and processing phase will require labour and new job opportunities could be accomplished if the company endeavours to offer employment to indigenous citizens of these communities. The employment of locals in the farming, milling and other processing operation will improve the standard of living of the locals and multiplying effect in the region. The creation of jobs will lead to increased income, expenditure, and investment enhancement. The benefits of those who are employed will lead to the ability to provide more for family members, which will have multiplying effect in the Project area and within the region; a buffer in the case of the changing economic circumstances.

Expectations concerning what the project will offer the local communities (especially the youth) as well as the region could be unrealistic. People have the impression that once the processing project opens, there will be an immediate increase in development in their communities and an increase in their standards of living. If these expectations are not realized conflict will most probably occur. In order to minimize the negative impacts of unrealistic or unmet community expectations, it is recommended that an ongoing stakeholder engagement plan combined with a transparent and appropriately scaled community development plan be implemented.

3.1.3 SOCIO-ECONOMIC IMPACTS IN RESPECT OF EMERGENT COMMUNITIES

Impact: Job opportunities/employment of local residents

Pre-mitigation Significance: Moderate positive

Recommended Mitigation/Enhancement: The optimum benefits of the impacts will be realized if the following recommendations are taking into consideration:

- Natural Habitats shall liaise with Makpele Chiefdom in developing an employment strategy so that the affected communities will be given priority.
- There will be improvement in agricultural and other technical skills through experience that will be acquired on the job and training programmes provided by the intending company.
- Women shall be given equal employment opportunities.

Post-mitigation Significance: Moderate positive

Impact: Smallholder scheme

Pre-mitigation Significance: Moderate positive

Recommended Mitigation/Enhancement: In order to realise the optimum benefits and mitigate the potential negative impacts, the following are recommended:

- Directly affected communities within the project area who do not benefit from employment opportunities shall be considered for the out-growers scheme if they own oil palm plantation.
- It is the responsibility of both parties to ensure that the cultivation of other food crops is not neglected as a result of the regular cash flow from the scheme.
- There shall be education and training on mismanagement of resources meant for the out-growers' scheme being used for other food crop cultivation such as pesticides, fertilisers.
- Sensitisation shall be done for out-growers on the consequence of food security and the implications of neglect of the cultivation of other food crops for oil palm as a result of regular cash flow from the scheme.

Post-mitigation Significance: Moderate positive

Impact: Improvement of local skills

Pre-mitigation Significance: Moderate positive

Recommended Mitigation/Enhancement: In order to realize the optimum benefits of such training skills, the following are recommended:

- A detailed health and safety policy including operational health and safety management plans and training modules should be developed for the oil palm project. This task is the sole responsibility of the health and safety department that will be set up by Natural Habitats. The health and safety policy and training, which should include community outreach.

Post-mitigation Significance: Moderate positive

Impact: Enhanced access to markets for the local farmers

Pre-mitigation Significance: Moderate positive

Recommended Mitigation/Enhancement: By being employed by Natural Habitats either directly or indirectly (smallholder scheme), they will gain access to an international market for CPO, as NHG exports CPO to the EU and the US, and these markets would have otherwise been closed to the local farmers.

Post-mitigation Significance: Moderate positive

Impact: Loss of or reduced access to agricultural land livelihood assets

Pre-mitigation Significance: Minor negative

Recommended Mitigation/Enhancement: In this regard, it is recommended that:

- The affected people be given priority for job opportunities.
- The affected people should be given priority for improved agricultural and/or livestock training skills.
- The affected people shall be considered for sensitization or training programme on how to access and manage micro-credit facility scheme.

The aforementioned is to ensure that the affected people have some alternative source(s) of livelihood.

Post-mitigation Significance: Minor negative

Impact: Potential conflict from issues related to labour

Pre-mitigation Significance: Moderate negative

Recommended Mitigation/Enhancement: The project will lead to disruption of the socio-economic structure and dynamics functioning in the communities of the project area.

It is recommended that:

- Natural Habitats will develop and implement a transparent recruitment, employment, purchasing of FFB, and terms of payment policy.
- Locals will need to benefit in terms of employment opportunities they are qualified for.
- Natural Habitats compensate project affected persons (PAPs) by giving them preference to income-earning opportunities over other individuals.
- The proponent should implement a training programme to build the capacity of the locals linked to target the phased replacement of expatriate staff with nationals.

Post-mitigation Significance: Minor negative

3.1.4 *ISSUES RAISED BY STAKEHOLDERS AND ASSESSOR'S COMMENTS*

Public Consultation and Scoping workshop held at Zimmi Court Barray, Jendema Road, Zimmi Town, Makpele Chiefdom, Pujehun District, on Saturday 7 November 2015 from 09:00-16:30.

Attendees

Momodu Maluway, Chiefdom Speaker of the Makpele Chiefdom, on behalf of Makpele Chiefdom and the Paramount Chief

Sadiq Sillah, Pujehun District Chairman,

Saffa Monya Tamu, Paramount Chief of Makpele Chiefdom Honourable Sidi Tunis, Member of Parliament for Constituency 91

INTERGEMS team

Peter Pijpers, Representative of NH Sierra Leone.

The biggest concern raised by Hon. Tunis Member of Parliament for Constituency 91, was that Natural Habitats would force the people for their properties, and that the lease agreement would not suit the people. He reiterated that he is not against any development for his people and he is not against Natural Habitats specifically, but he wants Natural Habitats to do what the people want as their lands are their major livelihood portfolio.

Natural Habitats confirmed and committed one more time to the following:

• Natural Habitats would not use individual or communities' lands without their willingness and agreement.

• ESIA is being undertaken in accordance with the requirements of the Environmental Protection Agency - Sierra Leone (EPA-SL) and other relevant international guidelines

• Workshop provides a platform and an opportunity for the local communities to join representatives of the NH (SL) Ltd and the ESIA Project Team, including other stakeholders, to make suggestions, ask questions, learn/understand more about the Project and its socio-economic and environmental impacts/benefits and share any views or concerns.

There is relatively clear support for the Project, though pockets of communities are still adamant to support the Project. However, there are also expectations that the Project will provide tangible benefits in the form of job provision, economic and community development. It is also expected that potential adverse impacts will be predicted and prevented or mitigated through the ESIA process and studies. Consultation with the Gola Rainforest authorities was particularly important so every effort is made to ensure compliance with local and international biodiversity conservation requirements.

Meeting and Public consultation with the Environmental Protection Agency, Sierra Leone (EPA-SL) Date: 23 November 2015

EPA representative concerns were the following:

- Is the 25 years lease only for Makpele Chiefdom?
- The MAFFS's guidelines about the percentage of land that should be taken have been fully consulted.
- Are the buffer zones limited to rivers, wetlands and streams only?
- Has the oil palm nursery been set up and what types of agro-chemicals are currently used?
- Has the Ministry of Water Resources been considered?
- Will wastewater be returned to river bodies - rivers, streams and/or lakes?
- Has NH considered the cumulative impact from other projects working in the Chiefdom and Pujehun District; for example, Kingho Mining activities.
- Are there communities within the plantation? Are they aware and in agreement with the Project?
- Has NH considered the livelihood of the communities?
- Has NH considered inland valley swamps (IVS) and upland swamps for farmers?
- Is NH directly involving the local authorities in the Project?

In response to the aforementioned concerns and questions expressed by the EPA-SL staff (PL and SK), Natural Habitats and INTERGEMS confirmed:

- The 25 years lease is for Makpele Chiefdom only but excluding the Gola Forest area. Natural Habitats explained that the original 1-km buffer zone around the Gola Forest areas has now be expanded to 4-km.
- Natural Habitats also confirmed that there are local communities within the oil palm plantation and that they are aware and in agreement with the NH Oil Palm Project.
- NH has taken into consideration the livelihood of the local communities but also expressed that the NH is concerned about whether NH can find 2.000-3.000 employees from within Makpele Chiefdom as the Chiefdom is devoid of highly educated and skilled youth.
- NH has so far taken up 20-30% of the land and that rice farming is encouraged. Consultations have revealed that rice farming, fishing and hunting are common.
- Families were asked for their consents when leases are less than 10 years. He also confirmed that NH is closely working with the Pujehun District Chairman, local authorities, Section Chiefs and Speakers, including MDAs. It was also confirmed that a Grievance Mechanism has been put in place and is well established and plays a key role in the successful implementation of the Project.
- A nursery has been set up in Manjama and another is ongoing. Natural Habitats pointed out that NH uses purely organic inputs with no agrochemicals. It was clarified that the Ministry of Water Resources have been contacted and informed and that NH will continue to reach out to all the relevant MDAs.
- It was explained that no untreated wastewater will be returned to rivers and streams. NH does not intend using water from the Mano River and Mahoi River for oil processing due to mining activities upstream of these rivers.

Table 2 List of Meetings and Consultations

Group/Organization Name	Issues Discussed	Place of Meeting	Date
Paramount Chief & Council	Introduction of Project Team, Natural Habitat, the Project; the ESIA process; history of the lease agreement; support for the project in two sections of the chiefdom; the issue of the 4km buffer zone; potential impacts of the project and benefits.	Paramount Chief's compound	14/06/2015
Section Chiefs	Introduction of Project Team, Natural Habitat, the Project; the ESIA process; support for the project in two sections of the chiefdom; Project potential benefits and recipients in Kengo & Seitua sections.	NH Compound	13/06/25015
Medical Workers	Introduction of Project Team, Natural Habitat, the Project and stage of ESIA; perceptions of the project; potential concerns for the project.	NH Compound	13/06/2015
Youth Representative	Introduction of Project Team, Natural Habitat, the Project and stage of ESIA; perceptions of the project; potential concerns and support for project.	NH Compound	13/06/2015
Market Women	Introduction of Project Team, Natural Habitat, the Project and stage of ESIA; perceptions of the project; potential concerns for the project.	NH Compound	14/06/2015
Women's Group	Introduction of Project Team, Natural Habitat, the Project and stage of ESIA; perceptions of the project; potential concerns for the project.	NH Compound	13/06/2015
Security Personnel	Introduction of Project Team, Natural Habitat, the Project and stage of ESIA; security concerns of the locality; perceptions of the project; potential security concerns for the project.	NH Compound	14/06/2015

Miner's Group Representatives	Introduction of the Project Team, Natural Habitat, the Project and stage of the ESIA; Representatives raised concerns on the lack of discussion or interaction with them on the proposed activities of NH; concerned about the future of their activities in the concession area given that they do not have an agreement with NH; requested for further meeting to iron out differences and/or areas of conflict; NH representatives confirmed they will not interfere with mining areas.	NH Compound	14/06/2015
Grievance and Development Committee	Presentation of the Project Team, the Project and stage of the ESIA; group pleaded for NH's cooperation for the smooth implementation of the project; proper wastes management plan to address wastes issues once the plantation is established and the mill becomes operational; requested for Legal aid that will guide and assist them in their mitigation efforts; advised that in the interim NH to concentrate on planting in Seitua and Kengo sections, the two sections that have already given consent for the project to go ahead while stepping up education and sensitization in Samagbe and Selimeh sections to get them to give their full compliance.	NH Compound	13/06/2015
Provincial Secretary's Representative	The office is aware of the dissention within Makpele Chiefdom over the Lease Concession of NH; Mediation of conflicts involving the Provincial Secretary's and District offices in Makpele Chiefdom to settle disputes amongst the Paramount Chiefs, section chiefs, community stakeholders and NH; emphasis on the need for better dialogue between NH and the communities, better communication and sensitization programmes to be mounted by NH for community stakeholders and the Gola Rainforest management and staff.	District Office, Bo	15/06/2015

Gola Rainforest National Park Management	Introduction of Project Team, the Project and stage of ESIA; discussed GRNP's relationship with NH; relationship with Forest edge communities; the cautionary letter sent to the Paramount Chief from the GRNP on the development of a plantation inside a 4km buffer belt.	GRNP Office, Kenema	15/06/2015
Councillors Ward 321 & 322	Introduction of Project Team, Natural Habitat, the Project and stage of ESIA; Land lease for the project; community support for the project; perceptions of the project; potential concerns for the project; Gola Forest buffer distance.	NH Compound	14/06/2015

List of legal documents, regulatory permits and property deeds related to the areas assessed

- The Environment Protection Agency (EPA) Act (Act No. 8 of 2008) established in 2008 and revised in 2010
- The National Environmental Policy 1994
- The Draft Forestry and Wildlife Sector Policy for Sierra Leone 2003
- National Lands Policy 2005
- Provinces Lands Act (Cap 122) – Leasing Land
- Forestry Act 1988
- Local Government Act 2004
- The Wildlife Act 1972
- Equator Principles (EP)
- Roundtable on Sustainable Palm Oil (RSPO)

International Policies, Guidelines, Standards, and Conventions

- The World Bank Safeguard Policies
- International Finance Corporation (IFC) Performance Standards
- Environmental, Health and Safety (EHS) Guidelines
- Equator Principles
- Roundtable on Sustainable Palm Oil (RSPO)

International Agreements and Conventions

- UN Convention on Law of the Sea (UNCLOS)
- UN Convention on Biological Diversity (UNCBD)
- Cartagena Protocol on Bio safely. To the Convention on Biological Diversity (Cartagena Protocol)
- Convention on Wetlands of International Importance (RAMSAR Convention)
- Convention on International trade in Endangered Species of Wild Fauna and Flora (CITES)

- Convention on the Conservation of migratory Species of wild Animals (CMS Convention)
- UN Convention to Combat Desertification (UNCCD)
- UN Framework Convention on Climate Change (UNFCC)
- Kyoto Protocol to the UN Convention on Climate Change (Kyoto Protocol)
- Bamako Convention on the ban of the Import into Africa and the Control of Trans-Boundary Movement and Management of Hazardous Wastes within Africa. (BAMAKO Convention)
- Convention for Cooperation of the Protection of the Marine and Coastal Environment of West and Central Africa region. (ABIDJAN Convention)
- Basel Convention on the Control of Trans-Boundary Movements of Hazardous wastes. (BASEL Convention)
- Convention on the Prior Informed Consent procedure for Certain Hazardous Chemicals and Pesticides in International trade. (Rotterdam (PIC) Convention.)
- Convention on Persistent Organic Pollutants. (Stockholm (POPs) Convention)
- Convention on the Protection of the Stratospheric Ozone Layer. (Vienna Convention)
- Montreal protocol on Substances that Deplete the Ozone Layer
- (MONTREAL Convention)
- Convention on the Protection of Cultural and Natural Heritage (World Heritage Convention)

3.2 HIGH CONSERVATION VALUE ASSESSMENT
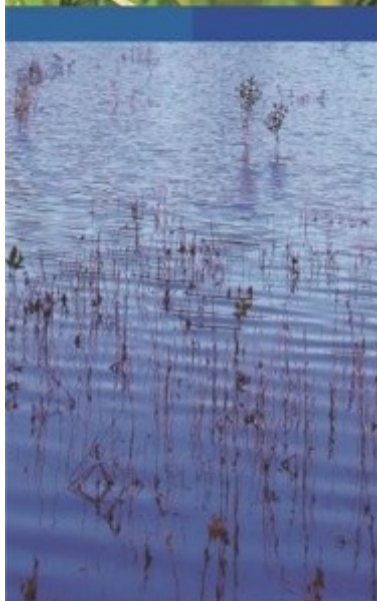
DIGBY WELLS
ENVIRONMENTAL

Natural Habitats (SL) Oil Palm Concession
HCV Assessment: Public Summary Report

Date: 7th April 2016

Table 3 HCV Assessment Details

HCV Assessment Details	
Date of Report:	7th April 2016
Lead Assessor:	Philip Patton
Licence Type:	Provisional registration: ALS15041PP
Contact No.:	Tel: (011) 789 9495
Location of Assessment:	Zimmi Town, Makpele Chiefdom, Sierra Leone
Organisation commissioning HCV Assessment	Natural Habitats Organic Products Grown in a Sustainable Habitat Heemraadssingel 188, 3021 DM, Rotterdam | The Netherlands M: +31-6-30 632 967| E: janhein@natural-habitats.com
Size of Assessment Area:	41.218ha
Total Area Designated as HCVMA	25.293,13ha
Current Land Use of Assessment Area:	Subsistence farming and oil palm. Planned oil palm plantation for Natural Habitats intended for RSPO certification.
Certification Scheme:	RSPO NPP certification.
Tier Rating	Tier 1 A total of 25.293,13ha of HCV area was identified on site, including HCV1-6. It is recommended that 15925,32ha of shrubland (not HCV) remains as plantable area. The site is located adjacent to a protected area, namely the Gola Rainforest National Park and human settlements are present on site. Due to these factors, a peer review was conducted.

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3.2.2.3   Avifauna

3.2.2.4   Mammals

3.2.2.5   Aquatic Ecology Assessment

3.2.2.6   Stakeholder Engagement

3.2.3   Findings

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3.2.4   HCV Outcomes

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3.2.4.2   HCV 2: Landscape-level Ecosystems and Mosaics

3.2.4.3   HCV 3: Ecosystem and Habitats

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3.2.1 INTRODUCTION

Natural Habitats (SL) Ltd (hereafter Natural Habitats) has commissioned Digby Wells Environmental (hereafter Digby Wells) to conduct a High Conservation Value (HCV) assessment for the proposed concession area for an Oil Palm Project in the Makpele Chiefdom, Sierra Leone.

Natural Habitats is a sustainable producer of organic and fairly traded palm oil; who work with small farm holders in Ecuador and Sierra Leone. The contact person for Natural Habitats is the Country Manager at Natural Habitats Sierra Leone Ltd., Peter Pijpers: peter@natural-habitats.com. Natural Habitats intend to apply for certification with the Roundtable of Sustainable Palm Oil (RSPO) New Planting Procedure (NPP).

The field investigations for the HCV assessment took place from the 19th to the 23rd of November 2015, following a screening assessment on the 19th to the 21st of October 2015. Additional information was obtained from the Environmental and Social Impacts Assessment (ESIA), compiled by Integems (2016).

The following reference documents were used to identify HCV areas:

- Brown, E., N. Dudley, A. Lindhe, D.R. Muhtaman, C. Stewart, and T. Synnott (eds.). 2013 (October). Common guidance for the identification of High Conservation Values. HCV Resource Network.

- HCV Resource Network 2015. Accessed at https://www.hcvnetwork.org/about-hcvf/resources/folder.2006-09-29.6584228415.

- ZSL, 2011. A Practical Handbook for Conserving High Conservation Value (HCV) Species and Habitats within Oil Palm Landscapes in West and Central Africa.

3.2.1.1 DESCRIPTION OF ASSESSMENT AREA

Natural Habitats has acquired a land lease concession for 99 years (the land lease is 50 years with an option to extend for 21 years + 21 years + 7 years) in the Makpele Chiefdom, with an aim to develop an organic oil palm plantation. The land lease covers about 30.700 hectares and is within the Makpele chiefdom (41.218ha). The HCS assessment has been done covering the entire Makpele chiefdom as this is considered to be important, due to the proximity to the Gola Rainforest National Park. Due to the large undertaking required for the full development of the Project, Natural Habitats requires the following:

- Nursery development - seedlings are prepared for field planting and the nursery and related infrastructure are established;

- Plantation development; and

- Palm oil mill (POM) installation and operation.

The concession area is located on the border of the Gola Rainforest National Park (GRNP), south-east. A buffer of 4km has been placed around this area, which is referred to as the leakage belt. The dominant landuse in the area is subsistence agriculture, which is the basis for the livelihoods of the majority of forest edge communities (Bulte et al. 2013). The regional and local setting are presented in Figure 3 and Figure 4

respectively.

Agriculture is a common occupation within the project area, as was revealed by the farmers during the ESIA studies. Further to this, livestock are reared within the project area and fishing is mainly carried out in the rivers adjacent to settlements. Artisanal mining is not common but diamond mining does take place on the banks of the rivers Mahoi and Mano. Unlicensed logging currently takes place within forested areas of the concession.
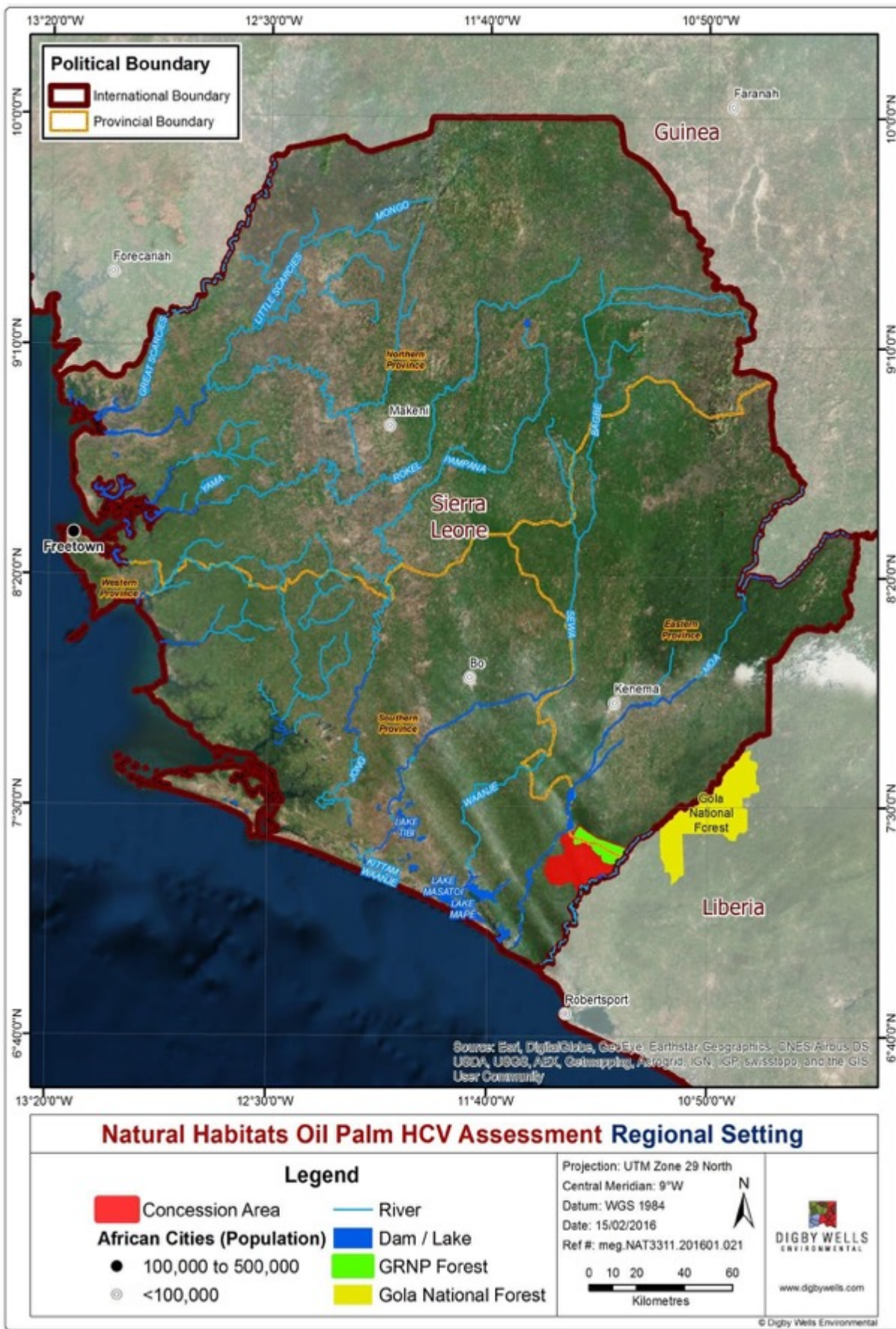
Figure 3 Regional Locality
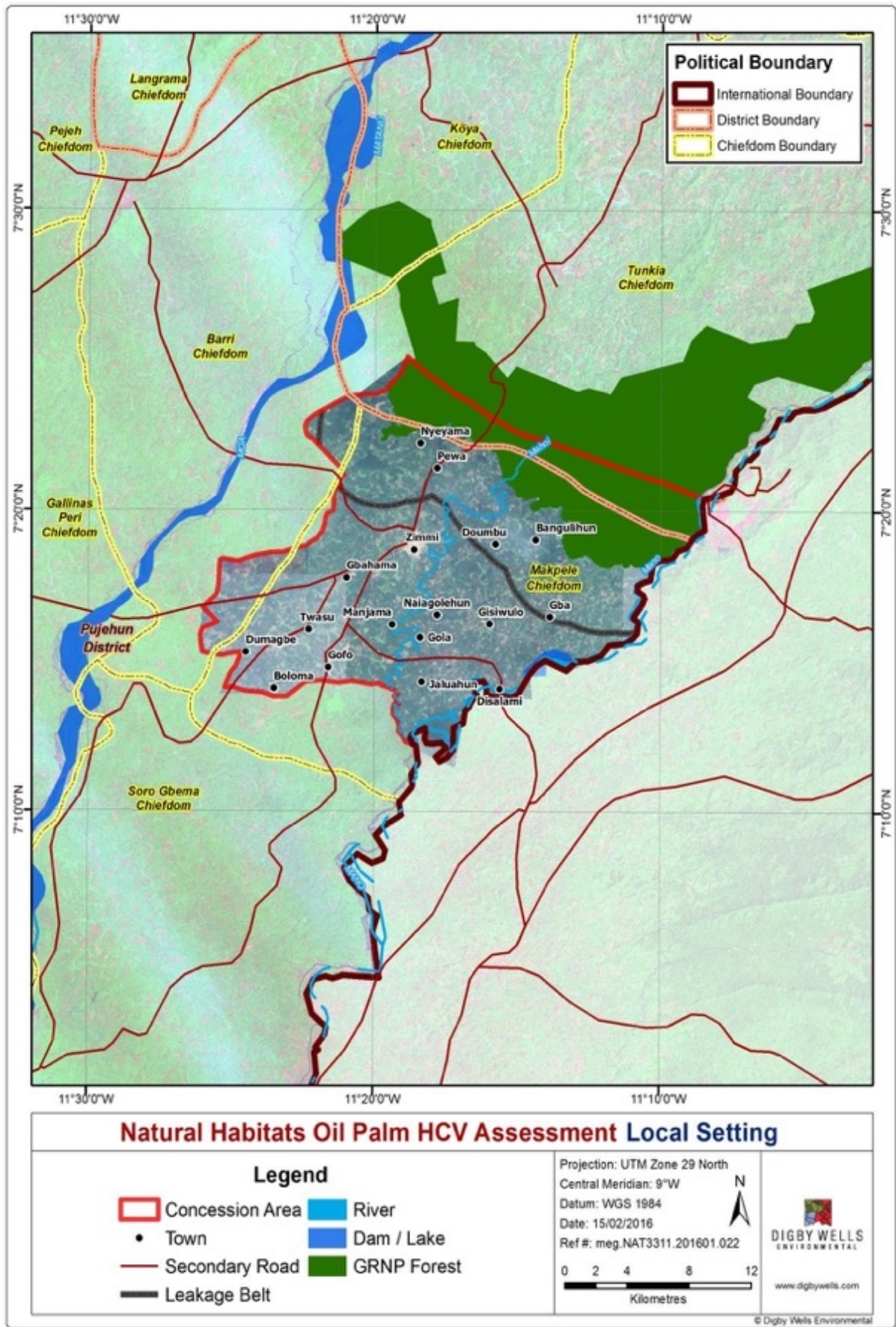
Figure 4 Local Setting

3.2.1.2 ASSESSMENT TEAM

The project team involved in the fieldwork and compilation of this report are listed their relevant qualifications and experience. The members involved in the Social Impact Assessment (ESIA) are listed in Table 1.

Table 4 HCV Project Team

Name	Role	Expertise	Bio
Philip Patton	Terrestrial Fauna and Lead Assessor	Ecologist and Ornithologist	Phil Patton is the Manager of the Biophysical Department at Digby Wells and is an accredited HCV Assessor (ALS15041PP). He holds a BSc Hons (Environmental Science) from the University of Cape Town, and a BSc (Geology and Geography & Environmental Management) from the University of Port Elizabeth. He is an experienced ornithologist, and has been registered as a Professional Natural Scientist since 2012. Phil has over 17 years of consulting experience in ecological assessments and environmental auditing. He has ecological and environmental working experience across Africa, Europe and the Middle East and is a registered professional natural
Russell Tate	Aquatic Ecology	Aquatic Ecologist	Russell Tate holds a Master's degree in aquatic health from the University of Johannesburg (South Africa). Russell has completed aquatic ecological assessments in several African countries including: Botswana, Democratic Republic of Congo (DRC), Mali, Senegal, Ivory Coast, South Africa, and Mozambique with focused tropical assessments in Cameroon, Liberia and Ghana and is a registered professional natural scientist in South Africa (400089/15.)
Crystal Rowe	Vegetation and Wetland Ecology	Flora and Wetland Ecologist	Crystal Rowe specialises in flora and wetland ecology. She achieved a BSc in Botany and Geology and a BSc Hons in Botany at Nelson Mandela Metropolitan University (NMMU). Key experience includes ecological impact assessments, baseline vegetation assessments, estuarine ecological state assessments and wetland health assessments. Project experience includes various countries such as: the DRC, Ethiopia, the Ivory Coast, Mali, Mozambique, Sierra Leone and extensively within South Africa. Crystal is competent in plant identification and is experienced in IFC compliant assessments. She is also certified to complete wetland Ecosystem Services and is a registered professional natural scientist in South

Table 5 ESIA Team

Name	Role
Julius Mattai	Principal Consultant

Professor A.M. Alghadi	Associate Principal Consultant
Josephine Scott-Manga	Senior Consultant
Edward Aruna	Associate Senior Consultant
Alpha Mansaray	Senior Consultant
Jusufu Moiwa	Consultant
Ibrahim S. Kamara	Consultant
Sylvester Tucker	Consultant

3.2.2 METHODS

A number of specialist assessments were conducted and used to complete this HCV assessment:

- Flora and Fauna;
- Aquatic Ecology and;
- Ecosystem Services.

In addition, information from the ESIA (Integems, 2016) was used for the social component of the HCV assessment (refer to Table 6) for activities timeline.

Table 6 Major Events in Assessment Chronology

	2015			2016		
Activity	Oct	Nov	Dec	Jan	Feb	Mar
Desktop Assessment	■					
Field investigations for biodiversity and ecosystem services		■				
Field investigations for ESIA including stakeholder engagement		■	■			
Compilation of HCV report				■	■	
Peer review					■	
Submission to HCVRN						■

3.2.2.1 VEGETATION SURVEY AND ECOSYSTEM SERVICES

Owing to the brevity of the site visit, target areas were identified during a screening survey in October 2015 and from aerial imagery prior to the site visit for representative sampling. The focus areas were chosen based on the presence of intact habitat and the propensity to harbour species diversity and included the following:

- The GRNP area adjacent to the concession area;
- Areas of fragmented natural forest in the concession area;
- Riparian zones and wetlands.

For the actual sample technique, a modified Rapid Botanical Survey (RBS) technique was employed. RBS is usually used to study plant communities and describe vegetation (Hawthorne, 2012) and allows for the elucidation of several aspects of vegetation including:

- Plant distribution, including that of Species of Special Concern (SSC) and invasive species;
- Trends in vegetation distribution including variation following on from environmental variables; and
- Conservation priority of vegetation.

Random plots were taken throughout the focus areas to record species encountered, vegetation composition, species dominance and the presence of alien plant species. The purpose of the vegetation assessment was to ascertain the presence of HCV triggers from a vegetation and flora perspective.

The following literature was used to identify plants:

- Botanical training and investigation of a botanical survey in Gola for Gola Forest Project/RSPB (Hawthorne, 2011);
- Trees of Sierra Leone (Saville and Fox, 1967);
- Woody plants of Western African forests: A guide to the forest trees, shrubs and lianes from Senegal to Ghana (Hawthorne and Jongkind, 2006);

3.2.2.2 FAUNAL SURVEY

Desktop studies and a site assessment were undertaken for mammals and birds, herpetofauna information was provided by survey results from the ESIA (Integems, 2016).

Species encountered were identified, recorded, and listed. Faunal species encountered by local people on site have also been noted, and photographs have been used where possible. In order to undertake the HCV assessment for fauna, a number of steps were undertaken during the desktop survey for the Makpele Chiefdom:

- Analysis of aerial photography with regards to habitat types with an emphasis on riverine systems, swamp areas and intact forested areas;
- Review of as many GRNP related reports and studies undertaken close to the study area as possible; and
- Species lists were obtained using the following resources:

  - World Wildlife Fund (WWF), the IUCN, Gola Red Project and African Bird Club online species distribution maps were used to obtain data for the distribution of mammals and birds within the

greater study area;

- The potential occurrence of mammals was supplemented by the species distribution maps in the IUCN and the Field Guide to African Mammals, Jonathan Kingdom (2007); and

- Lists of birds found in the study area were determined by an experienced Ornithologist and confirmed using a number of field guide publications including Birds of Western Africa (Demey and Barrow, 2006), Birds of Western and Central Africa (Van Perlo, 2002), and Birds of Africa South of the Sahara (Sinclair and Ryan, 2012).

3.2.2.3   AVIFAUNA

The principle ornithological field survey technique is transect surveys. For the site assessment, transect surveys were planned based on the different types of avifauna habitat, such as closed forest (thick canopy and gallery forest), open secondary forest, riverine habitat, swamps and farmed areas including villages. Transect procedures involve slow attentive walks along specific transect areas during which any bird seen or heard is identified and recorded. Point sampling was also conducted for a period of one hour at several localities throughout the site when opportunities arose including the boundary area of the GRNP and specific points along the Mahoi and Mano rivers. Bird species observed during the vegetation transect surveys were also recorded.

The following were recorded:

- All birds encountered or noted during the survey;
- A list of all species previously recorded in the area including those found in the GRNP; and
- A list of rare and endangered species that were encountered.

3.2.2.4   MAMMALS

Sightings and ecological indicators were used to identify the mammal inhabitants of the study area; this included scats, tracks and habitat such as burrows and dens. Where found, scats were collected and photographed (with a scale) to assist identification if necessary. Any tracks observed were used to identify species and density. Field guides were used to confirm identification. The following were recorded:

- All mammals encountered, noted, or captured during the survey;
- Animals listed in previous studies;
- Discussions with local villagers and hunters to confirm certain species;
- A list of the most prominent mammal species; and
- A list of threatened or protected species encountered during the survey.

3.2.2.5   AQUATIC ECOLOGY ASSESSMENT

A single survey was completed for this study. Water quality was measured using a calibrated Extech DO 700 multimeters. *In situ* constituents considered in this study included temperature (ºC), pH, dissolved oxygen

(mg/l) and conductivity (μS/cm).

The availability and diversity of habitat is important to consider in assessments due to the reliance and adaptations of aquatic biota to specific habitats (Barbour *et al.* 1996). Habitat quality and availability assessments are usually conducted alongside biological assessments that utilise fish and macroinvertebrates. Aquatic habitat was assessed through observations on each river system considered. The methods used for the assessment are set out by Bain and Stevenson (1990), Vannote *et al.* (1980), and Gerber and Gabriel (2002). The assessment and description of the habitat in this study has been used to ascertain the potential presence of HCV/Rare, Threatened and Endangered (RTE) taxa. Furthermore, in order to determine the conservation value of the considered river systems, an assessment for the potential of "natural conditions" was completed (Brown et al. 2013).

3.2.2.6   STAKEHOLDER ENGAGEMENT

A social assessment was conducted as part of the Environmental Social Impact Assessment (ESIA) conducted by Integems (2016) and included the collection of data and information from focus group discussions with selected communities/groups and Natural Habitats staff. A scoping (stakeholder consultation) workshop was held on the 7th of November 2015 in Zimmi Town, Makpele Chiefdom; to engage and consult the local communities and other key stakeholders to determine social impacts of the proposed development. The workshop also assisted in identifying key issues of relevance to ensure that these are assessed at a level of detail appropriate to the scale of the project. Natural Habitats have mapped the locations of cultivated fields, sacred sites, and settlements to supplement the findings of the ESIA.

3.2.3   FINDINGS

3.2.3.1   NATIONAL, REGIONAL AND LANDSCAPE CONTEXT

On a global and regional scale, the Natural Habitats area of influence is situated in a biodiversity hotspot (Myers, 2000), namely, the Upper Guinean Rainforest; which places conservation significance of the site from an international perspective (**¡Error! No se encuentra el origen de la referencia.**). Further to this, the concession falls within a global ecoregion according to the WWF, namely the: Tropical and Subtropical Moist Broadleaf Forests (Figure 5) which highlights the ecological sensitivity of the site for large vertebrates, water resources and forest flora. The site also falls within the Gola Forest Reserve IBA (Figure 6) which places conservation significance on the site from an avifaunal perspective.

On a national scale, the GRNP serves as a critical biodiversity resource for Sierra Leone, conserving numerous endemic and Red Data species and supporting exceptional biodiversity. The GRNP has also been identified as a Key Biodiversity Area (KBA) by the IUCN (Kouame *et al.* 2012). On a local scale, the forest and associated habitat provides immeasurable ecosystem services to the local communities on the forest edge that are dependent on the forest for basic needs.

The concession is considered as part of the wider landscape as per HCV requirements (Brown *et al.,* 2013). As such, protected areas, regional biogeography, and other aspects have been taken into account. The area of

influence of the project is that area that may be affected by the project, including activities such the development of roads, displacement of resource use by local communities, or areas affected by hydrology. The area of influence was deemed to be the concession area, as well as the immediate area surrounding it; to include the southern boundary of the GRNP and the leakage belt. The so-called leakage belt is referred to as the buffer area stretching over 4km around each block of the GRNP and includes forested and non-forested areas (excluding the eastern border which is traversed by the Sierra Leone-Liberian border. Where natural forest has been cleared in the leakage belt, the land use is usually intercrop subsistence farming of rice and vegetables for 1-2 years before being left unplanted for an average of seven years (RSPB, 2013).
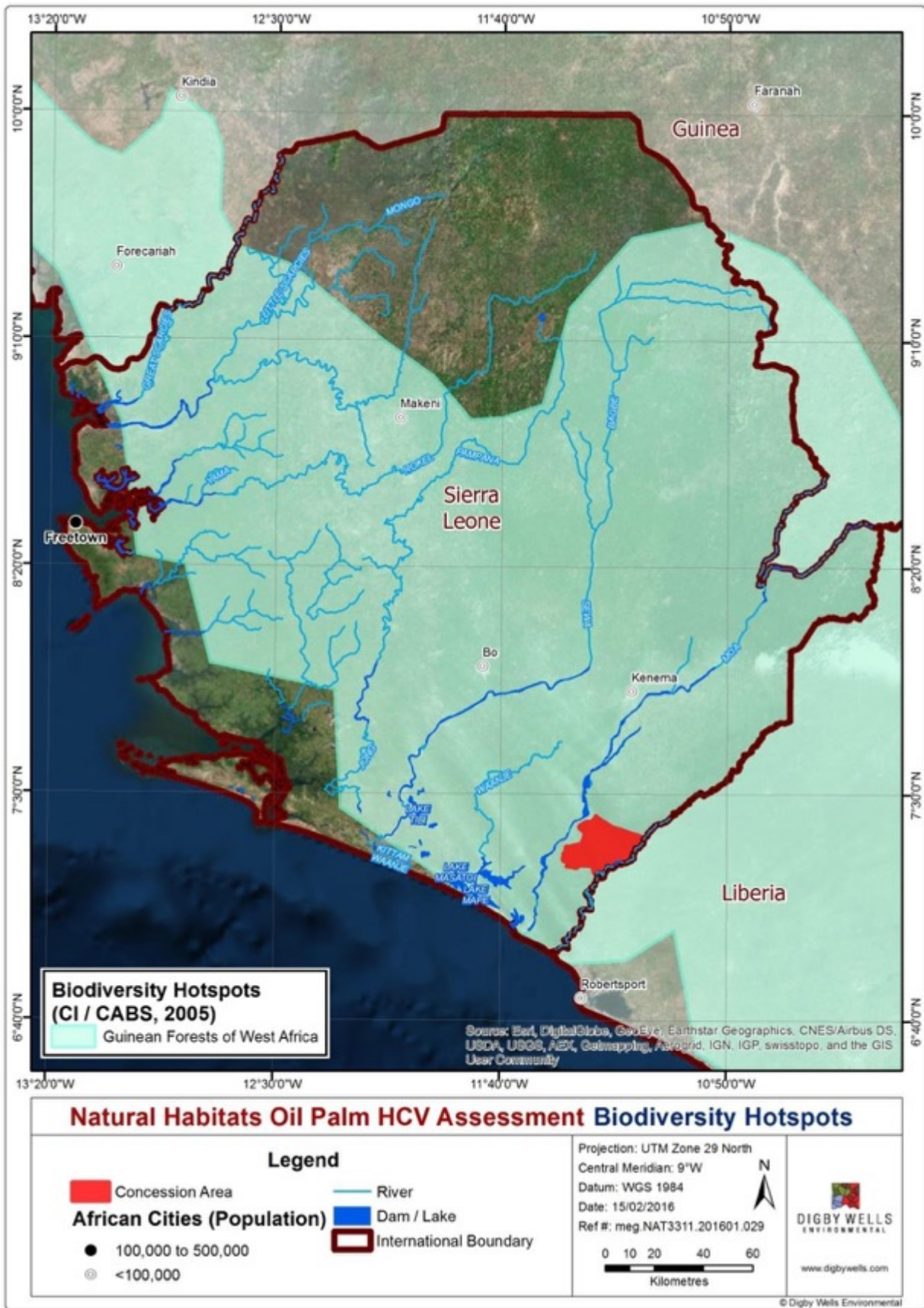
Figure 5 Biodiversity Hotspots in Relation to the Natural Habitats Concession
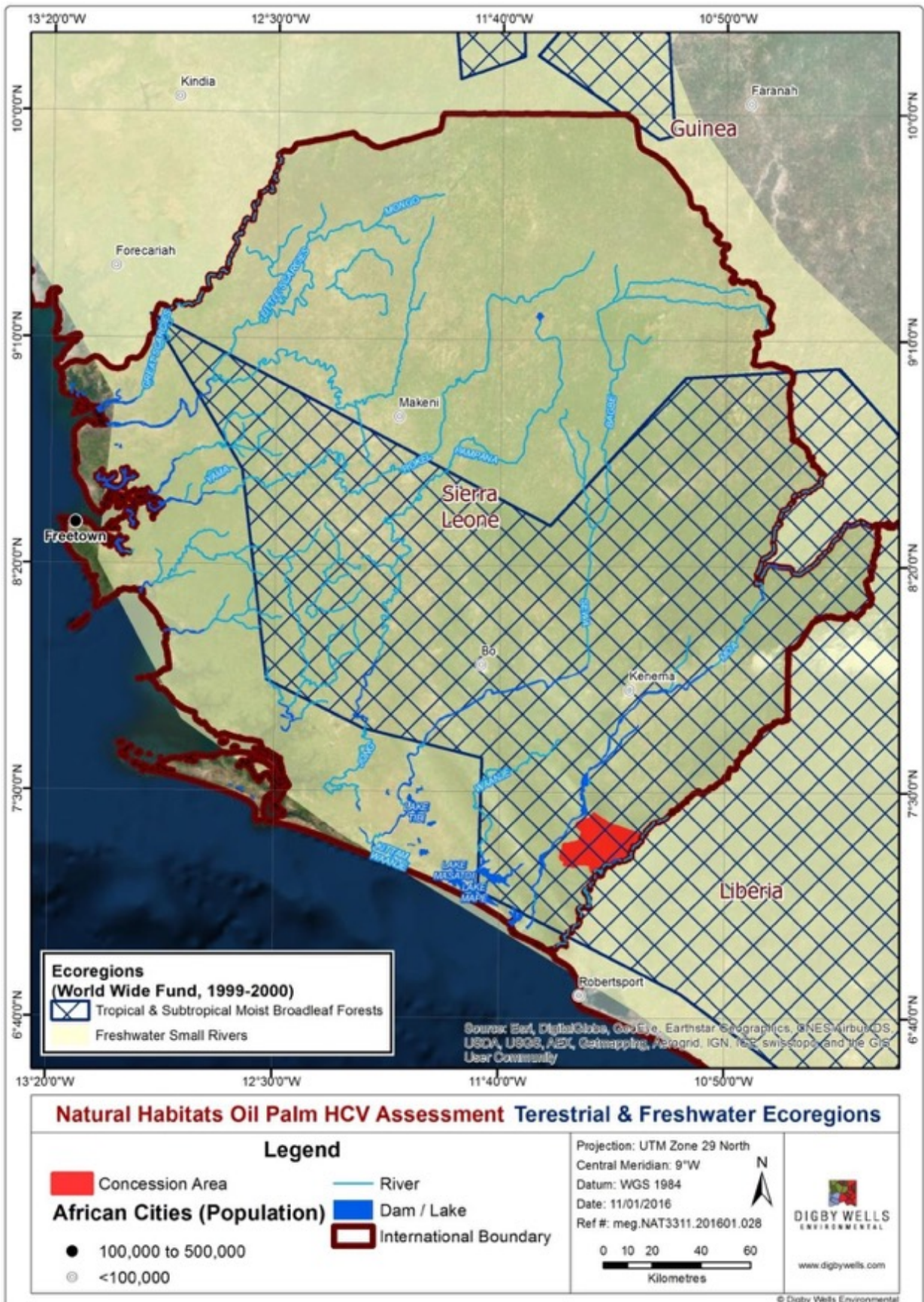
Figure 6 Ecoregions in Relation to the Natural Habitats Concession Area
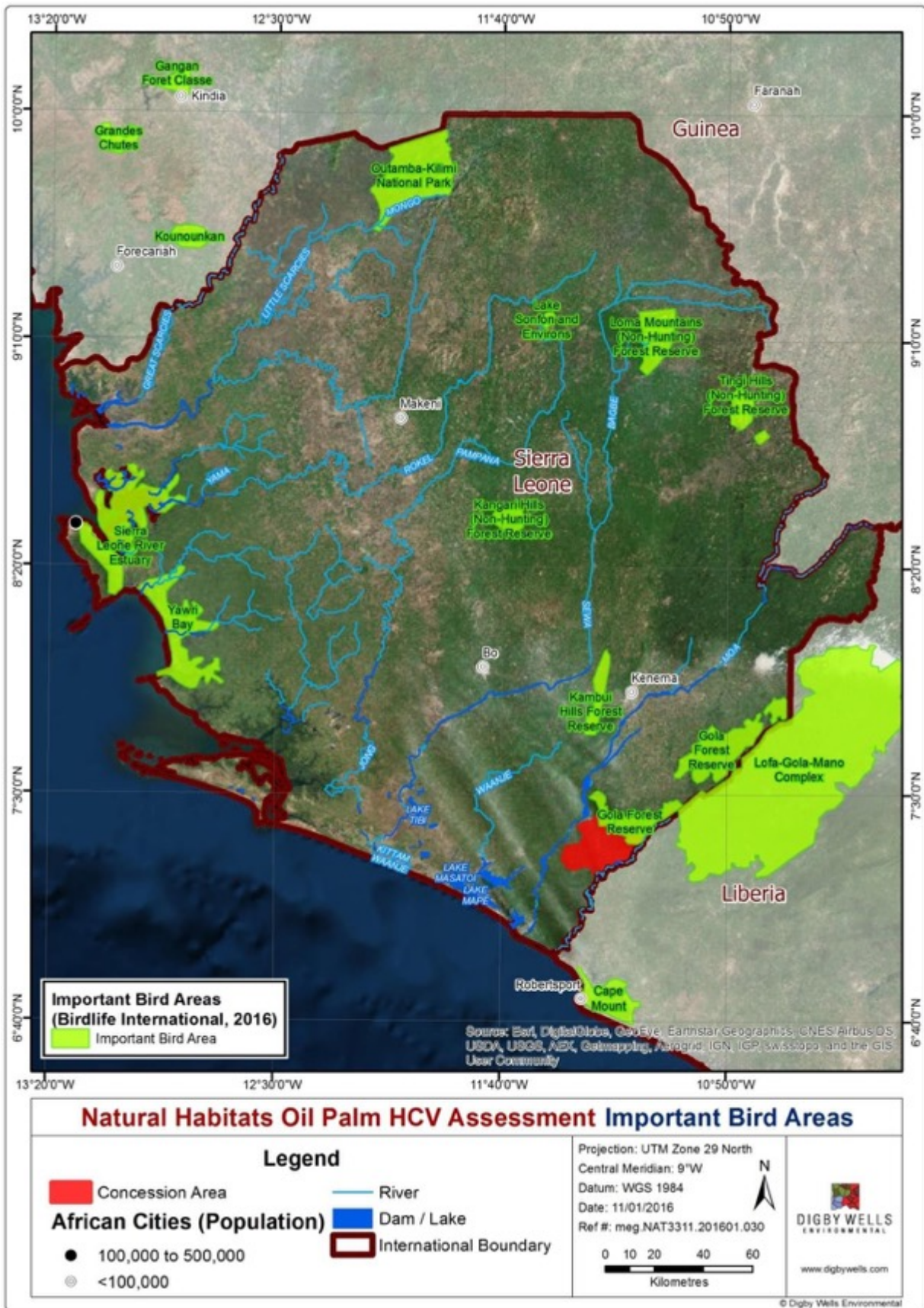
Figure 7 Important Bird Areas

3.2.4 HCV OUTCOMES

All six of the HCV criteria were triggered within the concession area, largely associated with the riparian forests linked to the GRNP, remnant forests and the wetlands associated with the Mano and Mahoi Rivers. A total of 25.293,13 of HCV area (without overlap) was mapped, representing 61% of the concession area, including buffers and the leakage belt. Table 7 lists HCV areas recorded on site and **¡Error! No se encuentra el origen de la referencia.** shows the distribution of these areas.

Table 7 HCV Areas in the Natural Habitats Concession Area

HCV class	Area (ha)	Habitats
HCV1	15213,55	GRNP, wetlands and rivers, natural forest remnants, riparian forest
HCV2	4003,81	GRNP, wetlands and rivers, natural forest remnants
HCV3	$23267,16^{1}$ $10941,84^{2}$	GRNP and leakage belt, wetlands, rivers and buffers.
HCV4	13527,31	GRNP, wetlands and rivers, riparian forest
HCV5	15273,16	GRNP, wetlands and rivers, forest remnants, riparian forest, cultivated areas
HCV6	305,93	Gravesites within the concession
Total HCV Area	**25293,13**	**All HCVs, leakage belt and buffers**
Total Plantable Area	**15 925,32 (39%)***	**Remaining area**

Key: [1] denotes total HCV 3 area in concession; [2] denotes HCV3 area outside of the leakage belt * Area excludes existing roads
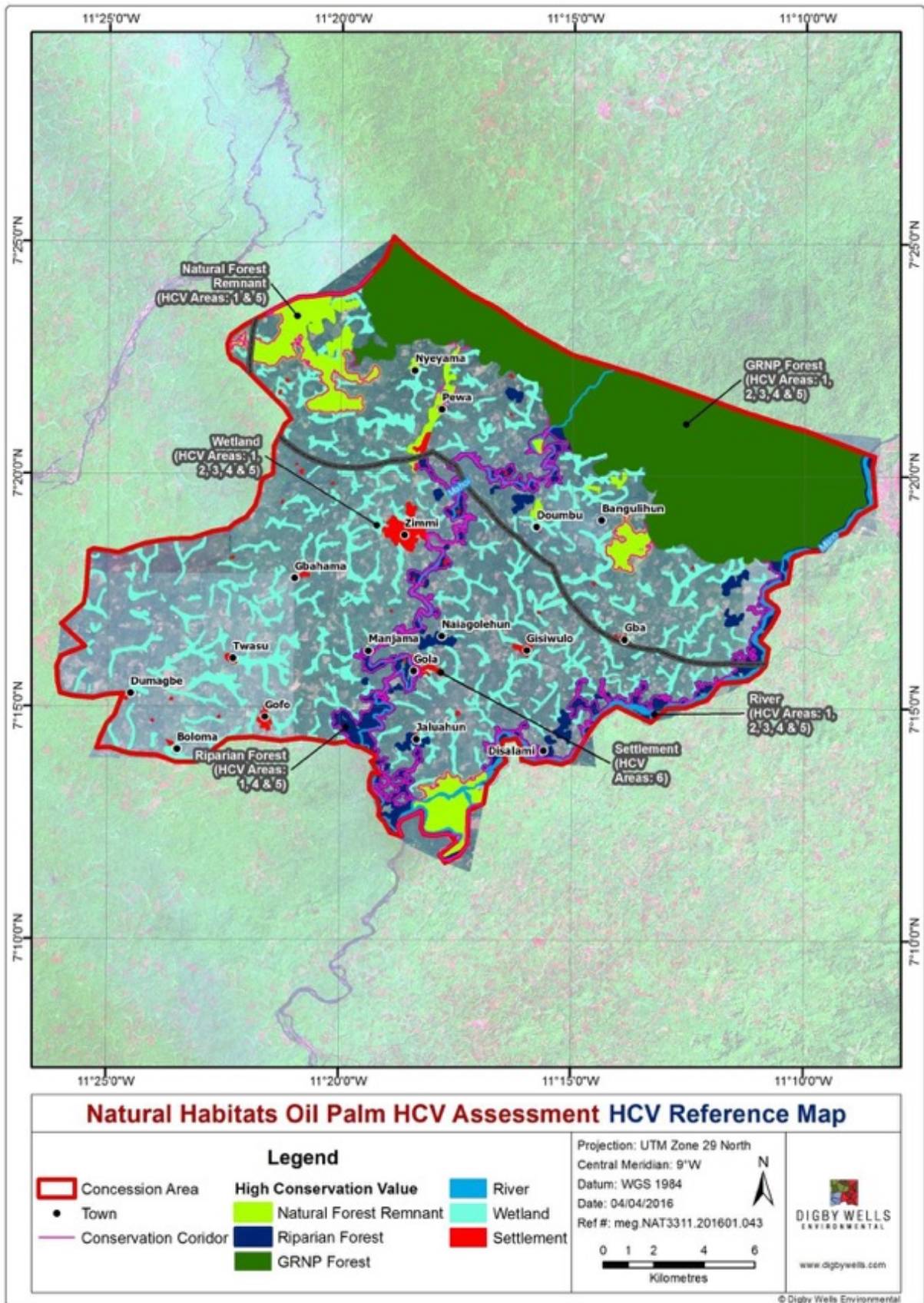
Figure 8 HCV Reference Map

3.2.4.1 HCV 1: SPECIES DIVERSITY

Forested areas associated with the site, including remnant forest patches, riparian forest along the rivers and the GRNP showed exceptional plant diversity. Six species of Red Data status were recorded during the field visits for the ESIA (Integems, 2016) and include the following: *Afzelia africana, Copaifera salikunda, Fleroya stipulosa, Lophira alata, Nauclea diderrichii* and *Terminalia ivorensis*; all of which are Vulnerable.

Examples of observed mammal species include the endangered Western Chimpanzee (*Pan troglodytes verus*) that was located in a patch remnant forest near Kana village. An estimated population of 300 Western chimpanzees exist in the GRNP (The Gola Project 2012), it is uncertain whether the family that is located within the leakage belt has been previously surveyed by the GRNP due to the location being outside the park. Red Data mammals recorded are listed in Table 8.

The project area, including the Makpele Chiefdom and the southern portion of the GRNP, is located close to an International IBA (Fishpool & Evans 2001) and holds a high number of the threatened and endemic species of the region. Many of these species are also present in the fragmented forests and riparian zones of the proposed project area. Recent bird surveys (Klop et al 2010, Demey 2011) recorded 294 species in the GRNP bringing the total to 327, which is amongst the highest of the Upper Guinean Forests. 132 species of birds were found within the Makpele Chiefdom area (including the southern boundary of the GRNP), of which 6 species are Afro-Palearctic migrants. Red Data birds are listed in

Table 9.

The fish fauna of the Upper Guinea freshwater ecoregion is diverse and endemic with about 28% of the 160 fish species that are endemic. The endemic taxa are dominated by small bodied fish adapted to swift currents and clear waters such as those belonging to family Rivulidae (Brown et al. 2015). A diverse and large percentage of the fish community is regionally endemic (40%) and 2 species (4%) of locally endemic species were captured on the concession. Red Data and endemic fish species are listed in Table 10. HCV 1 areas are represented in Figure 9.

Table 8 Mammal Red Data Species

Species Name	Threat Status	Threat Status	Habitat
Western Chimpanzee	*Pan troglodytes*	Endangered	GRNP, forest remnant
Olive Colobus	*Procolobus verus*	Near threatened	GRNP
Western Pied Colobus	*Colobus polykomos*	Near threatened	GRNP leakage belt
Sooty Mangabey	*Cercocebus atys*	Near threatened	Concession
Diana Monkey	*Cercopithecus Diana*	Endangered	GRNP, forest remnant
African Straw-coloured Fruit-bat	*Eidolon helvum*	Near threatened	Mano River

Table 9 Avifaunal Red Data Species

Common Name	Species Name	Threat Status	Habitat
Hooded Vulture	*Necrosyrtes monachus*	Critically Endangered	Zimmi town
Red-fronted Antpecker	*Parmoptila rubrifrons*	Near Threatened	GRNP/Leakage belt
Yellow-casqued Hornbill	*Ceratogymna elata*	Vulnerable	Forest Remnant
Timneh Grey Parrot	*Psittacus timneh*	Vulnerable	Forest Remnant

Table 10 Fish Red Data Species

| Species Name	Threat Status	Habitat
Doumea chappuisi	Vulnerable	Mahoi and Mano rivers and all wetlands and watercourses in the concession area
Kribia cf. leonensis	Endangered	Mahoi and Mano rivers and all wetlands and watercourses in the concession area
Epiplatys fasciolatus zimiensis	Endangered	Mahoi and Mano rivers and all wetlands and watercourses in the concession area
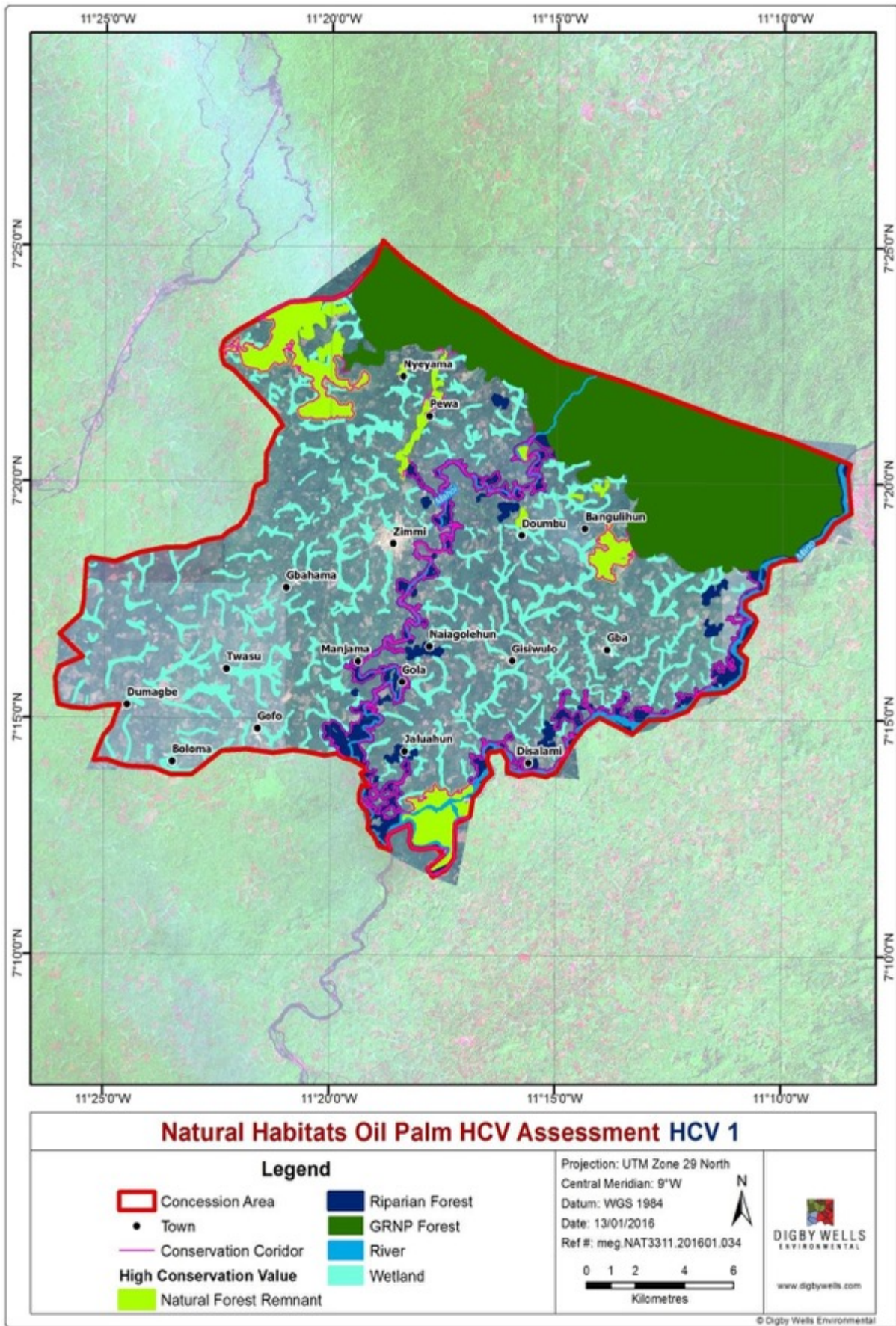
Figure 9 HCV 1 Areas

3.2.4.2   HCV 2: LANDSCAPE-LEVEL ECOSYSTEMS AND MOSAICS

All unmodified rivers and wetlands on site have triggered HCV 2 due to the absence of invasive taxa and the unmodified thermal, flow, nutrient, sediment and thermal regimes. These rivers were also found to be critical dispersal routes for fish and contained rare, threatened or endangered species.

3.2.4.3   HCV 3: ECOSYSTEMS AND HABITATS

Since the GRNP has been identified as an international biodiversity hotspot (Myers, 2000), the forest has been assigned HCV3 status (RSPB, 2015). Further to this, the GRNP has been listed as an IBA. Only 4% of the country's landmass is protected and intact forest landscapes are poorly represented. Remnant forests were assigned HCV 3.

3.2.4.4   HCV 4: ECOSYSTEM SERVICES

Wetlands naturally allow for slow infiltration and removal of suspended solids by filtering pollutants (Kotze, 2000) and high capacity to purify water through various chemical and biological processes and this is a critical ecosystem service. Wetland swamps are a dominant feature of the landscape associated with the Natural Habitats concession area and have been identified as HCV 4. In addition, the Mahoi and Mano Rivers, as well as the GRNP have been identified as HCV 4.

3.2.4.5   HCV 5: COMMUNITY NEEDS

Based on the information available from the social baseline study (Integems, 2016) and the other desktop data available for the area, HCV 5 is present within the area of influence. This is based primarily on the following key findings:

- The reliance of the local people on the natural water sources;
- The reliance of the local people on timber forest products for income (logging, building materials and the sale of firewood) as well as for subsistence use (building materials, firewood); and
- Reliance of local people on non-timber forest products (NTFP) for food and medicines.

Farming is prevalent in the concession area for both subsistence and commercial purposes (Integems, 2016). As much as 77% of households in the project area manage subsistence farms as a major source for their food security and livelihood. One of the major crops species harvested is oil palm and the majority of households have plantations covering an area of under 3 ha.

3.2.4.6   HCV 6: CULTURAL VALUES

The GRNP is a UNESCO world heritage site, which assigns global significance to the area. From a local significance perspective, gravesites, and sacred areas, which are of cultural value and should be avoided during development, cover an area of 305,93ha.

3.2.4.7   STAKEHOLDER ENGAGEMENT

Stakeholders consulted during the HCV and ESIA process are listed in Annex 1. The details of the concerns and recommendations of each member are presented in the ESIA report (Integems, 2016). Major concerns included:

- Employment for local community members;
- Details of the project commencement should be properly communicated with each community;
- Members of the leakage belt communities should be considered;
- The GRNP expressed interest in a mutual cooperation between the GRNP and Natural Habitats for management of HCVs and monitoring.

3.2.4.8   HCV MANAGEMENT AND MONITORING: SEE SECTION 5

3.2.4.9   REFERENCES: SEE SECTION 7

3.3   SOILS AND TOPOGRAPGHY

The Project area is located south of the Gori hills in the granite greenstone terrain, which comprises a basement of granites overlain by supra-crustal greenstone belt. These rocks form the bulk of the granite greenstone terrain of central to eastern Sierra Leone. The relief of Pujehun District can be divided into three zones: intermediate foothills zone, interior plains and the coastal swamps and beach bar region. The Project area generally falls within the dissected plains of extremely low relief with isolated small hills and common terraces, which merge, gently into inland valley swamps. Most of the land in Makpele Chiefdom is flat and below 2° in slope.

The two major soil types are the uplands and an undifferentiated hydromorphic soil in the valley swamps in the lowlands. Soils in the valley swamps are generally deep, poorly drained to waterlogged, dark grey sandy loam to clay loam topsoil over light brownish grey variable texture in the subsoils. The soils in both the uplands and the valley swamps are generally strongly acidic with low to moderate fertility.

The following map shows the elevations of the chiefdom.

ELEVATION MAP OF MAKPELE
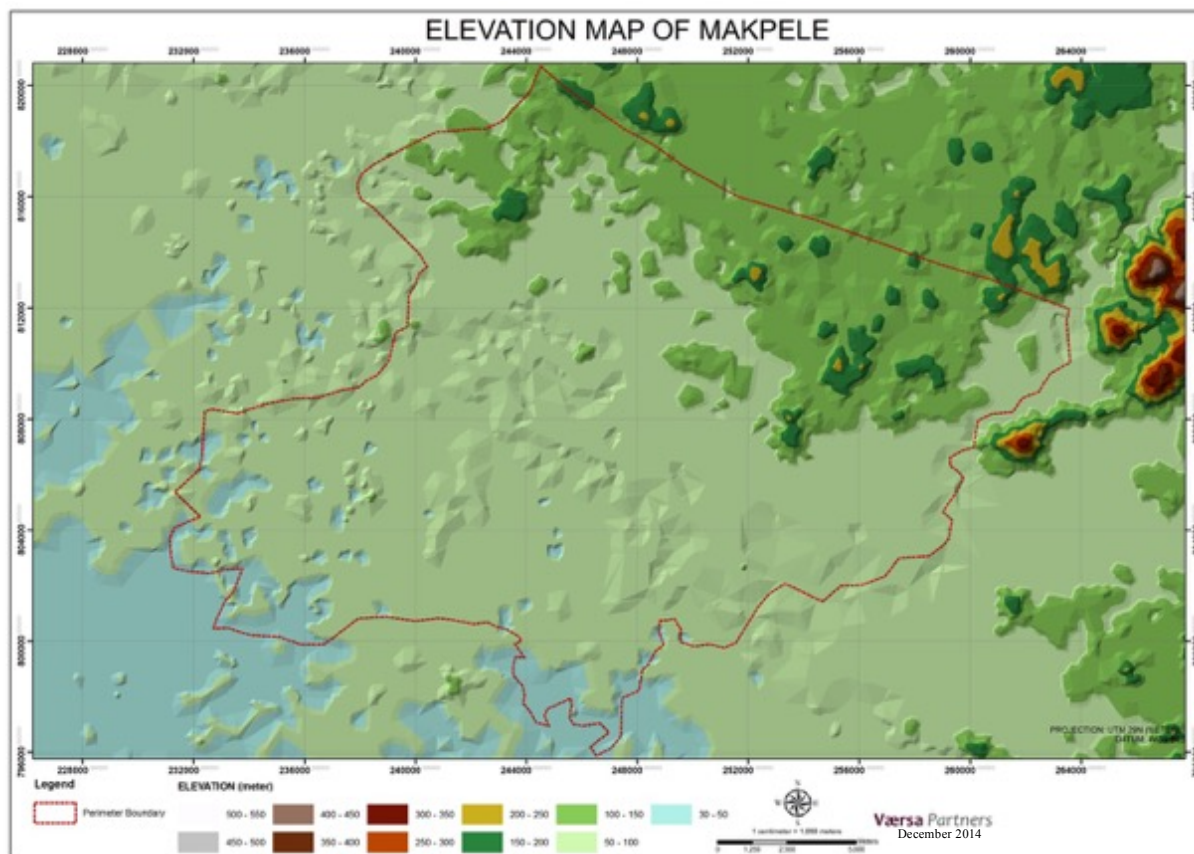
Figure 10 Elevation map for Makpele Chiefdom (Produced by Vaersa Partners)

3.3.1 IDENTIFICATION OF ALL AREAS OF MARGINAL, FRAGILE SOILS AND EXCESSIVE GRADIENTS

Wetlands and riparian buffer zones in the concession are identified in the map below. These areas are excluded from our development and will have additional buffer zones (wetlands 30m; and riparian forests 100m).
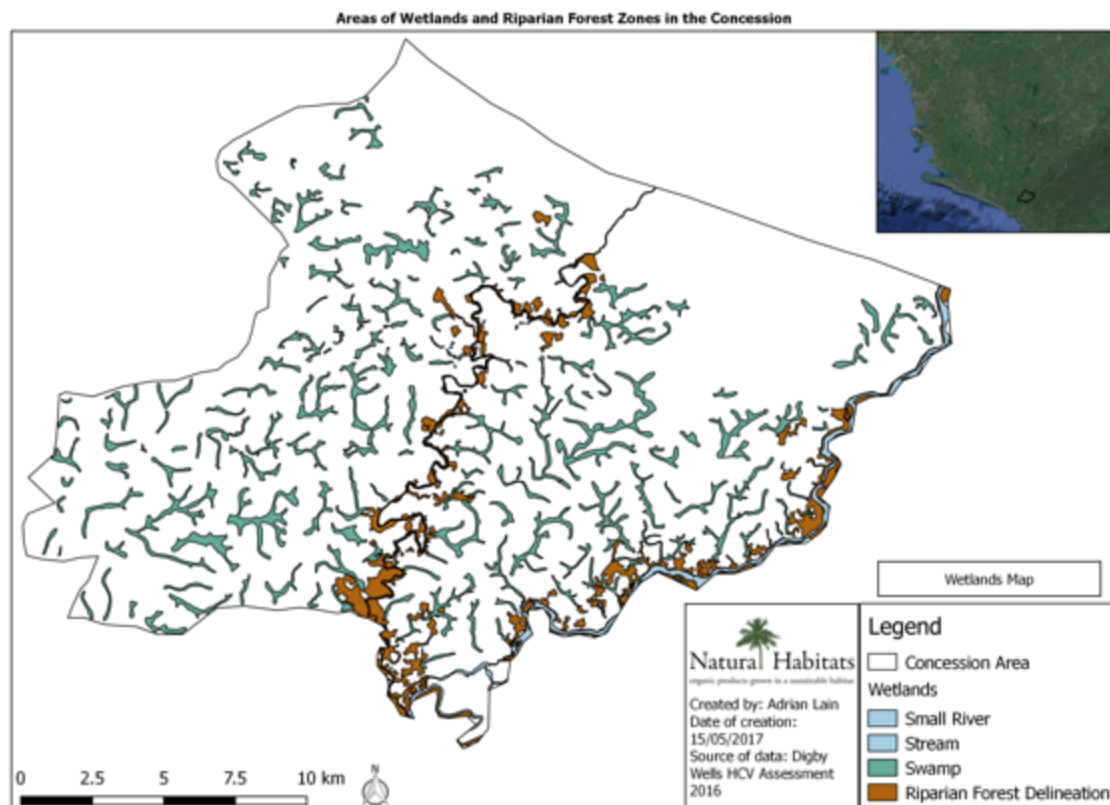
Figure 11 Areas of Wetlands and Riparian Forest Zones in the Concession

3.3.2 SOILS

Vaersa Partners conducted a soil analysis from four locations within the project area, the GPS points were respectively.

- Samagbe Soil Sample Pit: N07° 18.510' W11° 14.320'
- Selimeh Soil Sample Pit: N07° 21.580' W11° 16.470'
- Seitua Soil Sample Pit: N07° 17.160' W11° 22.420'
- Kengo Soil Sample Pit: N07° 14.180' W11° 23.430'
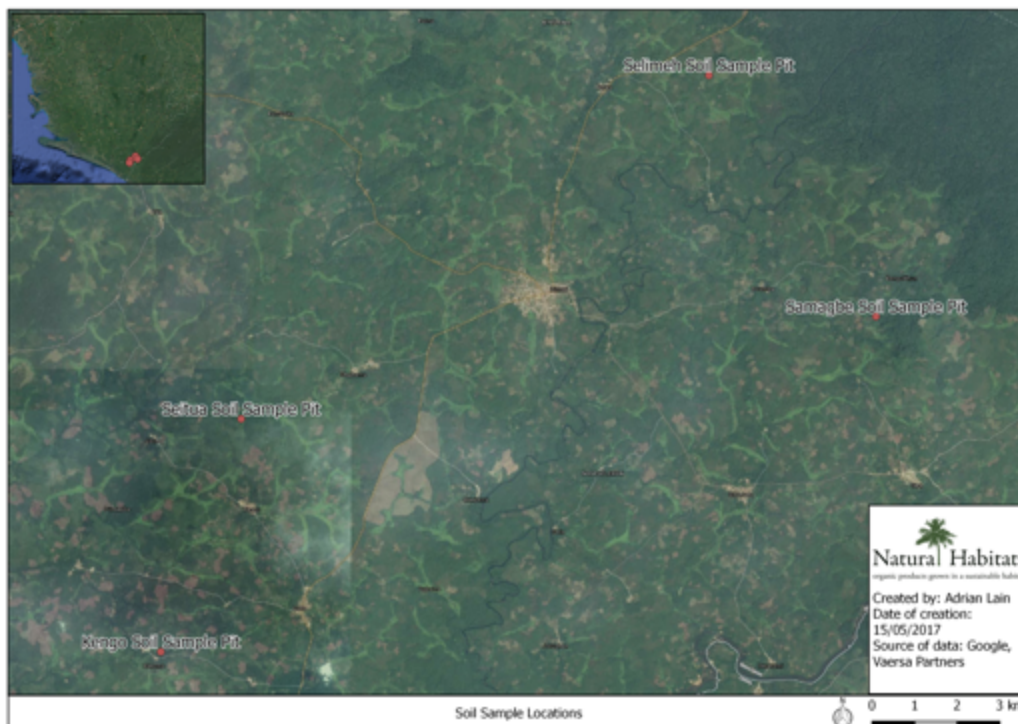
Figure 12 Locations of Soil Sample Pits in Project Area

Each pit was dug at a depth of 1,5 metres and soils were collected at three different depths. These soil samples were sent to Cropnuts in Nairobi, Kenya for physical and chemical analysis. A visual inspection of the soil pit shown in Figure 13 indicated a 40cm to 60cm deep gravel free colluvial layer over a gravelly lower subsoil.

Figure 13 Measuring Soil Sample Depths

3.3.2.1 SOIL ANALYSIS RESULTS

Soil texture – Sandy Loam

Soil order – OXISOL (USDA Soil Taxonomy), also known as Ferrasol (World Reference Base for Soil Resources)[1]

Sub order – UDOX

Great group – HAPLUDOX

3.3.2.2 SOIL CHARACTERISTICS

- Well drained/high porosity resulting in low available water holding capacity.
- pH is low – Acidic top soil (=4.9 in 0cm – 20cm).
- CEC currently low.
- High leaching rates.
- Low Ca:Mg ratio.
- Low Phosphorous.
- Low total bases.
- Optimum available K.
- Optimum C:N ratio.

Figure 14 Soils Collected in Bamboo and Soil Profile Labelled

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[1] http://www.fao.org/docrep/003/y1899e/y1899e08a.htm

Figure 15 Worker During Excavation of Soil Analysis Pit

Therefore, from this soil analysis we can be certain there are no peat soils (Histosols) have been identified during the soil studies within the project area. Additionally, The Harmonised World Soil Database[2] show the distribution of soils types in Sierra Leone and there are no identified areas of peat soil located within Sierra Leone.

Figure 16 Map of Sierra Leone Showing Soil Types

[2] http://www.fao.org/soils-portal/soil-survey/soil-maps-and-databases/harmonized-world-soil-database-v12/en/

3.4 HIGH CARBON STOCK ASSESSMENT

The HCS assessment was based on the HCS Approach as developed by Greenpeace, The Forest Trust and Golden Agri-Resources Ltd., and the Version 1 of the HCS Forest Patch Analysis Decision Tree. Although the HCS survey focused on the concession, the area of influence was deemed to be the concession area and immediately adjacent area including the southern boundary of the GRNP and the leakage belt.

The carbon stock map (Figure 20) is then integrated with other conservation set asides identified during HCV assessment. The integrated map (Figure 33) serves as a guide to project emission from land use change and projecting GHG emission from different development scenarios. The final GHG emission estimation is based on the optimum scenario for a low emission development plan shown in Table 21.

Core Datasets:

- Satellite imagery;
- Concession boundaries;
- Polygons of the identified HCV areas;
- Although the negotiations between Natural Habitats and the local communities are still ongoing, and attempt was made to delimit the areas which will be set aside for use for the community usage;
- A layer with the settlements in the area and a layer of the road network;
- Field verification sites of high carbon forest plots (plot locations are shown on Figure 17.
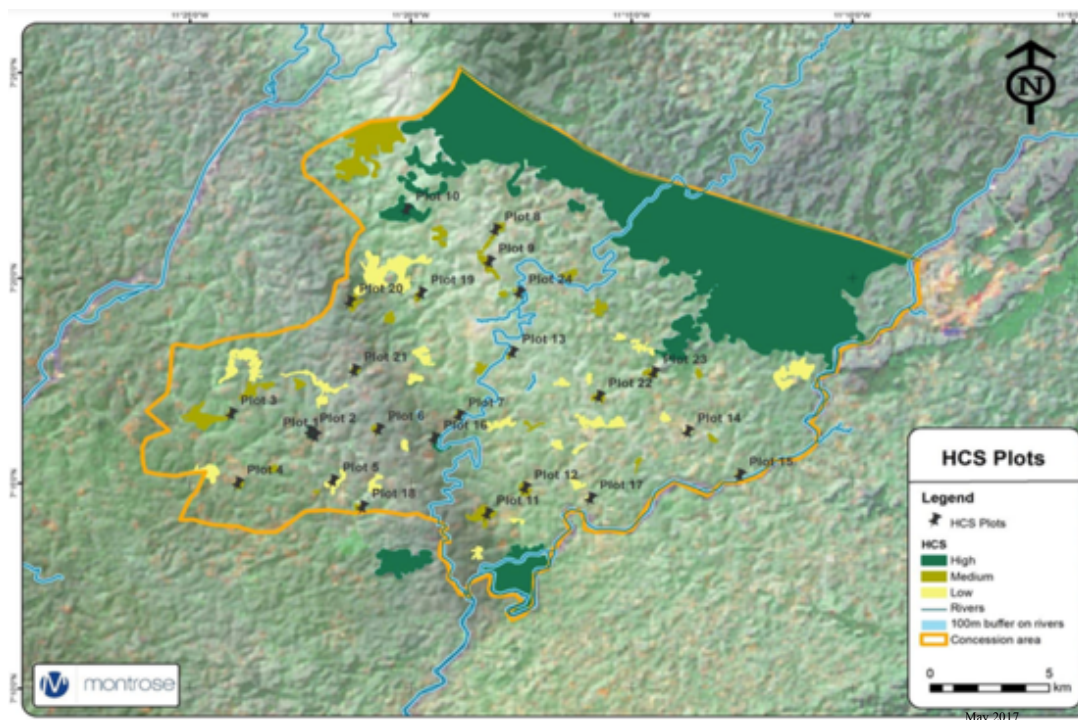
Figure 17 HCS Plots in the Concession Area

Techniques and Thresholds

The methodology used in this study is based upon the HCS Approach Toolkit Version 1.

The high carbon stock forest classification:

- Young Regenerating Forest (YRF)
- Low Density Forest (LDF);
- Medium Density Forest (MDF); and
- High Density Forest (HDF)

Low carbon stock classification:

- Scrub; and
- Cleared/Open Land.

These average carbon stocks of the forest classifications are based upon the biomass layer from the field data collected this study. Firstly, a carbon map was derived the stratification of the vegetation classes, next the forest patches were divided into HCS Forest to be protected, and Low Carbon Stock (scrub/open land), that are potentially suitable for oil palm plantation development. Refer to Table 11 to see the delineation of the carbon stocks in the plantation.

3.4.1.1 SOIL CARBON

Vaersa Partners conducted a soil analysis from four locations within the project area. Based on physical soil pits dug during the Feasibility Study in 2014, it was observed that the soil conditions in all areas are generally similar with the following properties:

- A 40cm to 60cm deep gravel free colluvial layer over a gravelly lower subsoil. This indicates that the physical properties of this soil would be suitable for oil palm cultivation.
- Well drained/High porosity resulting in low available water holding capacity.
- pH is low - Acidic top soil (about 4,9 in 0cm – 20cm).
- High leaching rates.
- Low Ca:Mg ratio.
- Low Phosphorous and total bases.
- Optimum available K.
- Optimum C:N ratio.
- Definite response to fertilizer application.

Peat Soil: The soil analysis results categorised the soil order as Oxisol (USDA Soil Taxonomy), also known as Ferrasol (World Reference Base for Soil Resources)[3]. This confirms that no Histosols are present in the concession. Soils are carbon pools that can be influenced by land-use and management activities, the soil carbon stock in mineral soils is relatively low. Therefore, conversion to oil palm on mineral soils does not significantly alter soil carbon stock levels or significantly increase soil GHG emissions. Therefore, carbon stocks of mineral soils are not considered as a significant carbon source in the RSPO New Development Calculator.

3.4.1.2   RSPO NEW DEVELOPMENT CALCULATOR

The net greenhouse gas emissions from the development of the project are calculated by adding the emissions released during land cover change during the conversion, crop production and processing, and subtracting these from the carbon emissions sequestered from the standing crop and in any conservation areas.

The calculator uses the emissions sources listed below:

- Change in land cover carbon stocks from conversion to palm oil;
- Manufacture of fertilisers and their transport to the plantation;
- Nitrous oxide and carbon dioxide resulting from the field application of fertilisers and mill by-products and other organic sources such as palm litter;
- Fossil fuel used in the field and at the mill (diesel);
- Methane produced during anaerobic digesting of the palm oil mill effluent (POME);
- Any emissions related to the cultivation of oil palms on peat soil (not applicable).

Emission sequestration from the following sources are also considered:

- Carbon dioxide sequestrated by the oil palms trees in the plantation, ground cover, and palm litter;
- Carbon dioxide sequestrated by biomass in conservation areas (only for forested conservation areas);
- Greenhouse gas emissions avoided by the selling of mill energy by-products (e.g. electricity sold to the grid; palm kernel shell sold to power industrial furnaces).

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[3] http://www.fao.org/docrep/003/y1899e/y1899e08a.htm

3.4.1.3 TEAM RESPONSIBLE FOR DEVELOPING THE MITIGATION PLAN

Name	Organisation	Role	Expertise
Jessenia Angulo	Natural Habitats Group	Group Sustainability Manager	Sustainability Management
Lilian Garcia	Natural Habitats Group	West Africa Sustainability Coordinator	Environmental Engineering
Adrian Perez	Natural Habitats Group	GIS and Environmental Technician	GIS Software and Mapping
Kalindi Lorenzo	Natural Habitats Group	Sustainability Coordinator	Biodiversity and Conservation Strategies

3.4.1.3 TEAM RESPONSIBLE FOR DEVELOPING THE MITIGATION PLAN

3.5 CARBON STOCK ASSESSMENT

3.5.1 LOCATION MAPS
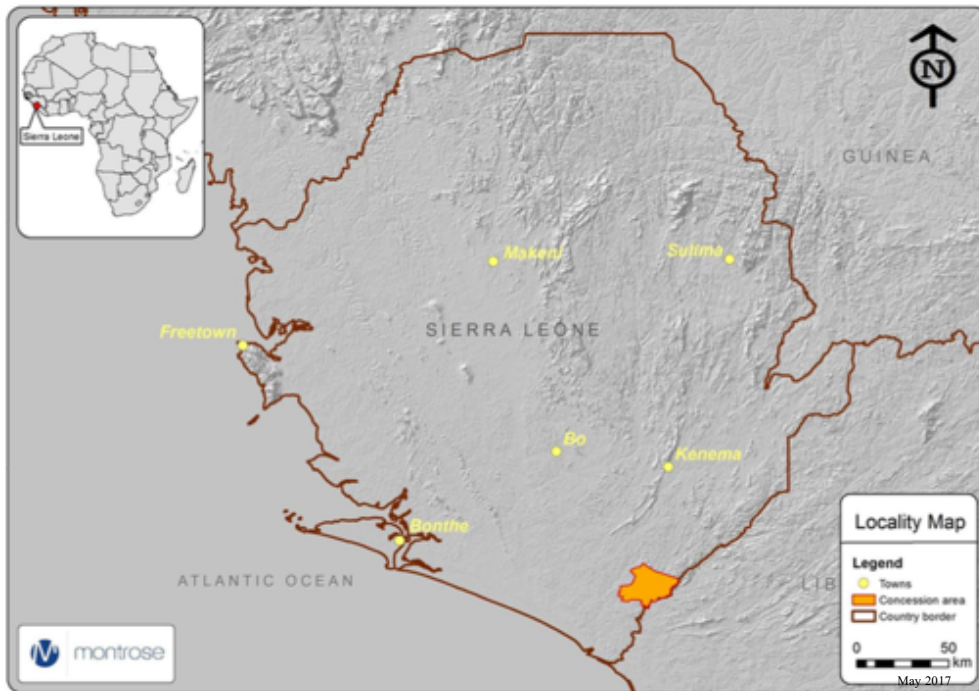
Landscape Level

Figure 18 Regional Location of the Concession

District Level
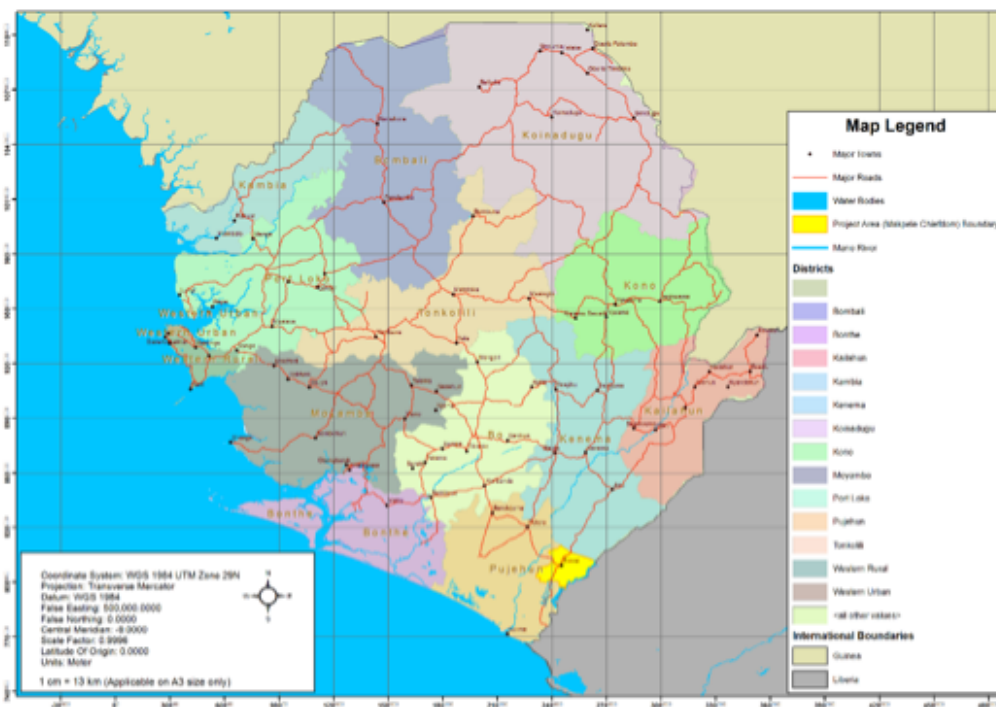
Figure 19 District Level Concession Boundary

3.5.2 LAND COVER STRATIFICATION

Land cover map of area was created by stratifying the concession into different land cover categories (these are detailed in Table 11) and assigning each applicable type land cover type a carbon stock estimation based on RSPO default values. Areas in the concession that were identified as being High Carbon Stock by our HCS assessment have been assigned the average value for HCS forests in the concession. This was calculated to be 343,43 tC/ha, this is higher than the RSPO default value of 'undisturbed forest' of 263tC/ha. Which makes us confident that by identifying and protected these additional areas of high carbon stock we are reducing a large amount of potential emissions that would have otherwise occurred from the conversion of such high carbon stock areas. The verification procedure used to identify high carbon stock areas (the HCS Assessment) is described in 3.4. Carbon stocks for HCV areas, settlements/villages, roads, and water bodies (and their buffer areas) were not calculated as the HCV areas are not considered for conversion to oil palm because of the protected status. The other categories are not considered because they also will not be converted to the oil palm and contain negligible carbon stocks regardless.

3.5.2.1 MAP SHOWING STRATIFICATION OF CARBON CLASSES IN THE CONCESSION

Figure 20 below gives an overview of the carbon stored in the concession (derived from assigned the land cover classes of the RSPO New Development calculator defaults and HCS assessment's average carbon value). Most of the concession consists of shrubland vegetation with low carbon content, and most of the biomass in the area is concentrated in High Carbon Stock forest patches.
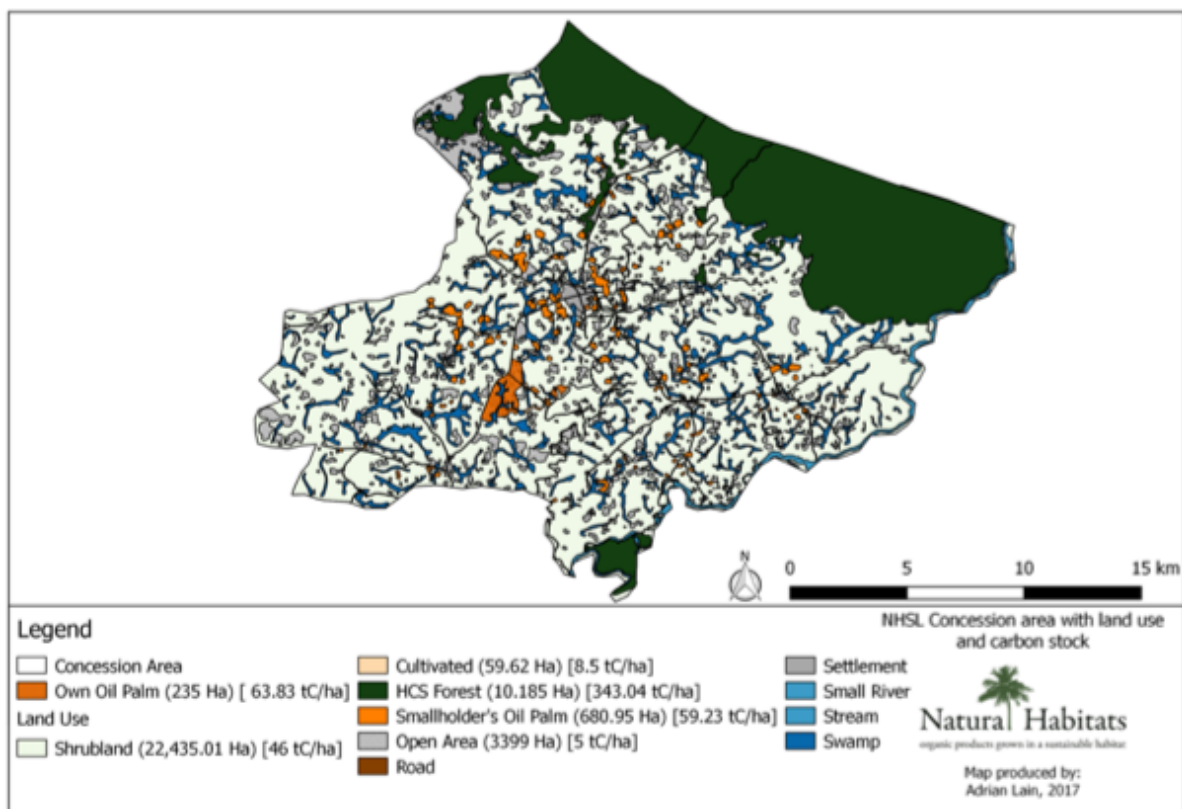
Figure 20 Showing Land Carbon Stock Classifications in the Concession

3.5.2.2   LAND COVER CLASS CARBON ESTIMATION

Table 11 Carbon Stocks per Land Cover Type (tC/ha)

Vegetation Type	Area (ha)	Average Carbon Stock (tC/ha) (All are RSPO default values[4] except the HCS forest).	Total Carbon Stock (tC)
High Carbon Stock Forest	10.185	343,04	3.493.862,4tC
Shrub Land (Young and Old)	22.435,01	46	1.073.962,46tC
Own Plantation Oil Palm	235	63,83	15.0000,05tC
Smallholder Oil Palm	680,95	59,29	40.373,53
Cultivated Food Crops/Annuals	59,62	8,5	506,77tC
Open Area (Grassland)	3399	5	16.995tC
Roads/Settlements/Waterbodies	4624,03	0	0tC

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[4] RSPO Default Above Ground Biomass and Below Ground Biomass Values (tC/ha), New Development Calculator 2016.

Totals	41.618,61		4.775.700,21tC

3.5.2.3 IDENTIFICATION OF LIKELY SOURCES OF EMISSIONS AND SEQUESTRATION IN THE NEW DEVELOPMENT

Emission Sources:

- Land clearing and decompensation of biomass;
- Fuel use in the field for ongoing operations (clearing through to general operations);
- Fertiliser use (from production of fertiliser through to field emissions through atmospheric);
- Mill fuel use for electricity production (diesel generators);
- Palm Oil Mill Effluent open air ponds (loss of methane to atmosphere);
- Transportation fuel use (from field to mill);

Sequestration Sources:

- Conservation areas sequestration (riparian areas and high carbon stock forests);
- Crop sequestration.

3.6   LAND USE COVER CHANGE ANALYSIS

3.6.1   METHODOLOGY

The objective of the LUCC is to analyse and classify land use and land cover status and identify land cover changes on Natural Habitats (SL) Ltd's concession. Remote sensing imagery was used to determine land cover (classification) using a variety of data sources.

The process included:

Determination of land cover classification system;

Selection of a classification algorithm;

Extraction of information; and

An accuracy assessment.

Sierra Leone has a humid tropical climate which is a problem when using remotely sensed data. Remote sensing is suitable for a LUC analysis however, when using Landsat images in tropical areas, clouds limit the level of monitoring and modelling that can be achieved.

3.6.1.1   SOURCE OF LUC DATASETS

Landsat 5 and Landsat 8 data were downloaded in Landsat Level 1 Data Products and standard radiometric and geometric correction were processed. As each band file is provided un-layered in GeoTIFF output format, the downloaded band files were layer stacked in ERDAS Imagine for analysis. Image processing was performed using ERDAS Imagine 2014 and ArcGIS for Desktop 10.3.1 (Advanced). The satellite images were rectified to UTM Zone 29N, WGS84. The concession, plantation and nursery areas are mostly contained within Landsat path 205, rows 55-54. Landsat 5 and Landsat 8 data were downloaded through:

1. Earth Explorer: http://earthexplorere.usgs.gov
2. Global Visualization Viewer: http://glovis.usgs.gov

Multi-temporal Landsat images were interpreted (visually on-screen) to document land use and cover change on the NHSL concession, plantation and nursery areas. This enable maps to be produced for the entire Makpele Chiefdom, illustrating four land use types (based on the RSPO

Vegetation Coefficients classification, Section 2.4) for four years (i.e., 2006, 2013, 2014, and 2015) and three temporal periods (i.e., 2006 to 2013, 2013 to 2014, 2014 to 2015).

Four pairs of clear and almost cloud-free (i.e., less than 10% cloud cover) Landsat 5 (2006) and Landsat 8 (2013, 2014 and 2015) data sets were selected as proxies to classify the study area (i.e., concession, plantation and nursery):

- 30 December 2006 (as proxy for "from November 2005 to November 2007");
- 24 December 2013 (as a proxy for "from November 2007 to 31 December 2009");
- 28 March 2014 (as a proxy for "from 1 January 2010 to 9 May 2014"); and
- 30 December 2015 (as proxy for "after 9 May 2014").

N.B., images for many of the years were obscured by cloud cover and unsuitable for this exercise.

The Landsat 5 and 8 ortho-rectified and co-registered scenes used in this study, capture identical periods of calendar days for 2006, 2013, 2014 and 2015. The initial satellite image, was year 2006 (cloud-free 2005 Landsat satellite imagery was not available), this served as a proxy for land-use changes that have occurred throughout 2005. Land use classification and change maps were generated for 2006, 2013, 2014 and 2015 for the whole concession area.

Atmospheric correction was not undertaken for the change detection. The LUC Analysis was undertaken with Landsat mosaic images only because (a) they are consistent with a resolution of 30 metres and (b) the combination of different Landsat sensors has only minor effects on the output of the images. It should be noted that Landsat has a high degree of similarities among its different sensors, a notable advantage compared to working with images with a coarser resolution.
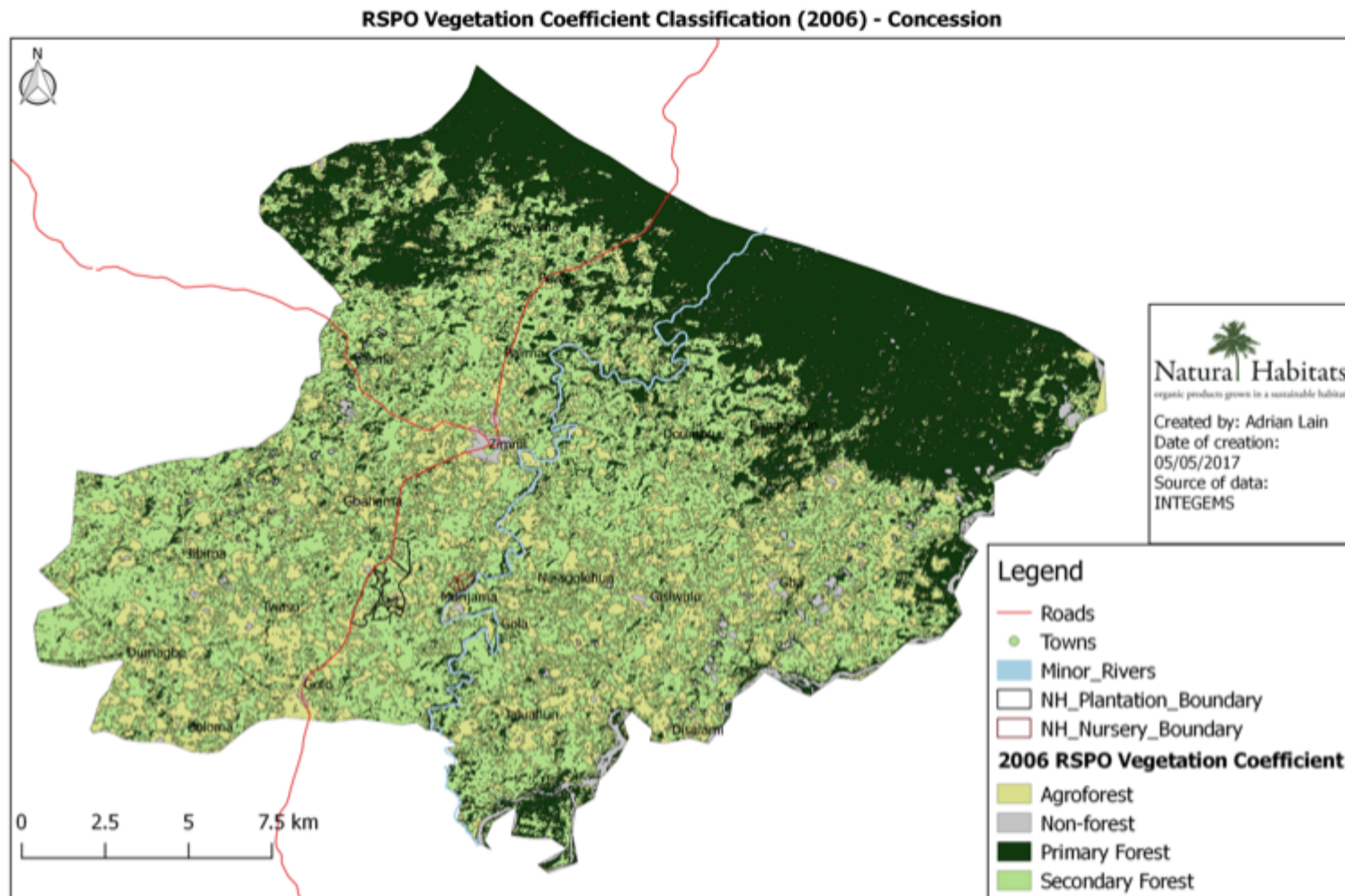
Figure 21 RSPO Vegetation Coefficient Classification 2006 - Concession

RSPO Vegetation Coefficient Classification (24 December 2013) - Concession
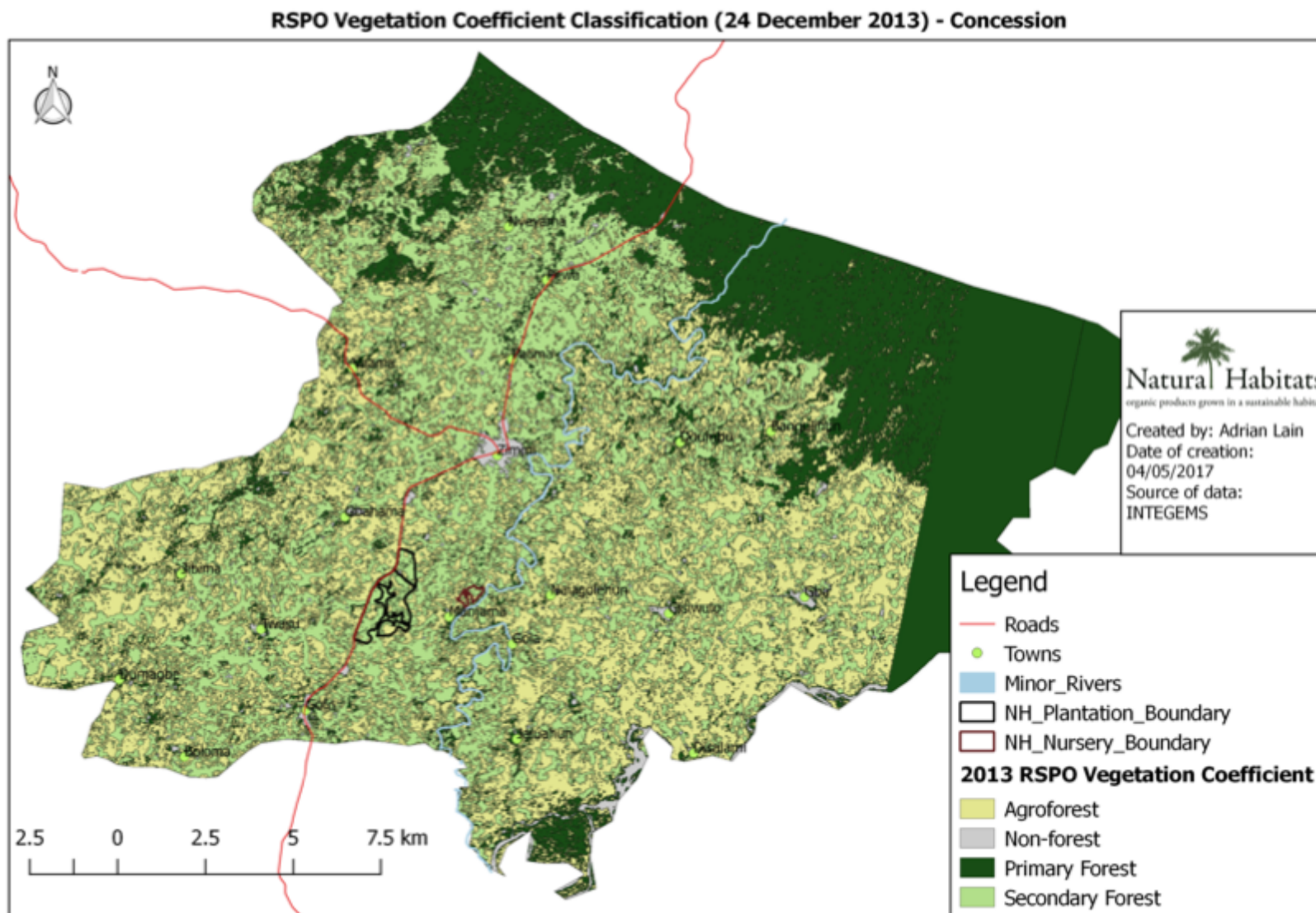
Figure 22 RSPO Vegetation Coefficient Classification 2013 - Concession
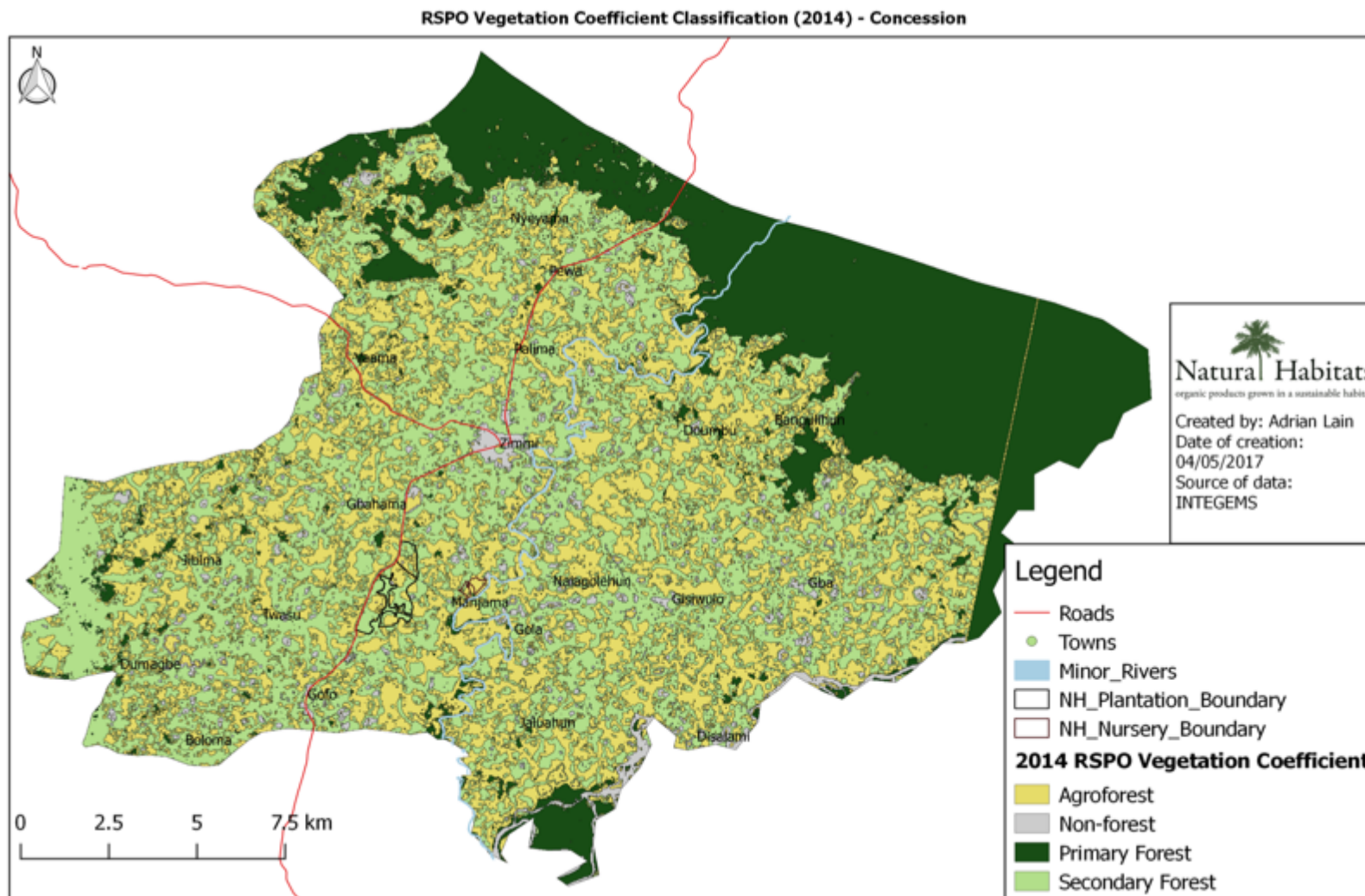
Figure 23 RSPO Vegetation Coefficient Classification 2014 - Concession
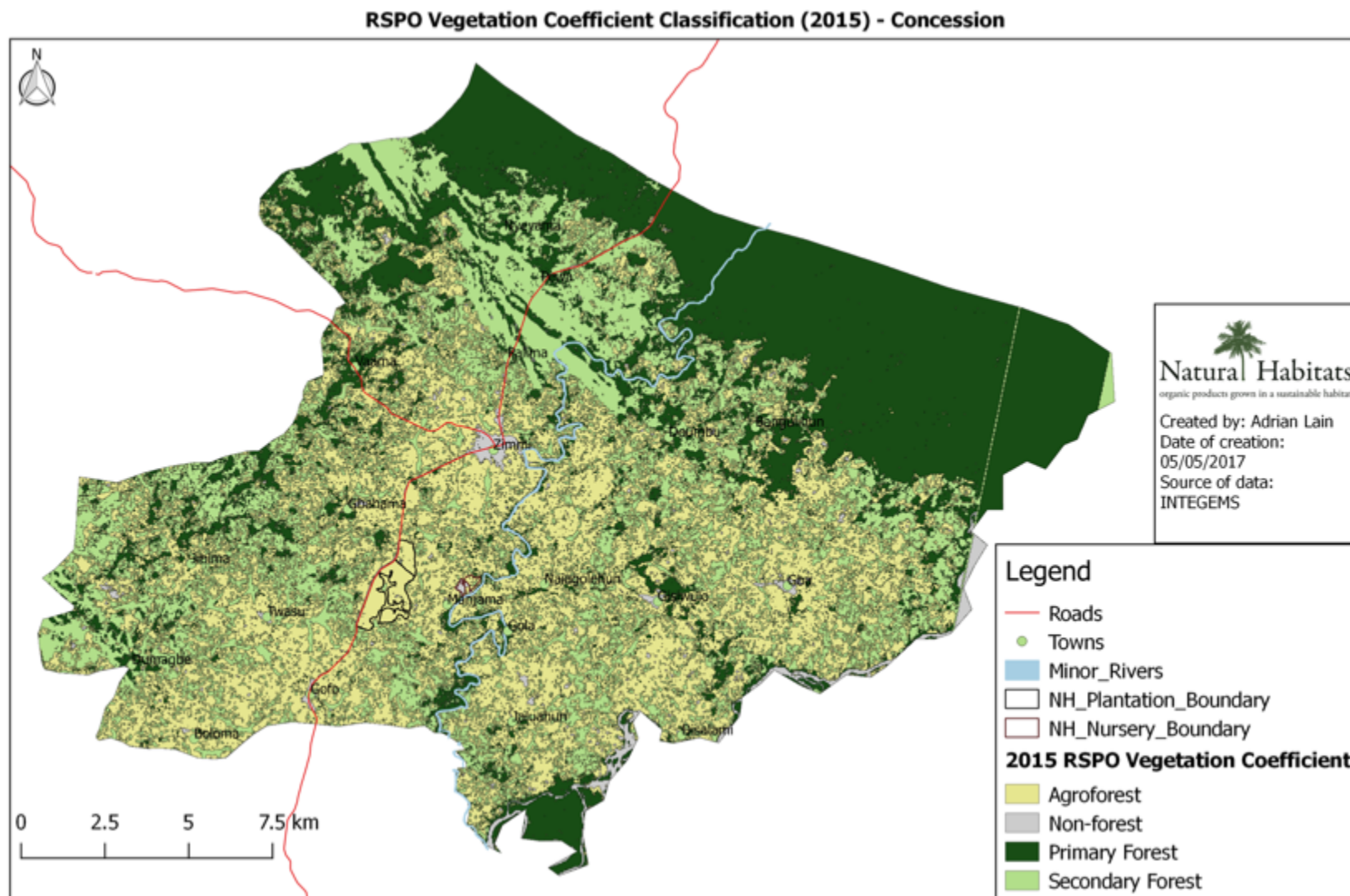
Figure 24 RSPO Vegetation Coefficient Classification 2015 - Concession

Figure 25 RSPO Vegetation Coefficient Classification 2006 - Plantation and Nurseries
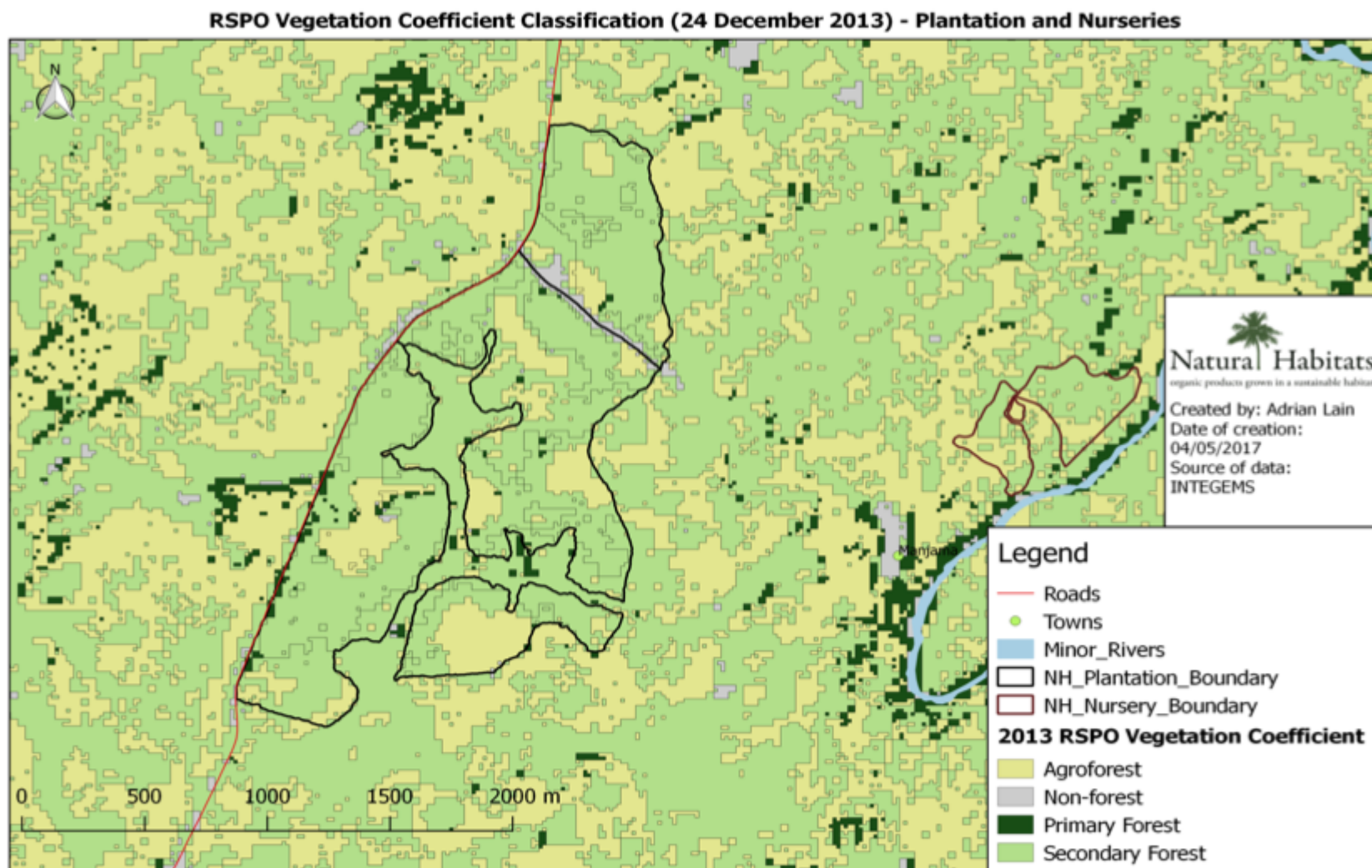
Figure 26 RSPO Vegetation Coefficient Classification 2013 - Plantation and Nurseries

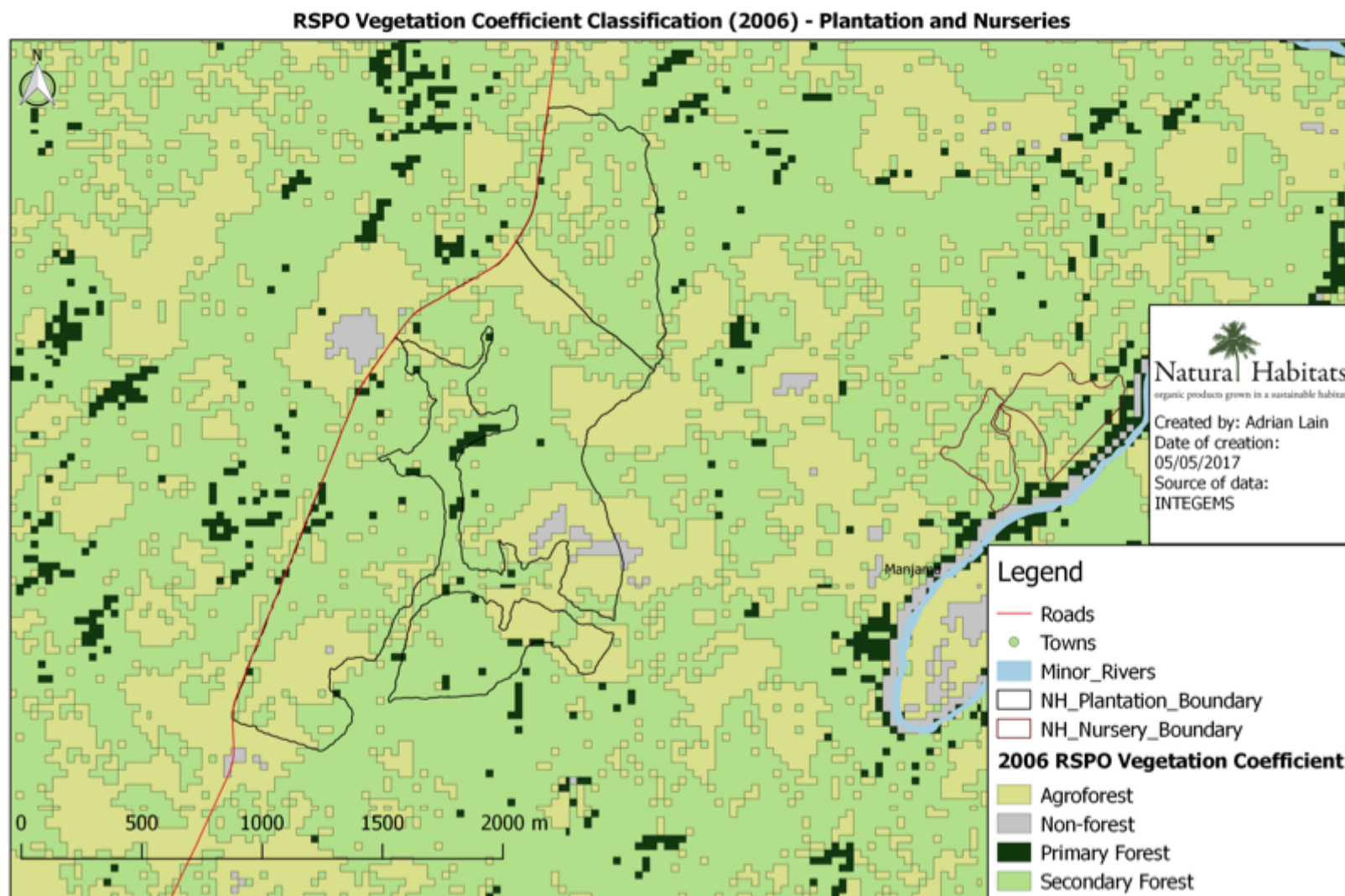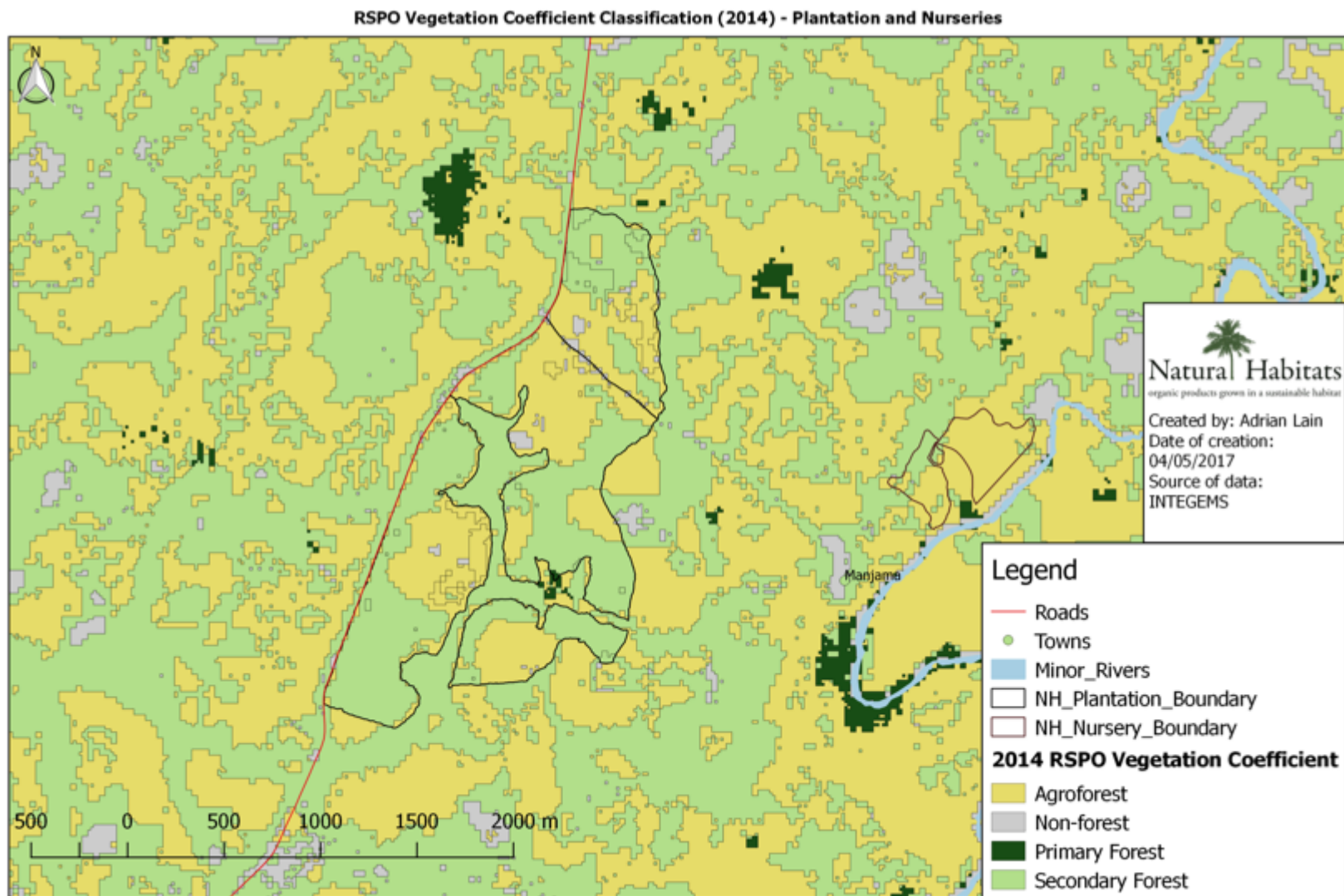**Figure 27 RSPO Vegetation Coefficient Classification 2014 - Plantation and Nurseries**

RSPO Vegetation Coefficient Classification (2015) - Plantation and Nurseries
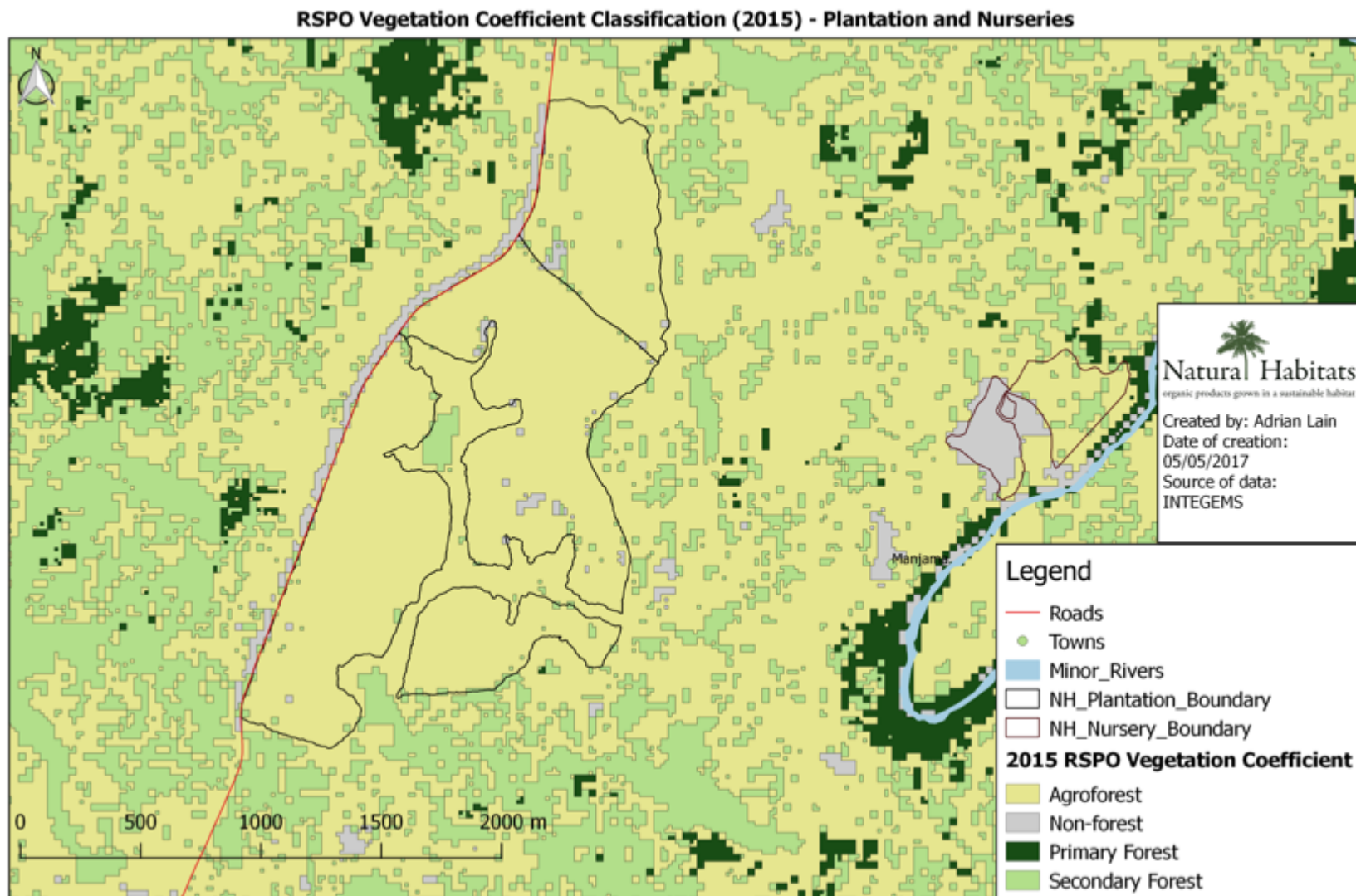
Figure 28 RSPO Vegetation Coefficient Classification 2015 - Plantation and Nurseries
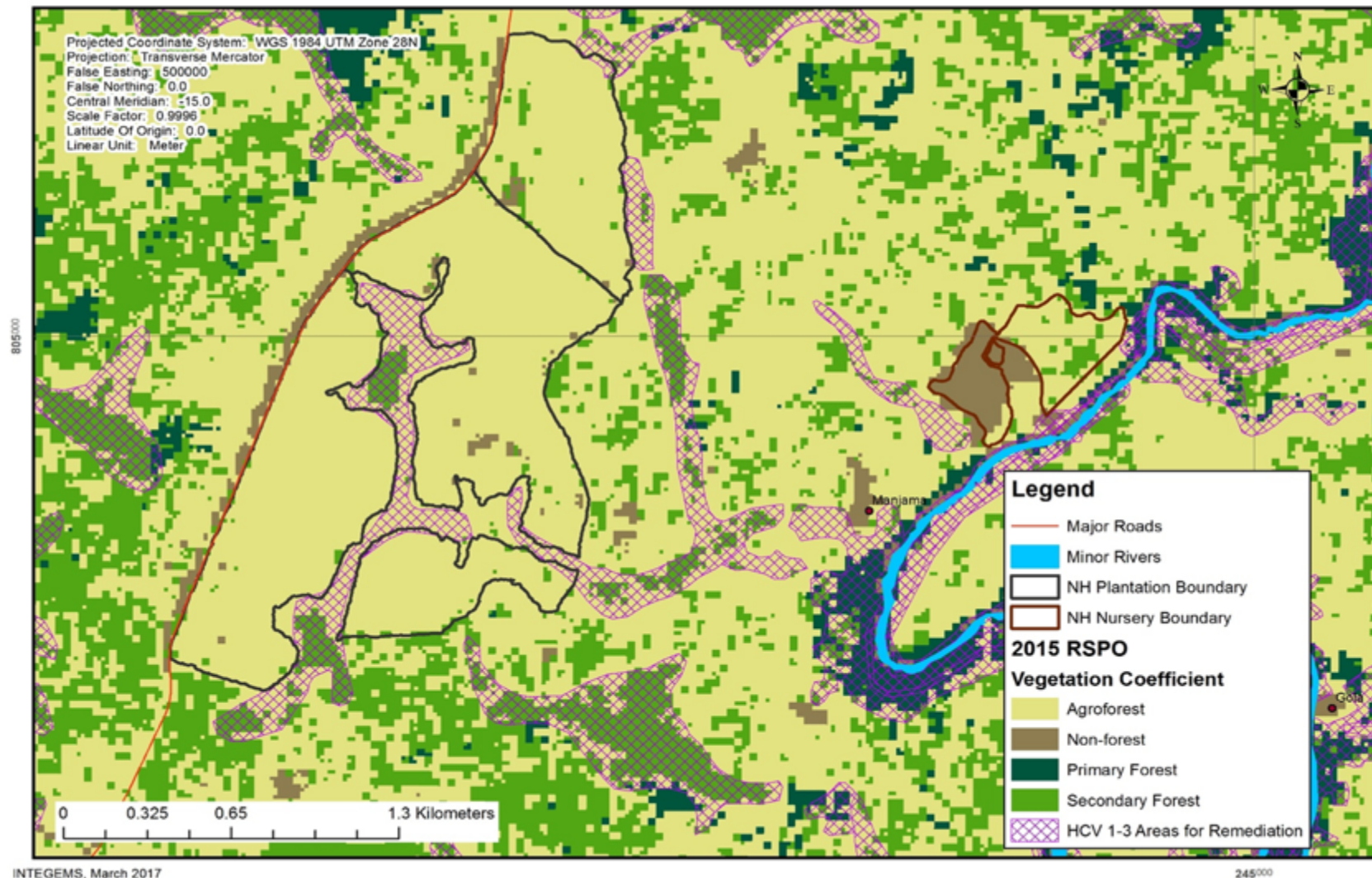
Figure 29 Concession 2015 Showing HCV 1-3 Areas
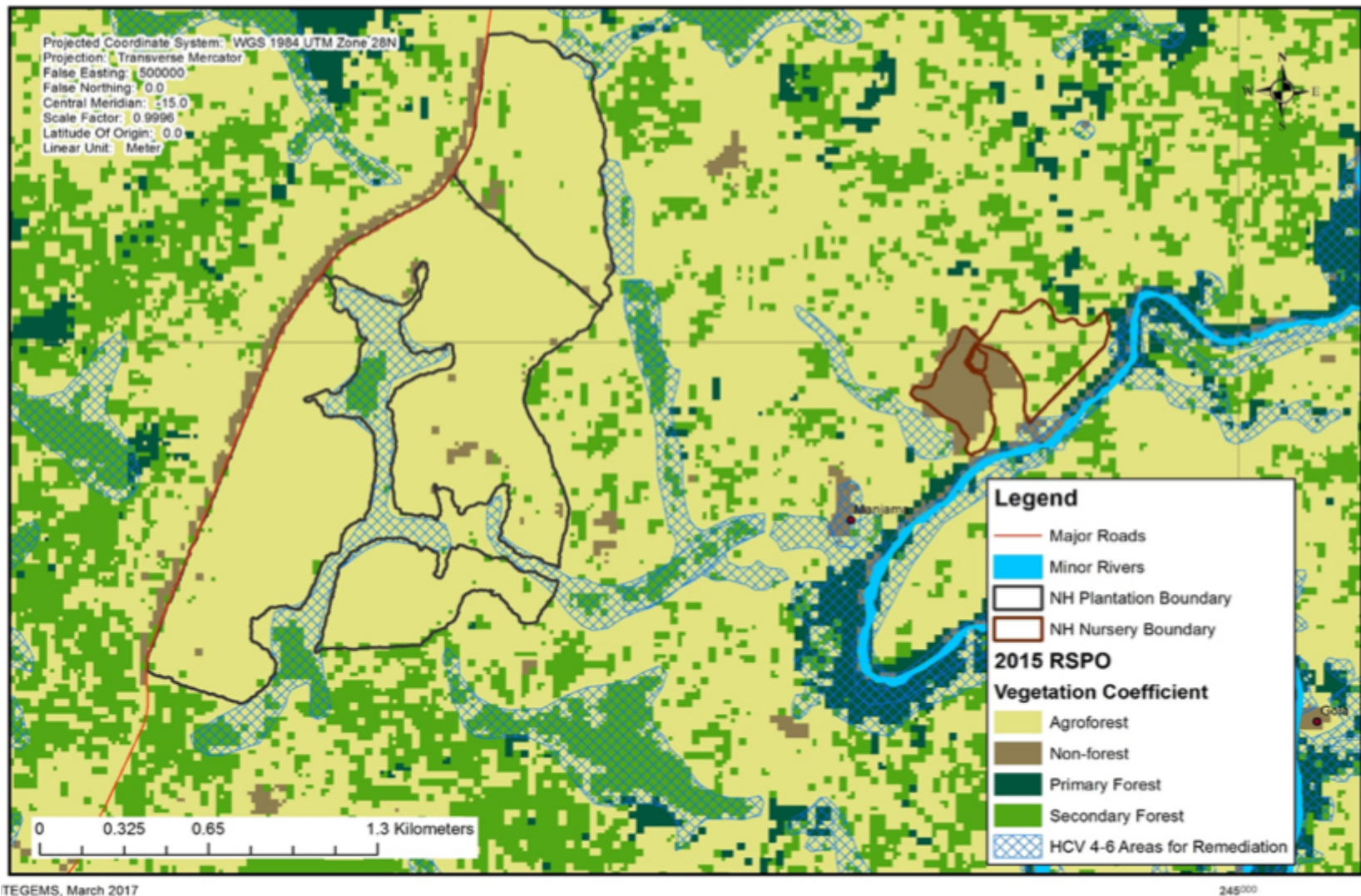
Figure 30 Concession 2015 Showing HCV 4-6 Areas

3.6.3 FINDINGS AND CONCLUSIONS

- Land was cleared by the previous owners of the concession, WAA2. WAA2 cleared 19 ha for nursery development in June 2014, and 216 ha for plantation development in May 2015;

- NHSL began a process to acquire WAA2 in 2014 but this was interrupted by a country-wide outbreak of the Ebola virus in September 2014 which lasted until November 2015;

- NHSL signed the transfer of shares in July 2014 and after that, appointed Vaersa to conduct a soil survey and feasibility study (November 2014). The transfer of ownership from WAA2 to NHSL was completed in the last quarter of 2015;

- An ESIA and HCV assessment were carried out by independent consultants (INTGEMS and Digby Wells) in 2015, the ESIA was approved by the Environmental protection agency of Sierra Leone in July 2016, and the HCV Assessment was accepted by the HCV Network in April 2016.

- The LUC analysis used information from previous studies and satellite imagery to classify vegetation into four classes (as per RSPO Vegetation Coefficient Categories);

- The findings of the LUC analysis show that NHSL has a total conservation liability of 279.56 ha:

- The liability relates to HCV 1, 2, and 3 areas;

- There are no liabilities for any HCV 4, 5, and 6 areas;

- Figure 29 and Figure 30 demonstrate that there has been no conversion of primary forest or any area required to maintain or enhance one or more HCV.

- Furthermore, the public consultation and disclosure process has confirmed that no unresolved land disputes;

- A workshop was attended by owners of the land that was cleared and lease agreements were signed and endorsed by local authorities (who have responsibility for land);

- NHSL have a SOP that deals with land clearing and, specifically, deals with avoiding clearing and that has not been subject to an HCV assessment;

- A total conservation liability of 279.56 ha has resulted from land clearing;

- NHSL have started drafting a RaCP that deals with compensation measures; NHSL is working with local communities to identify areas for conservation within the concession and are drafting a community forest management plan; and

- Meeting with local communities have already taken place so that they are informed and involved with the procedures.

3.7 FREE PRIOR INFORMED CONSENT PROCESS

The stakeholder consultation is one of the pillars of NHSL Project. Any operation done on the field is following a Free Prior Informed Consent (FPIC) consultation with the concerned stakeholders. The process to obtain FPIC among villages surrounding the concession area is an on-going process, which the NHSL team has commenced. Most of the FPIC consultations are meetings organised by the Company to which all villagers willing to speak or listen and all stakeholder are invited. Each meeting is recorded through minutes and attendance lists.

The FPIC methodology used for this project is presented as a diagram in Figure 31. It has embedded in several requirements of the RSPO Principle and Criteria. The social team of NHSL have completed the following actions against each step:

1. *Scoping, identification, and interest of communities:*

NHSL together with Vaersa Team conducted the first scoping in the lease area. Local communities' representatives, and key stakeholders were identified. NHSL team conducted the first approaches and each community concerned by the project has been visited and informed about the project.

There are two key meetings in this process: This first meeting has as an objective to inform the chiefdom about the NHSL project.

During a second meeting, letters are sent to the villagers, the company goes to the community, repeat the project expected benefit for the community and ask the landowner who wish to participate to make themselves known by the company to start demarcation. Attendance of the participant to the meeting is taken as well as pictures and minutes.

2. *Elaboration of the FPIC process with stakeholders:*

Communities' concern regarding the FPIC process, were raised and covered by NHSL. The company representatives explained and agreed that Natural Habitats would not use individual or communities' lands without their willingness and agreement.

Positive reactions and support to the project was generated. NHSL has conducted several scoping meetings, where all the members of the community are invited to participate to it. Invitation letters

are given to the town chief and the bearer of the letter explains what is in the envelope so that illiterate persons can be informed as well.

A mechanism to manage communications, information requested, issues, claims and complaints is in place. Furthermore, a list of all stakeholders is maintained and a record of communications, consultations and actions arising from these, is regularly updated. This procedure allows anyone to come and report grievances or information requests to the company. The Community Contact Person (CCP) is also a contact person to whom the company can count to transmit information to the communities concerning the project.

3. *Participatory Mapping, Participatory SEIA, and Participatory HCV Assessment:*

INTERGEMS and Digby Wells have already conducted assessments. SEIA has been submitted to the EPA Agency, and workshops for public consultation have already taken place. HCV Network has already approved the HCV assessment. Communities have been informed that the company will only develop areas free of HVCs and where no communities are settled.

4. *Inform and negotiation*

During these meetings, the Community Relations Officer (CRO) develops and explains, in Mende (local language) the lease held by NHSL. The CRO explains the terms of the individual landowners agreement and that the company would like to make with the bush owners willing to participate the project. It is emphasized during this meeting that the land leasing is free and that no one should stop somebody to lease his land if he wants it but also no one should force a landowner to give his land.

Before the plantation development, a team composed of the villagers, Natural Habitats personal and the relevant GoSL ministries; departments and agencies (MDAs) will go on the field and do the demarcation.
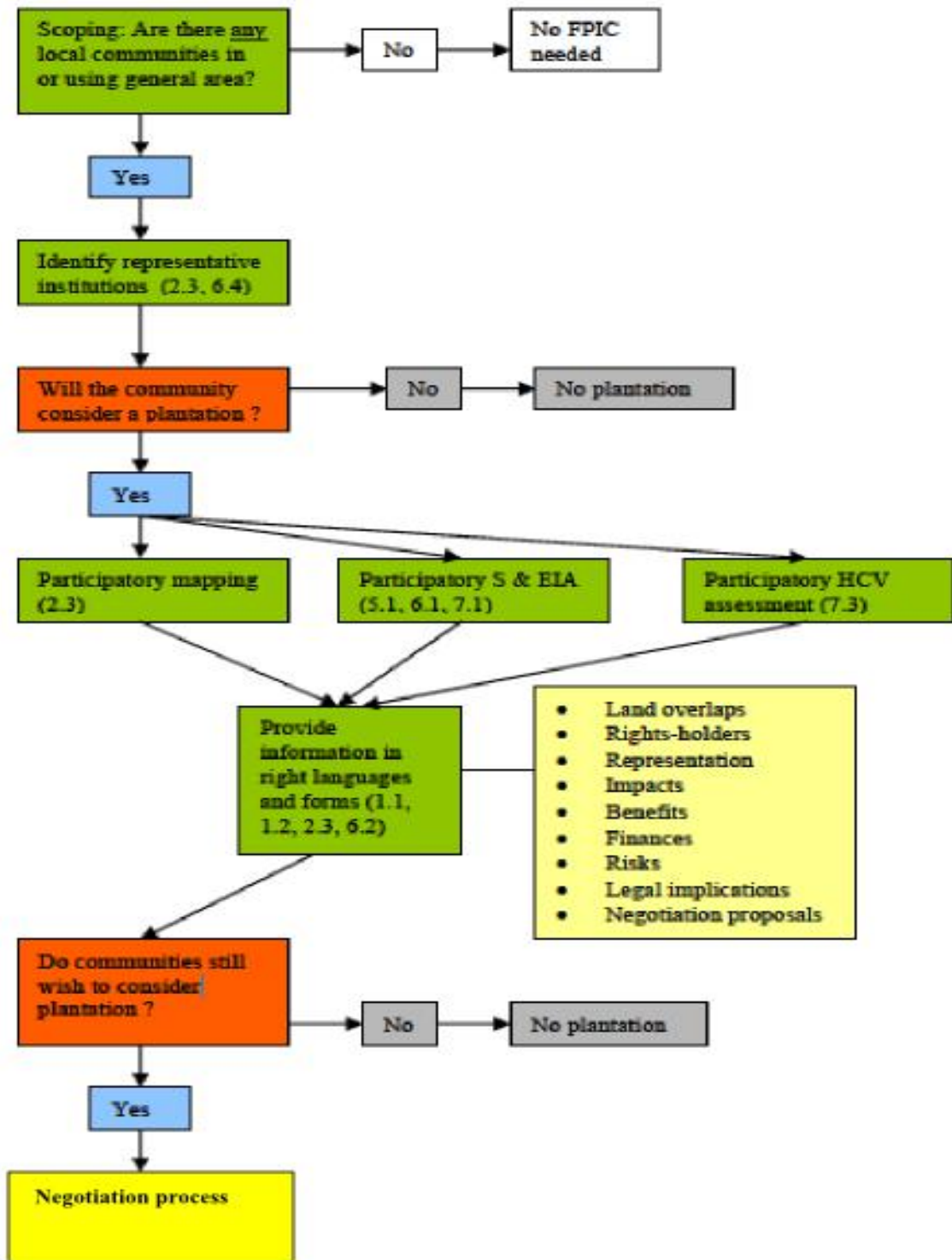
Figure 31 RPSO FPIC Flow Chart

As the last step of the FPIC process, and additional to the master lease, individual land owners' agreement (LOAs) were developed. Families owning the land, through the Paramount Chief as customary, legal and authorized custodian of the land of the Chiefdom; leased their land to the company. The LAOs contain strict statements, to protect the ecosystem services and need of the communities, as well as to protect areas that are crucial to communities' cultural identity:

- Villages and sacred bushed will be left untouched.
- Plantations of permanent crops of no less than 1 hectares and planted before 1st July 2012 will not be cleared, unless arranged otherwise and/or deducted from the leases acreage.

These LOAs were signed by the land owners, town chief, section chief, paramount chief, country manager of the company, district chairman, district officer, land owners' witness and NHSL witness.

The FPIC methodology used for this project is presented as a diagram in Figure 31. It has embedded in several requirements of the RSPO Principle and Criteria. The social team of NHSL have completed the following steps:

1. *Scoping, Identification, and interest of communities:*
2. *Elaboration of the FPIC process with stakeholders:*
3. *Participatory Mapping, Participatory SEIA, and Participatory HCV Assessment:*
4. *Inform and negotiation*

3.7.1.1 STAKEHOLDER ENGAGEMENT

Stakeholders consulted during the HCV and ESIA process are listed in Annex 1. The details of the concerns and recommendations of each member are presented in the ESIA report (Integems, 2016). Major concerns included:

- Employment for local community members;
- Details of the project commencement should be properly communicated with each community;
- Members of the leakage belt communities should be considered;
- The GRNP expressed interest in a mutual cooperation between the GRNP and Natural Habitats for management of HCVs and monitoring.

4   SUMMARY OF MANAGEMENT PLANS

4.1   TEAM RESPONSIBLE FOR DEVELOPING MANAGEMENT PLANS

Table 12 Organisational Information and Personnel Involved in Planning and Implementation

Contact Persons	Position	Entity
Sam Mostyn	Group Director of Operations	Natural Habitats Group
Peter Pijpers	Country Manager	Natural Habitats Sierra Leone Ltd.
Jessenia Angulo	Group Sustainability Manager	Natural Habitats Group
Lilian Garcia	West Africa Sustainability Coordinator	Natural Habitats Group
Mustapha John Bull	Plantation Manager	Natural Habitats Sierra Leone Ltd.
Yufusu Moiwa	Sustainability Manager	Natural Habitats Sierra Leone Ltd.

The overall responsibility for the development, day-to-day coordination, and administration of the implementation of the Environmental Social Management Plan (ESMP) lies with Natural Habitats' Executive Management.

The Sustainability team at headquarters will provide key support to all the local managers in each key area of the organization. Since Natural Habitats is an integrated group, it is very important that the guidance and NH policies and procedures are tailored and updated to fit the local context. Figure 32 shows how the sustainability-ESMP team is structured and how the support is aligned to each key area.

An Environmental-Social Management Unit (EMU) will be established to assist the organisation in the implementation of the actions to avoid, minimize and/or mitigate potential social and environmental Impacts.

Natural Habitats will form a Health and Safety Committee (HSC) that will meet regularly to address pertinent issues for the prevailing phase of works, non-compliances with the ESMP and actions needed in order to comply. Environmental management (protection) and monitoring plans schedule will be prepared by contractors and the NH team in accordance with the Project's ESMP.

Natural Habitats will be responsible for developing and implementing public relations procedures and communications for the Project to ensure the continuation of consultation process ensure transparency and build up trust and confidence about the Project. Regarding environmental and social impacts, Natural Habitats will use its public relations procedures and communications to make known details of the Project, it's time schedule and impacts.

In order to establish a direct communication channel that will ensure a proper land acquisition process Development and Grievance Committee has been established. The committee is directly involved in the negation process and provides a valuable feedback.

Natural Habitats will create the position of Health, Safety and Environment (HSE) Manager to ensure that the mitigation measures and other requirements set forth in the ESMP are adhered to. Natural Habitats will appoint a HSE Coordinator during the plantation development and the mill construction and operation phases of the Project.

The following guidelines will apply to the functions of the HSE Coordinator:

- The HSE Coordinator should have the ability to understand the contents of the ESMP and explain it to the different contractors, the site staff, the supervisors and any other relevant personnel;
- The HSE Coordinator would have to be on site to supervise environmental actions associated with plantation development and mill construction and operation activities;
- The HSE Coordinator should be able to understand, interpret, monitor, audit and implement the ESMP;
- He/she must give feedback to his/her hierarchy in the form of a written report.

4.1.1.1 MAIN MONITORING OBJECTIVES

Air Quality

- To measure emissions of particulate matter (PM), CO2, CO and NOX on an annual basis to confirm if emissions from the POM are within the guideline limits set by relevant standards;
- To measure concentrations of dust and gaseous emissions at selected locations surrounding the Project area, so that the results can be assessed in relation to relevant international air quality standard.

Biodiversity

- To document terrestrial flora and fauna prior to land clearing for each planting phase;
- Surface water and groundwater.

Some groundwater monitoring is performed in accordance with permit requirements.

- To evaluate compliance of water quality with the standards set by the permit;
- During the palm oil mill operations, to monitor surface water on a monthly basis at the main discharge points within the Project area;

- To assess the effectiveness of environmental management actions designed to minimize surface water contamination;

- To document changes in surface water flow if they occur;

- Soil.

To assess the effectiveness of environmental protection measures aimed to:

- Minimise erosion;

- Maximise sediment retention in surface runoff;

- Minimise suspended solid loads downstream of disturbed areas;

- Noise;

- Noise levels have to be taken on a monthly basis to ensure that noise levels produced by operation of the mill machinery and equipment do not exceed the applicable standards;

- Transportation;

- To document disturbances to local villagers due to equipment or product transportation if they occur;

- To avoid traffic accidents by respecting road signalization;

- To mitigate nuisance of increased traffic due to increased noise level;

- Minimise GHG emissions, through reduction strategies.

Social Monitoring

- To anticipate impacts potentially caused by incoming workforce;

- To evaluate the effectiveness of recruitment policy to give preference to local residents;

- To identify community concerns so that they can be addressed before they develop into serious community relations issues;

- To ensure that grievances are resolved and do not escalate into conflict;

- To ensure food security;

- To evaluate local community perception towards the Project during plantation development and operational stage;

- To support government and local communities to prevent and to combat diseases;

- To ensure that the opportunity for the spread of disease between the non-local workforce and local residents is kept to a minimum by multiple sensitisation meetings;

- Avoid any deterioration in public health and environmental sanitation as a result of the project.
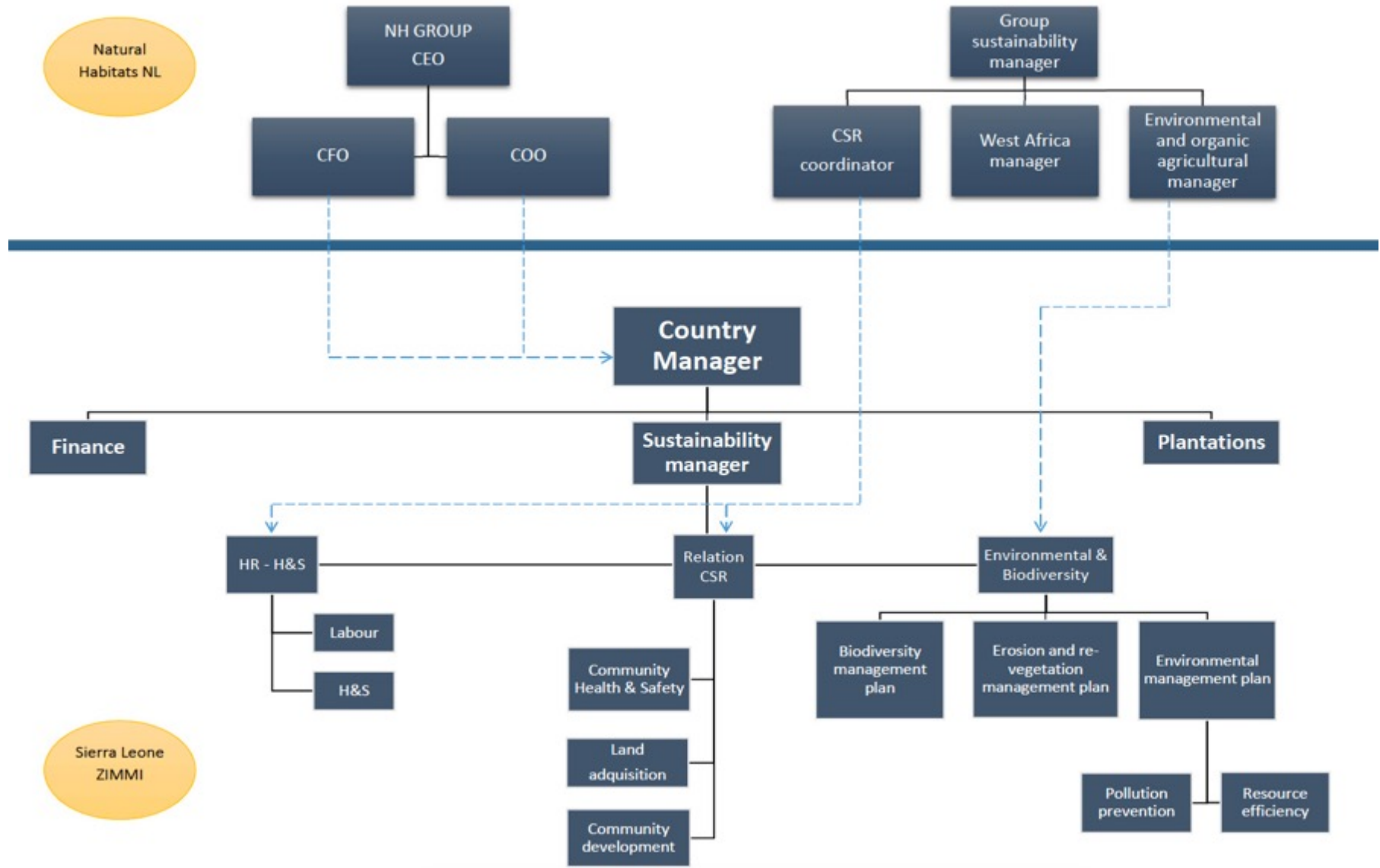
Figure 32 Sustainability-ESMP Team

Table 13 Responsibilities with Regard to the Implementation of the ESMP

Operational Area	Operational Process	Section	Scope of Management
Nursery, and plantations development (including smallholders)	Production	Planning	Annual planning/ new certification project
	Organic management and yield intensification program	Agriculture	Organic management plan. Protocol for yield intensification. Training, (content) and plan. Records, evaluation system. Organic evaluation and protocol for selection.
		Environment	Environmental impact mitigation. Biodiversity enhancement plan - HVC identification and training package. Agro-ecology plan: - Waste Management Plan - KPI on waste, water, energy reduction - All activities on CO2 GHG emissions monitoring and reduction strategies.
	Compliance with social and labour laws - Fair trade scheme and fund management	Social	Social baseline for communities and production areas. Social Action plan (to mitigate impact and to promote the Social areas of NH). Guidelines for HR Management (field). Fair price scheme.
	Farmers ICS - Management system	Certifications (Systems-processes)	ICS - Records, system to manage sourcing, and product integrity. Risk assessment. Supply chain development. Health and Safety package (H&S plan, monitoring). Contingency plans.
Mill (CPO)	Business plan	Planning	Business plan (annual targets - up to 3 year projections).
	Operations	Certifications (Systems-processes)	Operations management.
			Traceability (risk assessment).
			Food and safety (HACCP-GMP-Food Integrity - Quality).
			Health and Safety.
		Social	HR management - social responsibility.

			Community Impact Mitigation - social responsibility.
		Environment	Environmental Impact Mitigation - Biodiversity Enhancement. GHG emissions monitoring and reduction strategies.
Exports - General administration	Supply chain certification (product integrity)	Annual planning	Annual planning (SCC, continuous improvement).
		Certifications (Systems-processes)	Traceability (risk assessment).
			Food and safety (HACCP-GMP-Food Integrity - Quality). Recall protocol.
		Social	HR management - social responsibility (surveillance for the local laws compliance).

4.2 ESIA MANAGEMENT AND MONITORING

In the table below, potential environmental and socio-economic impacts are presented together with their proposed management and monitoring recommendations.

Table 14 ESIA Management and Monitoring Recommendations

Parameter to be monitored	Proposed Enhancement / Mitigation Measures	Location	Measurement	Frequency	Responsibility	Estimated time-frame for completion of task
Ecological Impacts - Loss of habitats of diverse species of flora and fauna.	• Habitat survey including areas suitable for protected areas, ecological corridors and buffer zones within the plantation; use of available remote sensing materials and field surveys; detailed in the plantable area, more general in the outgrower areas; team of local and international consultants. • To attenuate the loss of species, corridors will be left out to help the evacuation of the animals. Corridors facilitate the natural patterns of migration and will probably be most successful at protecting species. • Biodiversity Management Plan, including delineation of important habitats to be left outside of plantation areas, including riparian zones, remnants of forests, wetlands, habitats of suitable fauna, vulnerable species, biodiversity/ecological corridors, etc. The use of buffer zones.	Within the concession	Terrestrial Biodiversity Study - Identifying various flora and fauna species and habitat, and monitoring the concentration of endangered species. Land preparation is done of stages to facilitate animal evacuation. Aquatic Biodiversity Study – biological inventory of phytoplankton, invertebrates, macroinvertebrates and macrophytes.	Annually	Natural Habitats' Environmental, Health and Safety Manager /Biodiversity Expert/Sustainability Manager/External laboratory	Continuously

	• Outgrowers will be sensitised on biodiversity issues; outgrowers will be discouraged from establishing plantations within 4 km of the Gola Forest Reserve located north of the plantable area. • Monitoring of the situation, using remote sensing techniques (part of environmental monitoring). • Natural Habitats has a very strict no poaching policy. No hunting activities are allowed within the plantation area and regular monitoring for traps is done. • Herpetofauna are supported through the preservation of the natural wetland areas. A monitored with aquatic biodiversity study.				
Hydrological, drainage and water quality (deterioration and change in local hydrology)	• A buffer zone of 50m either side of the large rivers and 30m around wetland areas, in the concession to minimise sedimentation and river bank erosion. • Design and construction of the waste water treatment system (mechanical- biological treatment). Proper operation and maintenance of the mill and POME. • Identify and implement a technical solution to allow the use of treated wastewaters for irrigation of oil palm plantations to prevent non-compliance with standards and guidelines regarding the quality of the mill's effluent and negative impacts in the rivers. • Consider hydrology during the design of the infrastructure (bridges (high/low water marks).	Upstream and downstream of mill on the Surrounding Rivers (when mill is in place).	Visual inspection to verify adherence to the buffer zone surrounding water sources. Measuring of water quality in boreholes and rivers - pH, conductivity, TDS, nitrate, coliforms, colour, odour, turbidity, BOD, COD, oil/grease. % of plantation with leguminous cover crops. Water monitoring program is done	Monthly	Natural Habitats' Environmental, Health and Safety Manager Water Quality/Environmental Consultant/Hydrologist/Hydrogeologist	Continuously

	• Leguminous cover crop established will minimise soil erosion by reducing the depressive power of raindrops and acts as an impediment to surface run off. • Water monitoring program is implemented to observe seasonal trends in groundwater and surface water levels to continuously confirm safe use of the resource.		monthly to record changes in water levels.			
Air quality (deterioration)	• The company will comply with the requirements of relevant environmental laws for exhaust emissions from equipment and vehicles. During purchasing of machinery preference is made to equipment that have lower emissions. • All vehicles carrying demolition waste must be covered to prevent the spread of dust and demolition material. • Proper operation and maintenance of the boiler plant and the dust control systems, including aiming at lowest possible moisture content of the biofuel used at the plant. • If air pollution problems are encountered, the mill shall improve the dust removal system. • No-burning policy to be implemented and monitored at the plantations. • Dust control plan for the roads, basic approach being the reduction of vehicle speeds close to the communities; spraying with water, if needed.	Within the concession	Maintenance records and emissions levels of all machinery used by the company. Measuring of - PM10, NOx, CO2, CO, TSP from mill chimneys.	Once there is a mill the monitoring will be twice per year.	Natural Habitats' Environmental, Health and Safety Manager/Air Quality/Environmental Consultant	Continuously.
Solid Waste Management Issues	• Waste Management Plan as a part of the ESAP, including responsibilities and supervision of the landfill.	Within the concession	Assessment of implementation of	Twice a year	Natural Habitats' Environmental,	Continuously

		waste management plan.		Health and Safety Manager /Environmental Consultant/Was te Management Expert	
	• All the waste formed at the mill will be utilised, either as fuel or as soil conditioner in the plantations.				
	• Construction of a proper sanitary landfill for household and office waste and other waste, including construction waste; for the company's wastes only.				
	• Municipal solid wastes (combustible or non-combustible) shall be collected through the solid waste management system set up for the Project.				
	• No materials containing PCBs or asbestos will be used for construction.				
	• All hazardous wastes generated by the project operations will be transported to waste disposal facilities outside the proposed POM area.				
	• Transportation of all hazardous wastes would be conducted in full compliance with Sierra Leonean laws.				
	• A recycling plan will be implemented for all solid wastes including office materials where possible.				
	• Waste lubricants, lube oil and/or solvents would be re-used, recycled or disposed in environmentally appropriate ways.				
	• Where possible. Demolition wastes from the removal of existing roads should be reused during the construction of new roads and other construction works on sites.				
	• No materials containing PCBS or asbestos will be used in any construction.				

| Soils (fertility, stability, acidification, and impact of erosion) | • The primary amount of field preparation is carried out during the dry season, this is to avoid the risk of soil compaction and erosion.

• Prepare, implement, and monitor an erosion and sediment control plan, which includes measures appropriate to the situation to intercept, divert, or otherwise reduce the storm water runoff from exposed soil surfaces.

• Align the planting lines so that they run perpendicular to the direction of the slope (following the curves of any slope).

• Integrate vegetative and non-vegetative soil stabilization measures in the erosion control plan (e.g. leguminous cover crops, mulching organic matter during land clearing).

• Minimisation of the use of chemical fertilisers at plantation. Take other measures according to best practices to prevent contamination of surface and ground waters.

• The oil palms will be fertilised organically (with empty fruit bunches and using leguminous cover plants) and chemically.

• Relatively small amounts of chemical fertilisers will be used based on real needs. | Within the concession | Erosion and sediment plan is implemented during the plantation establishment. Soil Assessment - Gravel content, sand, silt and clay content, texture, pH, organic carbon, total nitrogen, total and available phosphorus, exchangeable bases like Ca, Mg, Na, exchangeable acidity and ECEC. | Annually | Natural Habitats' Environmental, Health and Safety Manager /Environmental Consultant/Soil Expert | Continuously |
| Occupational health and safety issues | • Sanitation improvement projects as a part of the Natural Habitats' Community Development Action Plan (CDAP) (e.g. rehabilitation of wells at the villages, construction of | Within the concession | Evaluation of CDAP progress. Evaluation of H&S implementation. Invoices and number of | Twice a year. | Natural Habitats' Environmental, Health and | Continuously |

	• Establishment of a company clinic, so that the communities' health care systems are not overburdened. • Management staff will be given responsibilities to take care of H&S issues in three sectors (plantations, mill, outgrowers and transportation); these responsibilities will be defined also for the mill construction and plantation establishment phases. • Preparation of the H&S policies, rules, and procedures (including also issues related to prevention, monitoring, bookkeeping, reporting and investigation, corrective actions, etc.) • The management shall arrange and supervise the H&S training given to the construction workers, the mill and plantation workers and the outgrowers. • Regular supervision of the adherence to the H&S rules, e.g. the use of protective equipment, especially in application of herbicides and pesticides. • Workers must wear PPE during their work, workers are only allowed on site if they have correct PPE on. • Smoking is prohibited (and any other open flames) within the vicinity of chemical and hydrocarbon storage facilities and refuelling/maintenance areas. • Fire extinguishers are keep in high risk areas for use during accidents.		fire extinguishers. First aid kits (inventory and expiry dates), pregnant woman are noted and reassigned work away from agrochemicals, until they have finished breast feeding. Blood screening of agrochemical employees is done twice yearly, the results are keep by the company and copy given to the employee for his own records. Washing stations are erected next to storage facilities. Records of anti-venom use, storage conditions and expiry dates on venom. H&S training records (given once per year and during induction for new employees).	Safety Manager /Occupational Health & Safety Specialist	

proper latrines, testing of dry toilets etc.; communities commit to the maintenance of the wells and latrines).

	• Pregnant and breast feeding women are prohibited from working with any agrochemicals and reassigned to appropriate work duties. • First aid kits are distributed in the different plantation areas, these are always within the expiry dates and workers as part of their H&S training receive guidance on how to use the contents. • Conduct regular blood screening of employees that handle and apply agrochemicals. • Eye wash and emergency stations are built next to agrochemical storage facilities. • Anti-venoms for common poisonous snakes in the year are keep in the company's medical centre. Storage conditions are maintained constantly (refrigerated). • All workers as part of H&S training will receive training of safety in the field (such as identifying and avoiding snakes), and what to do in case of bites.					
Water pollution due to sewage from base camp or agro-chemical usage	• Design and construction of the waste water treatment system mechanical- biological treatment. • Identify and implement a technical solution to allow the use of treated wastewaters for irrigation of oil palm plantations to prevent non-compliance with standards and guidelines regarding the quality of the mill's effluent and negative impacts in the river.	Upstream and downstream of mill on the surrounding water courses.	Measuring of - pH, conductivity, TDS, nitrate, coliforms, colour, odour, turbidity, BOD, COD, oil/grease	Before mill – annually. With mill - monthly	Natural Habitats' Environmental, Health and Safety Manager /Environmental Consultant/Wat er Specialist	Continuously

	• Proper storage tanks with secondary containment for oils and other chemicals at the mill, including oil and chemical book-keeping. • Proper chemical storage to be constructed for plantation chemicals, including pesticides and fertilisers, to minimise risks for human health and the environment, including chemical book-keeping. • Emergency response plan and equipment available and appropriate training given to the staff.				
Water or soil pollution from chemical storage	• All effluent exiting from mechanical workshops, garages and similar facilitates will have their own independent drainage system, which will be enhanced with oil/water separators to ensure that no oily hydrocarbon exits to the outside of these facilities. • Proper storage tanks with secondary containment for oils and other chemicals at the mill, including oil and chemical book-keeping. • Machinery (vehicles, trucks, motorbikes) are maintained to good condition to prevent oil leakages. Waste oils from the machinery is treated is correct way to prevent water or soil pollution. • Areas to be used for fuel storage and refuelling are constructed with precautionary measure to ensure safe operations (e.g. spill kits, retaining walls etc.). Contaminant trays around fuel storage tanks (diesel etc.) are installed. All storage tanks should be above ground and in bunds with impervious liners.	Within the concession	Evaluation of storage of chemicals and safety standards, machinery maintenance records, record keeping and invoices of emergency response equipment.	Monthly	Natural Habitats' Environmental, Health and Safety Manager /Environmental Consultant/Soil expert	Continuously

	• Proper chemical storage to be constructed for plantation chemicals, including pesticides and fertilisers, to minimize risks for human health and the environment, including chemical book-keeping. • Emergency response plan and equipment available and appropriate training given to the staff.				
Pest Management	• Integrated Pest Management Plan to be implemented to minimise the use of pesticides (no use of paraquat by Natural Habitats and its outgrowers, replaced by weeding by hand in the plantations and nursery). • The encouragement of biological control of pests, including planting nectar-producing plants: the adoption of agronomic methods that minimise the risks of pest outbreaks; and use of selective chemicals and application methods with minimal side-effects. • Proper chemical storage to be constructed for plantation chemicals, including pesticides and fertilisers, to minimise risks for human health and the environment, including chemical book-keeping. The buildings are lockable with concrete floors.	Within the concession	Evaluation of pest occurrences and treatments. Storage conditions and records. IPM practices will be recorded and monitored.	Monthly	Natural Habitats' Environmental, Health and Safety Manager /Environmental/ Pest Consultant	Continuously
Emission of pollutants which result from transportation of FFB to the palm oil mill and CPO to market centres	• The dust and noise generated that will be generated by the transportation of the fresh fruit bunch and the palm oil can be attenuated by the installation of traffic signage, speed limitation, installation of speed bumps, the reduction of vehicle speeds in the fields and near communities and	Within the concession (particularly surrounding the mill and office)	Monitoring of dust and noise levels (particles and decibels). Maintenance records of machinery.	Weekly	Natural Habitats' Environmental, Health and Safety Manager /Traffic Expert/Environ	Continuously

and increased traffic	spraying with water, if needed. PPE of face masks are used by those exposed to high dust levels. • Regular maintenance of machinery (vehicles etc.) in good operating condition to minimize greenhouse gases emissions.				mental Consultant
Emission of pollutants that result from combustion of fibre and palm nuts and fossil fuel used in the standby generators	• Proper operation and maintenance of the boiler plant and the dust control systems, including aiming at lowest possible moisture content of the fuel used at the plant. • If air pollution problems are encountered, the mill shall improve the dust removal system. • No-burning policy of Natural Habitats to be implemented and monitored at the plantations.	Within the concession	Regular maintenance records are maintained and verified every month. Air quality monitoring will be carried out at the point source and in specific locations (selected in accordance with the dispersion model), around the mill is monitored using an appropriate device. Signs of burning on the plantation are closely monitored and any fires are recorded.	Weekly and monthly	Natural Habitats' Environmental, Health and Safety Manager/Enviro nmental/Air Quality Consultant	Continuously
Noise nuisance	• In areas where excessive noise may occur, noise countermeasures should be applied, such as acoustic insulation. • Natural Habitats will ensure that the location of the POM is far from existing residential and that the noise in the environment is not major problem.	Within the concession	Monitoring of noise levels during different operations and locations	Monthly	Natural Habitats' Environmental, Health and Safety Coordinator /Noise Expert	Continuously

	• Noise Monitoring Programme is undertaken to ensure noise levels are kept within acceptable levels. • A HSE coordinator will endeavour to keep noise generating activities associated with construction activities to a minimum and within working hours. • Machinery and engine-operated equipment should be fitted with adequate silencers or mufflers to help minimise the noise they generate. Efforts should be made to keep the noise level to the World Bank Guidelines Standard limit of 85 decibels (dB).					
Job Opportunities/Employment of Local Residents	• The senior management of Natural Habitats will receive and review periodic assessments of job opportunities/employment of local residents and the effectiveness of the plans (CDAP, ESMP etc.) as well as unusual events that have occurred and have resulted in environmental and or social impacts (some unusual events may require immediate notification).	Local communities	Annual reports are provided for the affected communities on issues that are of concern to those communities (e.g. Makpele Chiefdom Council about the progress in implementation of the ESMP and CDAP).	Annually	Natural Habitats (SL) Ltd /Social Scientist/Researcher	Continuously
Small holder and out-grower scheme	• The senior management of Natural Habitats will receive and review periodic assessments of the Smallholder/Out-grower Scheme.	Within the concession	Annual report with assessment of schemes.	Annually	Natural Habitats (SL) Ltd /Social Scientist/Researcher	Continuously
Economic development in the region	• The senior management of Natural Habitats will receive and review periodic assessments of economic development in the region.	Within the concession	Annual report with assessment	Annually	Natural Habitats (SL) Ltd /Social Scientist/Researcher	Continuously

Social welfare, improvement of local skills and enhanced access to markets for the local famers	• The senior management of Natural Habitats will receive and review periodic assessments of social welfare, improvement of local skills and enhanced access to market for the local farmers.	Within the concession	Annual reports are provided for the affected communities on issues that are of concern to those communities (e.g. Makpele Chiefdom Councils about the progress in implementation of the ESMP/ESAP and CDAP	Annually	Natural Habitats (SL) Ltd /Social Scientist/Researcher	Continuously
Loss of or reduced access to agricultural land livelihood assets/food security	• Natural Habitats to keep track of planned and implemented plantation areas, and to secure that enough land is left for agriculture and collection of forest/garden products in the concession area; linked to the plantation management and environmental monitoring systems • Regular consultations with local communities; use of a grievance system • Monitoring of the land use situation, the disbursement and distribution of the lease payments, and the operation of the grievance system by an independent actor. • Programme and relevant plans (CDAP, ESAP etc.) as well as unusual events that have occurred and have resulted in environmental and or social impacts (some unusual events may require immediate notification).	Within the concession	The senior management of Natural Habitats will receive and review periodic assessments of loss of or reduced access to agricultural land livelihood assets and the effectiveness of the environmental management.	Twice a year	Natural Habitats (SL) Ltd /Social Scientist/Agricultural Researcher	Continuously
Population movement and potential conflicts from related to	• The senior management of Natural Habitats will receive and review periodic assessments of potential conflicts from unrealistic expectations held by the communities with regard to benefits created by the project.	Within the concession	Annual reports are provided for the affected communities on issues that are of	Annually	Natural Habitats (SL) Ltd /Social Scientist/Researcher	Continuously

labour and unrealistic expectations held by the communities with regard to benefits created by the project			concern to those communities (e.g. District and Chiefdom Councils about the progress in implementation of the ESMP/ESAP and CDAP).			
Vehicular traffic and safety risk	• Road safety programme to be designed and implemented (speed limits, road bumps at the risky areas, possible speed control equipment in company trucks, training of drivers, monitoring of compliance). • Safety awareness campaigns arranged at villages and at schools.	Within the concession	Traffic Count (Average Annual Daily Flow by vehicle types), Number of accidents/incidents.	Monthly	Natural Habitats (SL) Ltd /Traffic Consultant	Continuously
Archaeological sites	• If during land preparation an archaeological site or item is discovered, work will be immediately stopped and the relevant authorities contacted to give guidance on how to proceed.	Within the concession	Communication records with authorities concerning discovery. Evidence of supervised treatment e.g. removal of artefacts.	With the discovery of an archaeological significant item or place.	Natural Habitats (SL) Ltd. Plantation Manager	Continuously
Road and related infrastructure	• Roads are designed to follow the geographical features of the landscape (topography, contours). • Erosion of constructed haulage roads will be minimised through drainage construction, intensive compaction and by allowing trees to overhang the roads thereby reducing the impact of rain on the ground. • Roads are constructed perpendicular to the predominate slope to reduce risk of erosion.	Within the concession	Road maintenance records.	Monthly	Natural Habitats (SL) Ltd. Plantation Manager	Continuously

	• Road maintenance is regularly done to prevent the degradation of the road surface. • Ditches are established for storm water run-off.				

4.2.1.1   KEY PERFORMANCE INDICATORS (KPIS)

In order to achieve the aims of the ESMP the use of Key Performance Indicators (KPIs) will be followed. KPIs are tools to facilitate effectiveness of the monitoring process and the indicators include:

Air (ambient + emissions):

- Carbon dioxide (CO_2)
- Carbon monoxide (CO)
- Nitrogen oxides (NOX)
- Methane (CH_4)
- Particulate (PM10)
- Greenhouse gas emissions from fuel use in field and mill operations

Soil and Water:

- Total Hydrocarbons (TH)
- Biological Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Total Suspended Solids (TSS)
- Agrochemicals (N, P, K, Mg)

Noise:

- Noise level measurements

Quantity of water produced:

- Monitoring of POM effluent discharged

Hazardous and domestic waste produced:

- Monitoring of Waste Management Plan

Pesticides

- Monitoring of Pest Management Plan

The frequency of sample monitoring is to be guided by internationally accepted good environmental practices. Records shall be kept of all monitoring for future reference and guidance.

The Environmental Monitoring Plan could cover the following:

- General environment
- Air emissions
- Biodiversity
- Surface water and groundwater
- Soil
- Noise and dust emissions
- Social monitoring

4.3   HCV MANAGEMENT AND MONITORING

The total number of hectares allocated as HCV management areas area:

- The GRNP and leakage belt (19.234,4ha);
- All wetlands and rivers – including the 50m buffer zone (4.870,78ha);
- Riparian forest (1608,49ha);
- Natural Forest Remnants (1686,24ha);
- Settlements and sacred sites (305,93ha);
- Cultivated areas (740,55ha).

4.3.1.1   THREAT ASSESSMENT

Current threats to HCVs on site are listed in Table 15. The proposed oil palm plantation is anticipated to result in a loss of habitat, including HCV areas. When an area has been identified to hold outstanding significance or critical importance by the HCV assessment, management measures should be implemented to secure its value. This does not necessarily preclude development, however and three primary management options are prescribed (Jennings, 2004):

- Protection of the area (through reserves, zones and;
- Modifications or constraints on operations (mitigation measures will be provided to reduce the overall impact on natural areas) and
- Restoration activities (forest integrity can be restored with rehabilitation interventions or removal of alien plants).

Table 15 Main Current Threats to the HCVs Identified in the Project Area

HCV Type	Stressor	Potential Impact	Source	Note
HCV 1	Loss of forest remnant habitat	Very high	Illegal logging	Remnant forest area is reducing due to illegal logging. This result in loss of Red Data trees, as well as habitat for threatened fauna.
HCV 3	Loss of riparian forest	High	Expansion of communities into natural areas	Natural areas have been cleared for local villages, often on the edge of forests and wetlands.
			Expansion of cultivation into natural areas	Clearing for cultivation of Sorghum, Cacao and other crops was observed.
HCV 3	Loss of faunal diversity	High	Hunting for bushmeat	Red Data fauna were recorded at local markets and in captivity in villages.
HCV 4	Loss of wetland areas	Very high	Conversion of wetlands to rice paddies	Rice paddies were found to be planted in some

				wetland areas and this is likely to increase.
HCV 5 & 6	Degradation of water quality	Medium	Water contamination from local household use	Sewage effluent is released into wetlands. Locals make use of rivers to bathe and wash clothing/general household items.

4.3.1.2 MANAGEMENT AND MONITORING

No additional areas have been included as HCVMA's other than the HCV areas identified on site, covering 25.293,13ha. If the HCV areas outside of the leakage belt are preserved, the link to the GRNP will be maintained.

The following recommendations were made for monitoring and management:

■ Maintain and manage the buffer (leakage belt) at the interface between the Natural Habitats concession and the GRNP. The decision by Natural Habitats to establish a 4km buffer zone across the northern boundary bordering the GRNP is commendable and should mitigate any direct and indirect ecological impact on the GRNP;

■ The Mano River represents the border between Sierra Leone and Liberia and the 50m buffer along the banks of the river needs to be appropriately managed;

More people are expected to move into the Makpele Chiefdom due to the expectation of emerging employment opportunities from the proposed oil palm project. Appropriate educational programmes should be defined with local government authorities, to provide adequate social infrastructure and services to make people less dependent on the natural resources of the area;

■ All remnant forest patches such as the pocket of forest adjacent to Kaina village and other ecologically sensitive areas such as wetlands, riparian vegetation should be left untouched within the concession. Those areas that are not suitable for the planting of oil palm and must remain undeveloped to serve as biodiversity plots which must be managed as integral part of the plantation. Biodiversity corridors serve as suitable habitat for remnant fauna and flora and are important for

local biodiversity on the concession. All forms of habitat degrading activities such as hunting, farming and logging must be prohibited from the biodiversity management areas (MA's) and corridors;

■ It is recommended that fauna and flora monitoring with a focus on habitat, vegetation, large and small mammals, birds, reptiles, fish, and amphibians be facilitated on an annual basis. Results of these studies will provide site specific mitigation and management for the biodiversity within the concession for Natural Habitats;

■ It is recommended that roads be carefully maintained with appropriate drainage ditches. Gabions and other erosion mitigation measures may be applied wherever necessary.

■ Recommendations to manage illegal bushmeat hunting:

  ▪ Hunting for bushmeat by outsiders will need strong measures to limit this:

  ▪ Using gates or booms on forest roads where people enter with vehicles;

  ▪ Using forest guards to patrol the area;

  ▪ Information and education about the most endangered species;

  ▪ Working with government Wildlife Departments and the GRNP to report incidents and help ensure unlawful hunting does not occur; and

  ▪ Signs warning against illegal activities.

In terms of meeting RSPO requirements, Natural Habitats is required to adhere to the following:

  ▪ Identify specific MAs within the concession area;

  ▪ Develop and implement a management plan and associated maps for each of the MAs that can be easily applied by staff working on the ground;

  ▪ Develop and implement a monitoring plan for each of the MAs; and

  ▪ Do not expand into areas of natural forest as per RSPO regulations.

Overall threats to HCV areas identified and proposed mitigation actions are presented in Table 16.

Table 16 Mitigation and Monitoring of HCV's

Affected HCV	Impact	Description of the (Potential) Impact	Proposed Mitigation Actions	Monitoring Actions
HCV1: Species diversity	Loss of species diversity	There is a potential impact of loss of species diversity (if any of the forested areas or wetlands be cleared for planting)	• The GRNP and the associated leakage belt should be completely excluded from the development. • A farming education program with a focus on reducing the reliance on bush meat and increasing the reliance on domestic animals would reduce the hunting pressure on these animals. • An environmental education programme should be initiated by Natural Habitats as a contribution to the local communities and to promote the conservation of the GRNP for its critical biodiversity value.	• Development plans including areas to be excluded are clearly communicated to company employees, communities, and any external contractors. Records of meetings and minutes are kept. • Training programs are conducted and training records are kept, new trainings are conducted with any new farmers and retraining's conducted yearly. • Environmental education program progress is monitoring against process and evidence of implementation in available. • Yearly satellite imagery shows the maintenance of the corridor between riparian forest and the GRNP. • All buffer zones are clearly communicated to company employees, communities, and any external contractors. Records of meetings and minutes are kept. • Records and results of new freshwater surveys are conducted and results communicated to relevant stakeholder. New surveys to monitor populations are conducted every three years. • Collaboration with GRNP concerning a chimpanzee monitoring program is established. Records of meeting and minutes are kept. • Sustainable logging plots will be established in within the plantation using fast growing and non-endangered species. Before the species reach maturity, sustainable logging practices
HCV2, HCV3, HCV4	Loss of habitat will result in the loss of HCV 2, 3 and 4	Loss of habitat will result in the loss of HCV 2, 3 and 4 if any forest remnants or riparian forests are	• The corridor between the riparian forest and GRNP should be maintained. • A buffer of 50m has been placed around the Mahoi and Mano rivers and it is strongly recommended that this	

		cleared for planting. Further to this, wetlands provide critical habitat for important endemic aquatic biota and habitat loss is a major threat. Of particular concern are: Forest remnants; Riparian forest linked to the GRNP; Wetlands; Mahoi and Mano Rivers.	area, as well as the riparian forest is excluded from the plantable area; • Additional freshwater ecological surveys are required in order to determine the presence of cryptic, migratory, and elusive species. • The natural forest remnant areas identified in this report should be incorporated into the chimpanzee monitoring plan for the GRNP in collaboration with the GRNP staff; • Sustainable logging should be promoted in villages adjacent to these forest patches by Natural Habitats as aforementioned for the riparian forests.	will be emphasized (not logging natural forest patches, only cutting fast growing non-endangered species, replacing cut trees with replacement planting).

HCV5, HCV6	Loss of community needs in terms of natural resources	There is no expected risk that the local settlements will be directly affected by the proposed development. Natural Habitats will not plant in any existing villages or settlements. Community needs in terms of natural resources, however, may be lost if the habitats referred to for HCV2, 3, and 4 are lost.	• Villages and farmlands must be avoided. The following MA's should be excluded from the development footprint.	• Development plans including areas to be excluded are clearly communicated to company employees, communities and any external contractors. Records of meetings and minutes are kept. Updated satellite imagery shows that restricted areas are not being developed.

4.3.1.3 SOIL MANAGEMENT AND MONITORING

Management and mitigation measures are not necessary because there will not be any planting on fragile and marginal soils.

4.4 GREENHOUSE GAS EMISSION MANAGEMENT AND MONITORING

4.4.1.1 GHG EMISSIONS ASSESSMENT FOR NEW PLANTINGS

By stratifying the concession into the relevant carbon stocks, it shows an abundance of low carbon stock (shrub and open land) areas that can be used for development. Thus, avoiding areas of high carbon stock that would generate large emissions during conversion. The next stage is to integrate these areas with social and HCV set-asides, as seen in Figure 33. This allows us to identify and avoid HCV areas and community set-asides, in addition to low carbon stock areas.
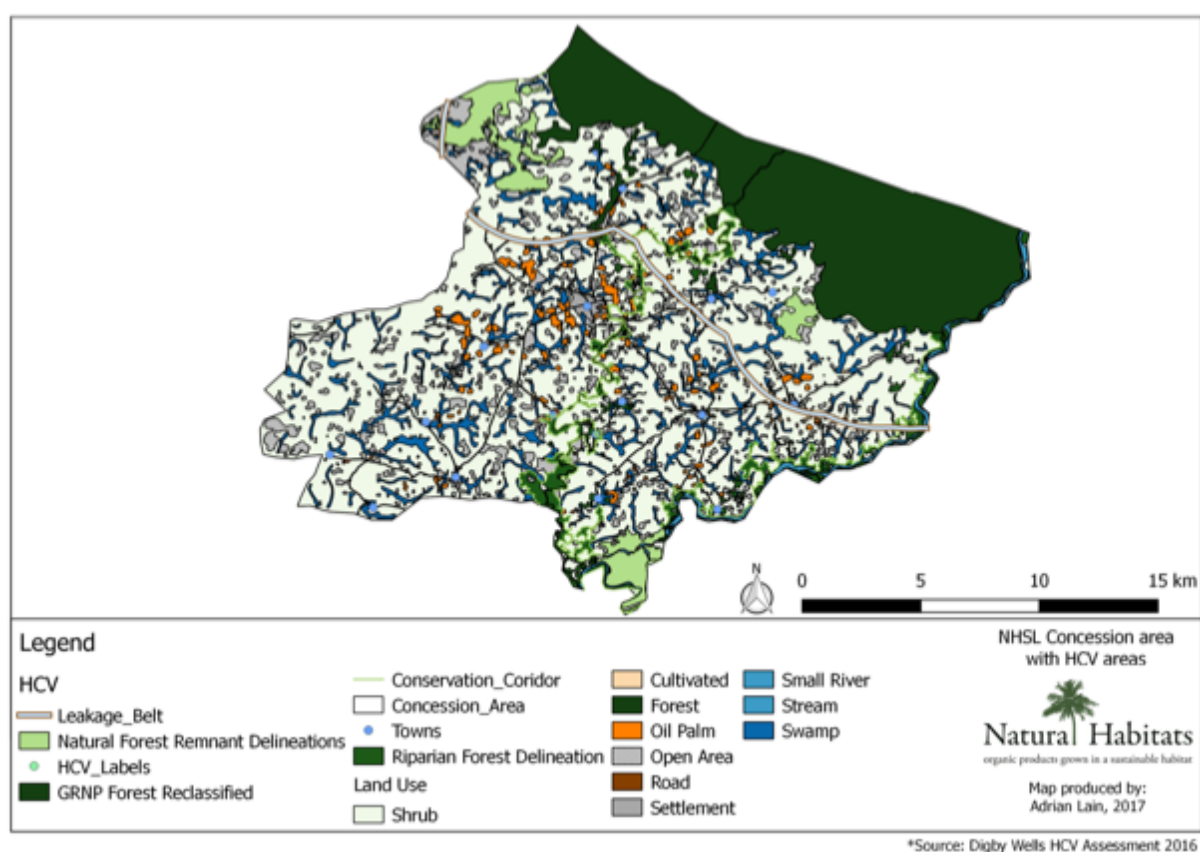
Figure 33 With Integrated Social and HCV Classifications

4.4.1.2 DEVELOPMENT SCENARIOS

Based on carbon stock and HCV maps, two scenarios were developed to estimate the different potential emissions of the proposed NPP area.

Assumptions Used for the Calculator that are the Same for Both Scenarios

- A yield of 20tFFB/ha.
- Fuel use of 63l/ha/yr for field and transport, fuel use in the mill of 0,45lt/FFB processed.
- No conversion of peat soil.
- Vigorous growth for oil palms.

- Oil extraction rate of 22%.
- 100% of POME is diverted to anaerobic digestion ponds.
- 50% of empty fruit bunches (EFB) applied directly to the field, 50% of EFB converted to compost.

Table 17 Description of New Development Scenarios

Scenario One	- Fertiliser use is restricted to the nursery (19ha) and applied at rate of Phosphate[5] 12kg/ha/yr and Potassium Chloride[6] 20kg/ha/yr. This is to maintain the whole plantation as a completely organic operation, as the seedlings are certified organic before they reach the age of commercial production. - All HCS areas are reserved for conservation purposes, preventing the development of these high carbon stock areas.
Scenario Two	- Half the plantation (3750 ha) is managed organically (non-synthetic inputs and compost application), and the other half (3750 ha) is managed conventionally with compound fertiliser application specialised for oil palms (Commercial Name: MPOB 1 with a formula of: 10%N+5,4%P2O5+16,2%K2O+2,7%MgO+0,5%B2O3).[7] With an application rate of 1287kg/ha/yr in the conventional 3750 ha plantation. - All HCS areas are reserved for conservation purposes, preventing the development of these high carbon stock areas.

Table 18 Showing the Main Emission Difference Between the Scenarios

	Scenario One	Scenario Two
Planting Area (ha)	7500	7500
HCS Forest Set Asides (ha)	10185	10185
Combined Fertiliser + N2O Emissions (tCO2e)	3135	13114,02

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[5] X5Y(PO4)3: Phosphate (P2O5) from rock phosphate, K2O from muriate of potash.

[6] Potassium Chloride = MOP = muriate of potash.

[7] Complex fertilizer: N from sulphate of ammonia, P2O5 rock phosphate, K2O from muriate of potash.

4.4.1.3 SCENARIO ONE

Table 19 Projections of GHG Emissions from Scenario One

Summary of results

Field emissions & sinks (Assumes vigorous growth for oil palm - for use by large scale operations)

	t CO_2e	t CO_2e/ha	t CO_2e/t FFB
Land clearing	12.341,08	1,65	0,08
Crop sequestration	-70.215,33	-9,36	-0,47
Fertilisers	395,30	0,05	0,00
N2O	2.740,13	0,37	0,02
Field fuel	1.474,25	0,20	0,01
Peat	0,00	0,00	0,00
Conservation credit	-24.545,85	-3,27	-0,16
Total	**-77.810,43**	**-10,37**	**-0,52**
Mill emissions & credit	tCO_2e	t CO_2e/ha	tCO_2e/tFFB
POME	29.403,52	3,92	0,20
Mill fuel	210,61	0,03	0,00
Purchased electricity	0,00	0,00	0,00
Credit (excess electricity exported)	0,00	0,00	0,00
Credit (sale of biomass for power)	0,00	0,00	0,00
Total	**29.614,12**	**3,95**	**0,20**
Total emissions, tCO_2e (field and mill)	**-48.196**		
Allocation:			
t CO_2e/t CPO	**-1,46**		

Figure 34 Scenario One: Showing Emissions Sources and Sinks

Emission Sources/Sinks
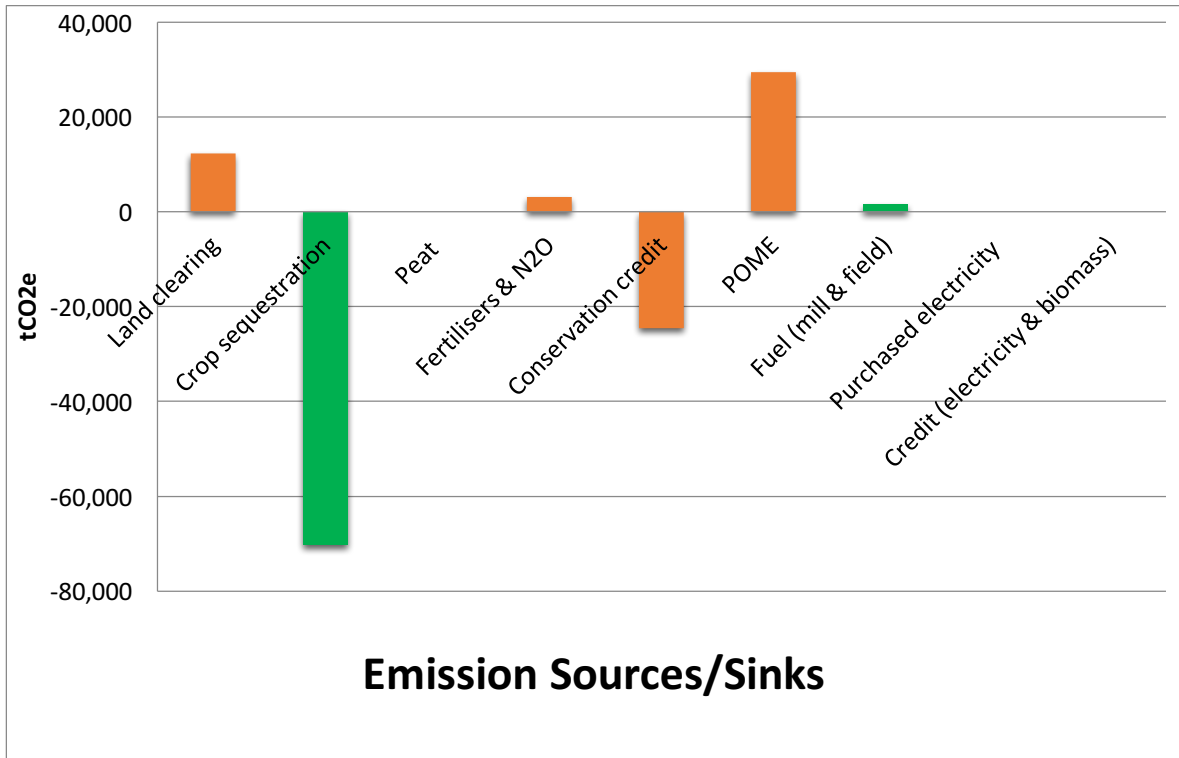
Table 20 Projections of GHG Emissions from Scenario Two

			t CO$_2$e/t
Summary of results			
Field emissions & sinks (Assumes vigorous growth for oil palm - for use by large scale operations)			
	t CO$_2$e	t CO$_2$e/ha	FFB
Land clearing	**12.341,08**	**1,65**	**0,08**
Crop sequestration	**-70.215,33**	**-9,36**	**-0,47**
Fertilisers	**7.381,93**	**0,98**	**0,05**
N2O	**5.732,09**	**0,76**	**0,04**
Field fuel	**1.474,25**	**0,20**	**0,01**
Peat	**0,00**	**0,00**	**0,00**
Conservation credit	**-24.545,85**	**-3,27**	**-0,16**
Total	**-67.831,84**	**-9,04**	**-0,45**
Mill emissions & credit	tCO$_2$e	t CO$_2$e/ha	tCO$_2$e/tFFB
POME	**29.403,52**	**3,92**	**0,20**
Mill fuel	**210,61**	**0,03**	**0,00**
Purchased electricity	**0,00**	**0,00**	**0,00**
Credit (excess electricity exported)	**0,00**	**0,00**	**0,00**

Credit (sale of biomass for power)	**0,00**	**0,00**	**0,00**
Total	**29.614,12**	**3,95**	**0,20**
Total emissions, tCO₂e (field and mill)	**-38.218**		
Allocation:			
t CO₂e/t CPO	**-1,16**		

Figure 35 Scenario Two: Showing Emissions Sources and Sinks
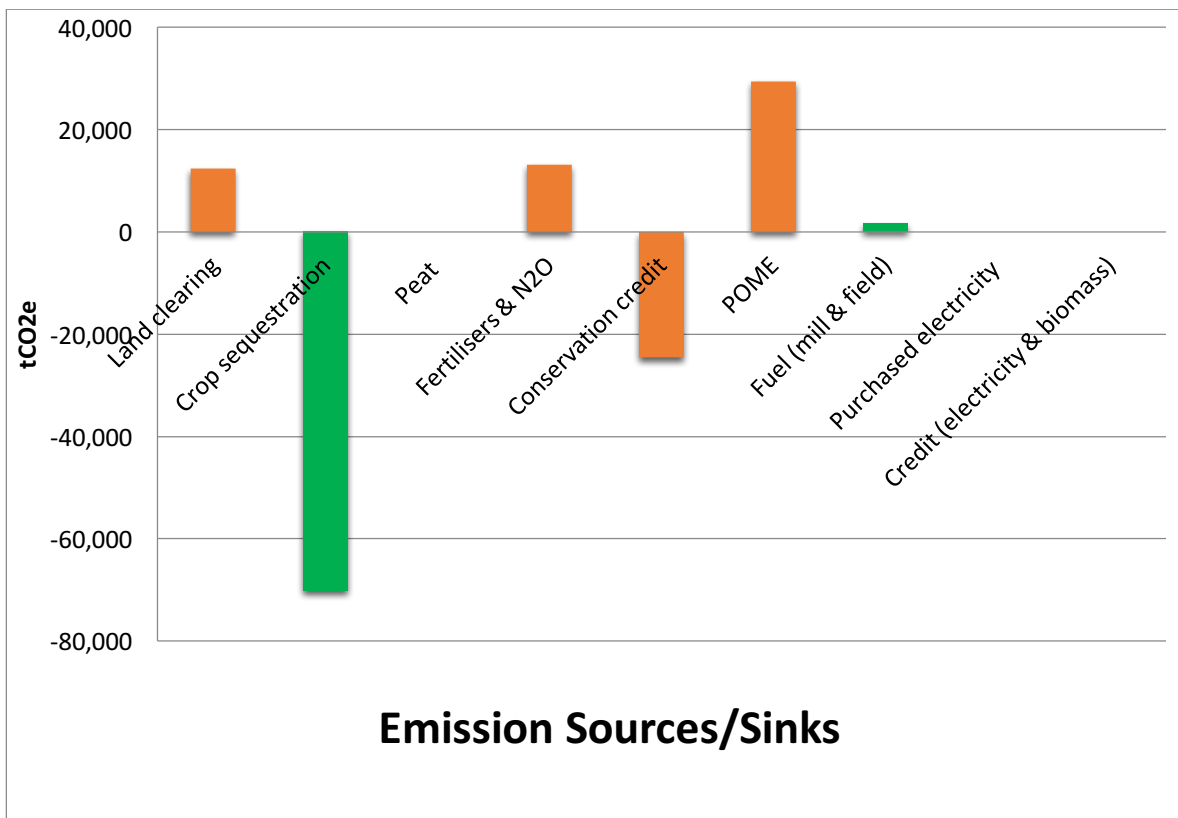
5   CONCLUSION

Both scenarios will net sequestration of CO2 from the atmosphere. However, because of Natural Habitats Group commitment to organic practices Scenario 1 has been selected. This will maximise the developments' ability to mitigate the potential emissions sources of inorganic fertilisers. This will allow all of the 7500 ha plantation to be maintained under wholly organic practices. This scenario also includes conserving all identified HCS and HCV areas, and maintaining appropriate communities' areas. -1,47 t CO2e/t CPO is estimated as the potential emission (sequestration) from our proposed development.
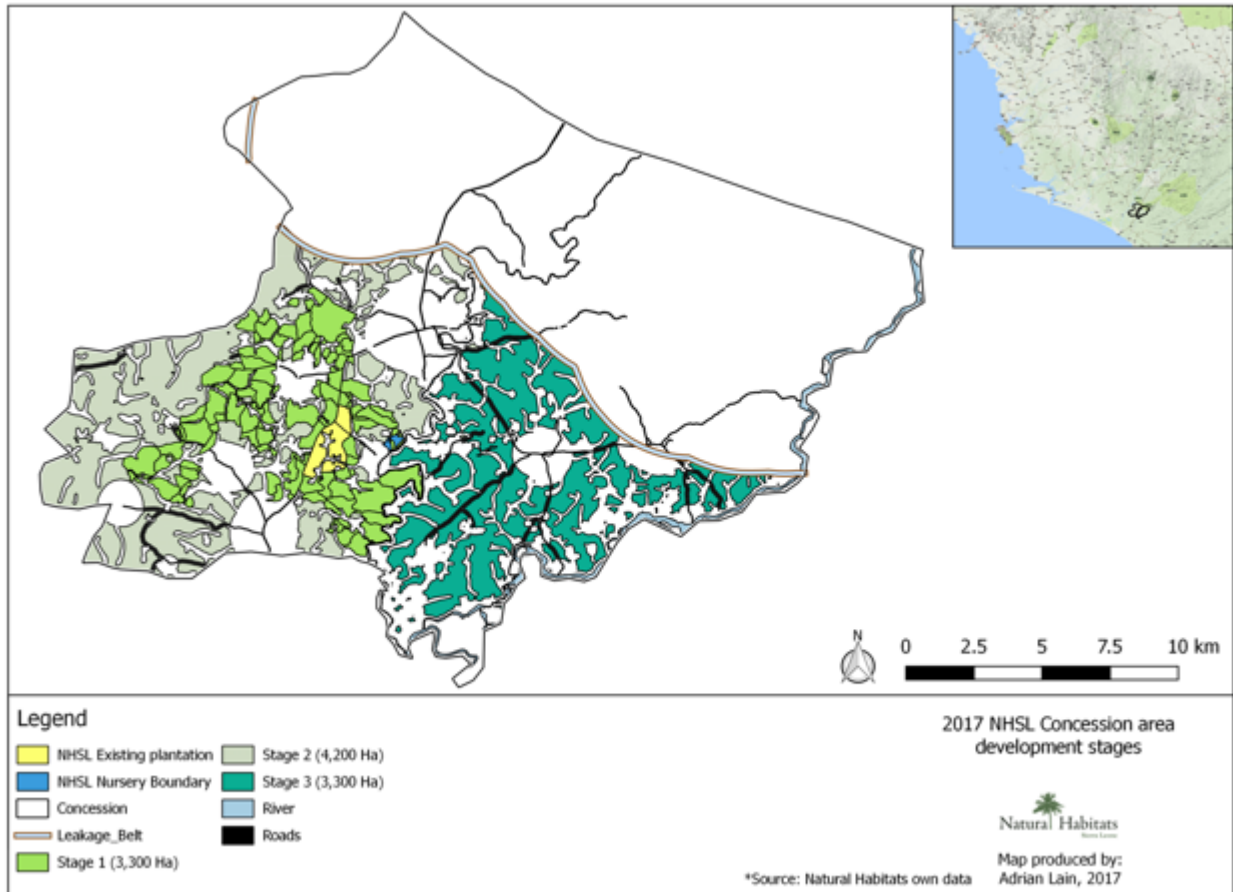
Figure 36 The Development Stages[8]

Figure 36 takes into consideration all constraints of the development;

- Social (community areas with relevant buffer zones);
- High conservation areas (with relevant buffer zones);
- High carbon stock areas (with relevant buffer zones);
- Infrastructure (roads with relevant buffer zones).

The remaining areas of low carbon stock values (shrub and open land) are delineated for development. This is done in two main stages, with land (stage 3) also being allocated for a possible independent outgrower scheme. Stage one and two sees the conversion of 921 ha of open land and 6607 ha of shrubland to oil palm plantation with a combined carbon value of 12.156,28tC.

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[8] Stage 3 is a proposed outgrower scheme.

5.1.1.2 FINAL GHG PROJECTION CHART

Table 21 Final GHG Projection Chart

Summary of results			
Field emissions & sinks (Assumes vigorous growth for oil palm - for use by large scale operations)			
	t CO_2e	t CO_2e/ha	t CO_2e/t FFB
Land clearing	**12.341,08**	**1,65**	**0,08**
Crop sequestration	**-70.215,33**	**-9,36**	**-0,47**
Fertilisers	**395,30**	**0,05**	**0,00**
N2O	**2.740,13**	**0,37**	**0,02**
Field fuel	**1.474,25**	**0,20**	**0,01**
Peat	**0,00**	**0,00**	**0,00**
Conservation credit	**-24.545,85**	**-3,27**	**-0,16**
Total	**-77.810,43**	**-10,37**	**-0,52**
Mill emissions & credit	tCO_2e	t CO_2e/ha	tCO_2e/tFFB
POME	**29.403,52**	**3,92**	**0,20**
Mill fuel	**210,61**	**0,03**	**0,00**
Purchased electricity	**0,00**	**0,00**	**0,00**
Credit (excess electricity exported)	**0,00**	**0,00**	**0,00**
Credit (sale of biomass for power)	**0,00**	**0,00**	**0,00**
Total	**29.614,12**	**3,95**	**0,20**
Total emissions, tCO_2e (field and mill)	**-48.196**		
Allocation:			
t CO_2e/t CPO	**-1,46**		

This new development project is set to take place only on open and shrubland areas, because of these of the low carbon stock type, conversion to oil palm will lead this to be a net sequestration project. Natural Habitats Group is fully committed to not developing on peat soils, high conversation areas, community set-asides and areas of high carbon stock forest as determined through our rigorous assessment and community engagement procedures.

Natural Habitats will seek to implement additional measures to reduce our overall emission sources. Strategies for reducing net emissions:

- The use of organic materials as in-situ mulch, generated through land clearing activities, to return as much nutrients to the field. To strictly avoid carbon emitting alternatives, such as burning of the residues.

- Limit consumption of generators operating on the site, only using for essential electricity generation purposes. Alternatives for powering the water pump, office and health centre will be investigated, such as solar power generation.

- Machinery and equipment maintenance is regularly done, to will ensure that excessive emissions from unkempt machinery is reduced.

- Fuel consumption from vehicles (trunk, motorbikes etc.) is carefully monitored to ensure that trips are only done when absolutely necessary and optimised wherever possible to cover the shortest amount of distance. Staff are trained on efficient fuel use strategies.
- Road maintenance is done regularly to reduce possible negative effects on fuel consumption from driving over poor roads.
- During the settling of the mill, highly efficient equipment (such as boilers and chimney filters), are chosen to reduce potential emissions from the mill's operation.
- POME will be piped from the mill through six consecutive ponds equipped with nets to filter out the solids and with impellers for aeration.
- 25% of the POME will be diverted from the ponds to compost making, this will be an efficient way of increasing nutrient delivery to the field, without increasing emissions through synthetic fertiliser use.

Specific measures to offset our emissions:

- Increase sequestration potential of riparian areas, by supplying suitable tree seedlings from our tree nursery, for boosting the number of trees and species. Therefore, increasing the carbon sequestration potential.

5.1.1.3 PROCESS FOR MONITORING THE IMPLEMENTATION OF THE PLAN

Table 22 Monitoring of GHG Emissions Reduction Plan

Strategies for Reducing Emissions	Monitoring	Frequency	Person/s Responsible for Strategy Refinement
Land clearing and biomass treatment.	During land clear activities, field supervisors ensure the organic material is mulched and evenly distributed. It is never burnt.	Monitoring is done every time a new area is cleared	Field Supervisors must report to the Plantation Manager. Plantation Manager in collaboration with Sustainability Manager decide on any need for refinement.

Limit consumption of fuel for generators.	Fuel receipts are kept and analysed every month to monitor consumption levels, and investigate any cases of excessive use.	Every month	Plantation Manager and Finance Officer.
Electricity generation alternatives investigated, such as solar power generation.	During project settling alternative energies are considered.	During project settling	Plantation Manager and Director of Operations.
Machinery and equipment maintenance.	Maintenance and records are reviewed every month to ensure compliance to plan.	Every month	Plantation Manager and Mill Manager.
Fuel consumption from vehicles (trunk, motorbikes etc.).	Fuel receipts are kept and analysed. Trips are recorded and checked to ensure compliance with plan. Training for staff of efficient fuel use strategies. Road maintenance is regularly done.	Every month	Plantation Manager.
Emission efficient mill equipment are chosen.	Information of emission potential of mill equipment are analysed before purchasing.	Before mill equipment is purchased.	Mill Manager and Director of Operations.

Strategies for Offsetting Emissions	Monitoring	Frequency	Person/s Responsible for Strategy Refinement
A tree nursey with suitable species is established.	At least 500 seedlings per year are supplied for replanting in riparian areas.	Once per year (after planting season (May-August)).	HCV Manager

6   INTERNAL RESPONSIBILITY

6.1.1   FORMAL SIGNING OFF BY ASSESSORS AND COMPANY

This document is the summary of ESIA (Environmental and Social Impact Assessment) and HCV (High Conservation Value) and GHG (Greenhouse Gas) assessments for the 41.218 hectares in Makpele Chiefdom, Sierra Leone, proposed for development of oil palm plantations by Natural Habitats Sierra Leone and has been accepted by the Management of Natural Habitats Group. We the undersigned accept responsibility for the assessments and summary.

6.1.2   STATEMENT OF ACCEPTANCE OF RESPONSIBILITY FOR ASSESSMENTS

Signed on behalf of SEIA assessors

Julius Mattai

Managing Director/Principal Consultant

Integrated Geo-information and Environmental Management Services (INTEGEMS)

8G Main Motor Road

(Technical Institute Drive)

Congo Cross

Freetown

Sierra Leone

Signed on behalf of HCV

Philip Patton.

Report Compiler and Lead High Conservation Value (HCV) Assessor

Digby Wells House, Turnberry Office Park, 48 Grosvenor Road, Bryanston, 2191, South Africa.

Statement of Acceptance of Responsibility for the GHG Assessment

Signed on behalf of Montrose Environmental, Jersey,

Philip Patton (Pr.Sci.Nat.) Licensed HCV Assessor

Director

Montrose Environmental

Signed on behalf of Natural Habitats Sierra Leone,

Signed on behalf of Natural Habitats Sierra Leone,

Jessenia Angulo,

Group Sustainability Manager.

Natural Habitats

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Annex 1 Stakeholder Engagement

Name	Address/Organisation	Designation
Sadiq Sillah	Pujehun District Council	Chairman
Annika Ciliers	Gola Rainforest National Park	Conservation Scientist
Mohamed Maluway	Kengo Section and Makpele Chiefdom	Section Chief and Chiefdom Speaker
Limamu Koroma	Selimeh Section	Section Chief
Saffa Kanneh	Zimmi Town	Town Chief
Foday Ansumana	Seitua Section	Section Chief
Ernest Rogers	Ward 321	Councillor
Saffa Monya Tamu	Makpele Chiefdom	Paramount Chief
Sidi Tunis	Constituency 91	Member of Parliament
Jitta Kanneh	Makpele Chiefdom	Chiefdom Mammy Queen
Momoh J. Kawa	Council	PRO
Mohamed Jalloh	Zimmi	Community member
Jenkins Seitua	NH	Staff
Emmurana Kamara	Zimmi	Community Member
Juanan Marrah	Zimmi	Member/Carpenter
Ahmed Kanneh	Zimmi	Okada/Bike Rider
Alhaji Feika	Zimmi	Farmer
Laminu Kawa	G.C.D.C	Chairman
Hassan Njallay	Zimmi Traders Union	Chairman
Foday Sannoh	Makpele Chiefdom	Chiefdom Imam
Mohamed J. Kawa	Zimmi	Section Chief
Momoh M. Kamara	Miners Group, Makpele Chiefdom	Chairman
Brima Kamara	Gola Rainforest/Zimmi	P.C Representative

Sgt Yayah Konnneh	Zimmi Police Station	Sgt/Officer
Sylvester Massaquoi	Zimmi Town	Sanitary Inspector
Samuel Frazer	Pujehun Town	Concern Citizen
Saidu Swarray	NH/Zimmi	Staff
Denis Maekelbergh	NH/Zimmi	Sustainability Manager
Bockarie Samba	Zimmi	Court Clerk
Mohamed Mansaray	NH	NN Ass. Plantation Manager
Alhassan Kanneh	Zimmi Town	Farmer/ Community Member
Kabba zoker	Kengo Section	Youths Leader
Chevai Jalloh	SSD/Zmiim	Member
Musa S. Seitua	Tuasu	Community Member
Chief Sam Sesay	Tuasu	Town Chief
Chief Brima Konneh	Tuasu	Town Chief
Chief Mambu Massaquoi	Kengo	Town Chief
Dominic S. Konneh	Zimmi	Secretary, Land Owners Committee
Max A.L. Konneh	Zimmi	Secretary to the SSD, Sensitization and Demarcation Committee
James M. Konneh	Makpele Chiefdom	Chairman, Community Development
Jebbeh Kposowa	Zimmi	Deputy Chiefdom Mammy Queen
Hassan Njallay	Gbeyamagubla	Town Chief
Adama Konneh	Zimmi	Chair Lady, SLTU
Edwin S. Feika	Manjama	Community Member

Sao Seitua	Gbahama	Community Member/Farmer
Osman Koroma	Gbahama	Community Member/Farmer
Ibrahim Kallon	Madina	Community Member/Farmer
Kabbah Zoker	Gofor	Community Member/Farmer
Momodu Nyallay	Zimmi	Community Member/Miner
Masssah Muana	Zimmi	Community Member/Petty Trader
Jenneh Barrie	Zimmi	Community Member Seamstress
Keima Sheriff	Zimmi	Community Member/Petty Trader
George Kpaka	Gbahama	Community Member/Farmer
Mohamed Shaw	Zimmi	Community Member/Petty Trader
Jeffa Kuyateh	Zimmi	Community Member/Miner
Michael Johnny	Zimmi	Custom Representative
S. R. Gbenda	Zimmi	O.C. Immigration
Anointing Ganawa	Zimmi	Community member/Pastor
Vandy M. Kamara	Zimmi	Councillor Ward 322
Gabriel Jusu	Zimmi	Community Bank Manager
Mohamed Massaquoi	Gofor	Former Court Chairman
Moiwa Marrah	Kengo Section	Youths Leader
Abdulai Kuyateh	Samagbeh	Community Member/Farmer
Mustapha Borsua	Selimeh	Teacher
Mustapha Seitua	Gbahama	Community Member/Farmer
Abdulai Conteh	Gofor	Community Member/Miner
Hawa Koroma	Selimeh	Community Member

Mariama Mansaray	Selimeh	Community Member
Aminata Koroma	Samagbeh	Youth Chair Lady
Alusine Mansaray	Makpele Chiefdom	Quarter Chief
Hawa Sesay	Gbangu	Youth Chair Lady
Mustapha Fallon	Samagbeh	Youth Chairman
Mohamed Sillah	Selimeh	Community Member/Petty Trader
Vandy Swarray	Zimmi	Community Member/Miner
Junior Kuyateh	Makpele Chiefdom	Youths Leader
Sgt Musa Momoh	Zimmi Police Station	Sgt
Munda Konneh	Selimeh	Youth Representative
Cpt Kabineh Sillah	Zimmi	Zimmi FPB
Augustine Conteh	Zimmi	Zimmi Police Station
Jusu Seitua	Zimmi	Community Member
Vandi Seitua	Kengo	Community Member/Farmer
Gbessay Massaquoi	Gibima	Town Chief
Musa Kanneh	Gombu	Youth Leader
Ansu Jalloh	Zimmi	Community Member
Jayah Mansaray	Kengo	Community Member/Farmer
Laminu Sheriff	Gibima	Youth Leader
Mariama Koroma	Segbehun	Women's Chair Lady
Lahai Maluway	Selimeh	Imam
Mustapha Sannoh	Seitua Section	Youth Leader
Mulana Konneh	Seitua Section	Quarter Chief
Lahai Kanneh	Samagbeh	Community Member

Olmeh Dagorseh	Samagbeh	Youth Leader
Sallu B. Kanneh	Gba CHC	Health Worker
Ibrahim Kamara	Zimmi	Community Member
Lanson F. Fofanah	Zimmi	Community Member
Mohamed Koroma	Zimmi	Community Member