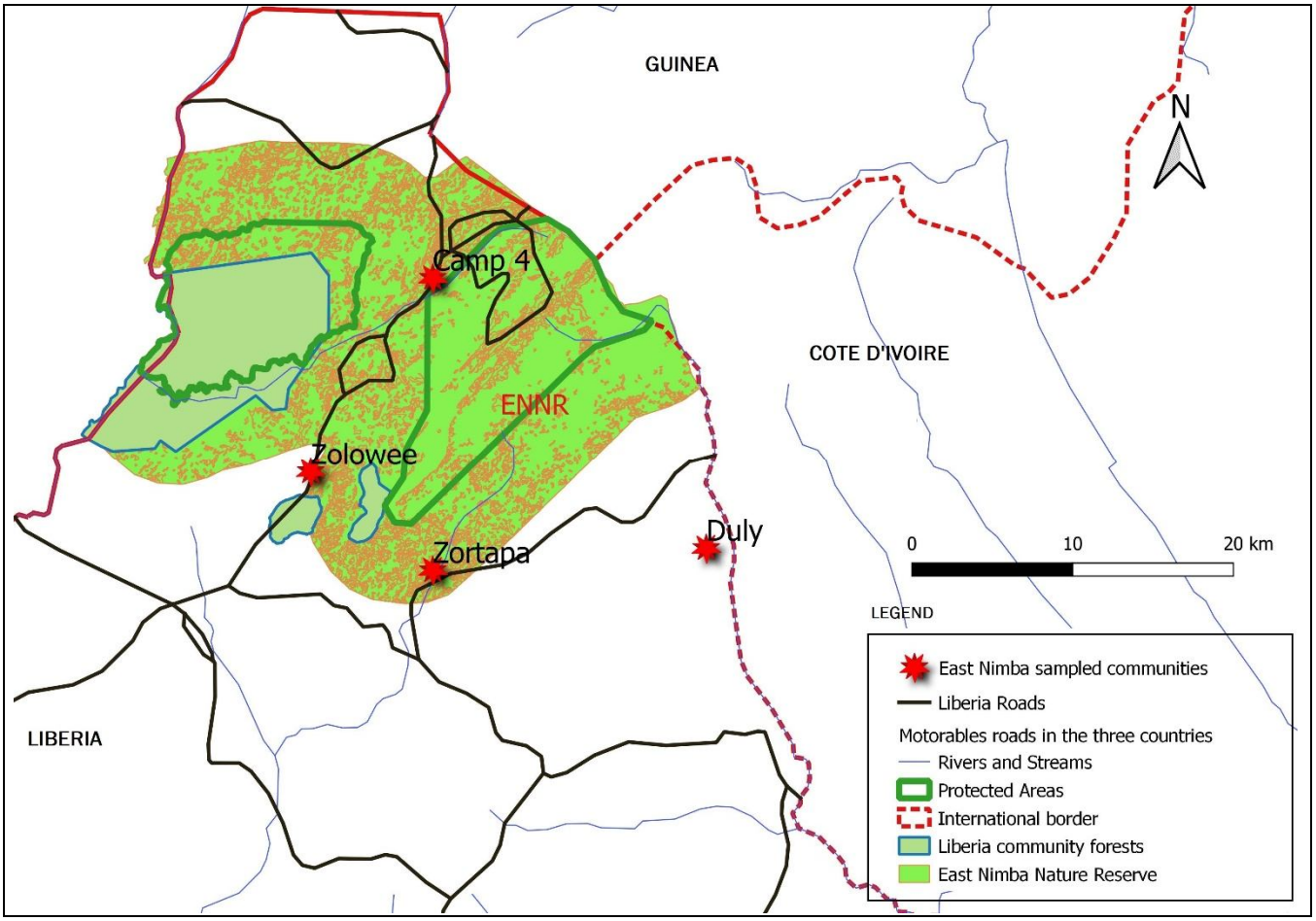

Source: https://diva-gis.org/gdata

TITLE:	**FOREST LANDSCAPE RESTORATION OPPORTUNITIES ASSESSMENT**
SCALE:	**Sub-national**
Country	**Liberia - East Nimba Nature Reserve (**ENNR**)** **Liberia – Guinea – Cote d'Ivoire Transboundary landscape**
Supervising Body:	**Forestry Development Authority (FDA)**
Funding	**Global Environmental Facility (GEF)**
Year	**2020**

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List of abbreviations

AAE		Average Annual Expenditure
FIFES		Forest Incomes for Environmental Sustainability
CODA		Committee of Peace and Development for Africa
VOSEDO		Volunteers to Support International Efforts in Developing Africa
AAI		Average Annual Income
AML		ArcelorMittal Liberia
ANR		Assisted Natural Regeneration
CBD		Convention on Biological Diversity
CBR		Cost Benefits Ratio
CFMA		Community Forests Management Agreement
CO2		Carbon Dioxide
CRL		Community Rights Law
ESIA		Environmental and Social Impact Assessments
ESSP		Engineering Sustainable Solutions Program
FACE		Farmers Associated to Conserve the Environment
FDA		Forestry Development Authority
FLR		Forest Landscape Restoration
GEF		Global Environmental Facility
HCVF		High Conservation Value Forest
INDC		Intended Nationally Determined Contributions
IUCN		International Union for the Conservation of Nature
IWRM		Integrated Water Resources Management
LAMCO		Liberian-American-Swedish Mining Company
LCC		Local Consultative Committee
LDN		Land Degradation Neutrality
LMF		Landscape Management Framework
LRB		Land Rights Bill
MOA		Ministry of Agriculture
MRU		Mano River Union
NBSAP		National Biodiversity Strategy and Action Plan
NGO		Non-Governmental Organization
NTFP		Non-Timber Forest Products
PA		Protected Area
REDD+		Reducing Emissions from Deforestation and forest Degradation and the contribution of Conservation, Sustainable forest management and Enhancement of forest carbon stocks.
ROAM		Restoration Opportunities Assessment Methodology
SDG		Sustainable Development Goals
tCO2eq		Tons of Carbon Dioxide Equivalent
ToC		Theory of Change
UGF		Upper Guinea Forest
UNDP		United Nations Development Programme

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Foreword

The implementation of a Restoration Opportunities Assessment Methodology (ROAM) around the East Nimba Nature Reserve (ENNR) is part of the Integrated Water Resources Management (IWRM) project being implemented by the Mano River Union. The ROAM application is implemented to address the outcomes of following four main activities of the IWRM Project, namely:

- 1.2: Produce onsite guidelines for restoring productivity of tree-based systems to promote best practices of forest landscape restoration interventions and sedentary agriculture practices in key sectors affecting the forest ecosystem
- 1.9: The production of opportunity maps for restoration of degraded areas
- 1.14: Collection of information on human populations and socioeconomic dynamics in order to assess the origin of threats to natural resources and impact on livelihoods and sustainable resources management
- 1.17: Negotiate integrated land use planning in a participatory manner with stakeholders and target groups.

A number of observations are hereby made to enhance understanding and proper use of the results of this assessment.

Firstly, the multi-criteria analyses performed as part of the ROAM methodology are unique to the complexity, and context of the landscape. It is therefore, presented under the methodology section, and needs no repetition in the Annex.

Secondly, the ROAM applications are implemented to address expected outcomes of integrated land use planning, enabling the generation of sustainable sources of income from various restoration interventions.

Thirdly, the ROAM exercises will recommend and provide technical mechanisms for achieving improved management of existing and new tree-based agricultural activities near protected areas and other High Conservation Value Forests.

Finally, the ROAM exercises will deliver action plans that include on-site guidelines, promoting the use of various best practices for restoring productivity to tree-based systems, thereby, strengthening sedentary agricultural practices in key locations where such practices can help perpetuate ecosystems services (biodiversity, water, detoxification, and carbon sequestration) provided by forests; and also support community livelihoods.

The Consortium

Executive Summary

Under the Mano River Ecosystem Conservation and International Water Resources Management Project, a consortium of National NGOs comprising Farmers Associated to Conserve the Environment (FACE), Forest Cry, and GREENLIFE was contracted by the Forestry Development Authority (FDA) of Liberia to implement a Restoration Opportunity Assessment Methodology (ROAM) within the East Nimba Nature Reserve (ENNR) Landscape. This was carried-out in four communities outside, and within five kilometer of the boundaries of the ENNR, namely; Camp 4, Zolowee, Dulay and Zortapa.

The higher goal of the ROAM process is to help Liberia achieve Sustainable Development Goals (SDGs) through landscape restoration interventions at site level. ROAM will thus; support Liberia in the sustainable management of natural resources; improve data and information gathering and sharing at national and regional levels; contribute to livelihoods of local communities by building resilience at the ecosystem level and help the country combat land degradation and climate change. More specifically at the site level, the ROAM set out to identify and characterize relevant stakeholders; identify most relevant and feasible restoration opportunities; analyze their costs and benefits; their ecosystems (water services, biodiversity, carbon) benefits; explore appropriate and available finance and investment options and identify key national, regional and global policy enablers or bottlenecks.

Information was gathered by a team of consultants, followed by extensive desk reviews of documentation; and an inception workshop, during which the methodology was presented and extensively discussed. The ROAM implementation process comprised consultations with communities near the East Nimba Nature Reserve as well as FDA staff and members of the Local Consultative Committees (LCCs). Additional stakeholders such as miners and forest products exploiters were consulted on an ad hoc manner. Using Focused Group Discussions (FGD), socio-economic analysis focused on participatory land use and resource mapping; household surveys and analysis; demographic survey and analysis, farming systems analysis, food security analysis, value chain assessment, stakeholder mapping and a benefit cost analysis of major commodity tree crops. Through these analyses, a sense of the ENNR Landscape's economic and livelihoods context was acquired; and local drivers of deforestation and forest degradation understood.

A Theory of Change, for restoration in the ENNR Landscape was elaborated. It encapsulates the vision of the communities of the landscape and its periphery. That vision is to have the deforested and degraded sites rehabilitated with cash/tree crops that will yield both ecosystem and direct economic benefits for communities. This vision includes that of the FDA, one of the institutions of government responsible for the sustainable management of forest resources in Liberia. Analyses towards this vision used remote sensing and geographic information systems techniques, multi-criteria analysis of spatial data; forest management, land use, elevation and hydrology. These activities were all carried out to better identify priorities and opportunities for landscape restoration in the ENNR Landscape. Using expert inputs and results of the socio-economic, ecological and spatial analyses, four restoration interventions were identified for the region inside and outside of the ENNR.

These comprise of; *inside the reserve* (i) Assisted Natural Regeneration (ANR); implemented and managed with support from Environmental Impact Assessment guidelines in disturbed areas, especially on former Liberian-American-Swedish Mining Company (LAMCO) mining areas; *and outside the reserve*

(ii) Individual or group Plantation development of hybrid oil palm, cocoa and/or rubber agroforests; interspersed with indigenous species such as cola (iii) rehabilitation of individual home gardens outside the reserve through enrichment with tree-crops, and (iv) Assisted Natural Regeneration (ANR) outside the reserve, targeting vulnerable zones such as river/stream banks an degraded gallery forests.

The restoration options were subjected to analyses for biodiversity, social, ecological and economic indicators. The interventions were further evaluated against some success factors linked to the national and international policy context; and eventually, viable financing mechanisms for landscape restoration were explored.

Finally, based on the objectives laid-down from the outset of the assessment, the following specific recommendations are made;

Inside the East Nimba Nature Reserve (ENNR)

- Work with the FDA and ArcelorMittal Liberia (AML) experts and others, already on the ground to test different fast growing species common in disturbed forests, and use different planting methods to restore the sites in the reserve previously degraded by LAMCO; and plant species recommended include *Piptadeniastrum africana, Albizia ferruginea, Albizia zygia*, *Albizia adiantholia*. Fast-growing pioneer species such as *Ceiba pentandra* are showing promise and should be planted in the trial sites.

- Early positive results showing *Ceiba pentandra* to be doing well in mined areas, need to be capitalized upon and addition techniques of Assisted Natural Regeneration are recommended for use on degraded gallery forests, river and stream banks inside the reserve. During the restoration of degraded mining sites, it should be noted that the original vegetation in the highest and steepest parts of the LAMCO mines was grass, not forests.

- These restoration investments will contribute to overall carbon sequestration and eventually to storage in a measurable way.

Outside the ENNR; within 5 km of its periphery

- The development of commodity tree crop plantations of oil palm, cocoa, rubber or other appropriate species (e.g. cola) on aging agroforestry systems, from degraded secondary bushes, appropriate old fallows and home gardens will be vigorously promoted, and the development of value chains for their products supported.

- Development of these plantations will contribute to overall carbon sequestration and eventually to storage.

- Ensuring community tree plantations include at least 10% indigenous tree species (e.g. cola), per hectare to enhance on-farm biodiversity and increase chances of certification of community plantations.

To achieve improved knowledge and understanding at the national and regional levels, the following are recommended;

- Improved data and information gathering and sharing on land-use, e.g., on artisanal mining, small scale timber and NTFPs actors in HCVF in Liberia to help inform planning decisions by working with the FDA and with the MRU for transboundary lessons.

- Improve understanding of tree crops value chains, such as cocoa, oil palm, rubber, cola (including of NTFPS such as X*ylopia aethiopica*) and how sustainable small-scale agriculture, and commodity tree crop production practices can be promoted and financed (including through Certification) around HCVF.

- Improved knowledge, data and awareness of opportunities and mechanisms for financing landscape restoration from private and public sources.

- Excellent factors of success exist at national and international levels. For instance, Landscape Restoration contributes to the REDD+ program, to National Adaptation Plans, to CBD Aichi Art. 14, and to the UNDP's LDN. Through the monitoring of restoration of degraded lands inside and out of the ENNR, an evaluation of the contributions to local individual and community livelihoods and to the Bonn Challenge and ARFR100 initiatives by Liberia can be achieved.

- The main expected source of finance identified are through Public sources (the State, FDA and even the MRU); from Bilateral and Multi-lateral donors for restoration investments in the ENNR. So far, the ArcelorMittal Liberia (AML) mining company has been very engaged in support of the management plan development of the ENNR. This support continues through ecological restoration trials and are certain to continue. Outside the reserve (also applicable inside), there is growing interest from Private Sectors (e.g., AIRBUS Industries Toulouse) to purchase/secure bio-carbon (as offsets) from Reforestation Projects. The requirements for this from the private sector can be very specific, yet represents a very viable source of financing. Given that such private sector buyers also seek strong certification, there is room for negotiating more flexible arrangements, more adapted to local context, yet acceptable to private sector entities. Finally, the development of commodity tree crops of oil palm, rubber and cocoa represents the biggest restoration opportunity outside the Reserve. There is a huge internal and regional market for these commodities. What is required is solid value chain analyses to better understand these investment streams. Such value chain analyses were outside the scope of this ROAM.

1. Background

1.1. The Mano River Union sub regional context

The Mano River Ecosystem Conservation and International Water Resources Management (IWRM) project, is funded by the Global Environmental Facility, executed by the International Union for the Conservation of Nature (IUCN) and implemented in the four Member States of the Mano River Union; Liberia, Côte d'Ivoire, Guinea and Sierra Leone.

The project targets the conservation and sustainable use of the transboundary water basins and their biodiversity resources within the Mano River Union Member States. These resources are of the highest importance for the sub-region, seriously affected by socio-political problems with displaced and suffering populations, and demand support under these very difficult contexts. The project seeks to promote holistic approaches to integrated ecosystem management and to design participatory and community–based strategies, which will lead to in-situ conservation and sustainable use of soil, water and biota in the river basins and on their watersheds.

The MRU covers a total area of 751,429 km² and an estimated population of 51,706, 755 (CIA Fact Book, www.cia.gov July 2020 projection). All four countries share nine transboundary River Basin Ecosystems comprising of; (i) the great Scarcies – Kolenten (linking Sierra Leone and Guinea), (ii) Lofa (stretching into Liberia from the Guinean Highlands, (iii) the Mano, and (iv) Moa Makona (linking Sierra Leone and Liberia), (v) Little Scarcies (linking Sierra Leone to Guinea in the far west), (vi) Cavally (linking Liberia to Cote d'Ivoire), and (vii) Sassandra, being contiguous with the Cavally linking Liberia to Cote d'Ivoire. The remaining two river basins; (viii) Cestos and (ix) Saint John, have their entire upstream portions in the Cote d'Ivoire and Guinea, respectively, with the bulk of their downstream, within the territory of Liberia.

These river-basins are narrow-shaped and small-sized (22,000 km² and 320 km-long on average), and highly vulnerable to degradation (MRU, 2011). The key biodiversity hotspots are largely in their upstream catchments, whereas protected areas tend to concentrate mid and downstream. Smallholder agriculture land-use, charcoal fabrication, game hunting, wildlife trade, human intrusions into protected areas and bushfires by resident populations upstream, constitute important drivers of landscape degradation, land cover change, water quality issues, biodiversity and soil fertility loss. Meanwhile, in some downstream catchments, such as the Gola, Wonegizi and Grebo-Krahn-Sapo Landscapes, reports of land use conflicts, involving land use operations including mining, logging and agro-industrial plantations are common (MRU, 2011).

1.2. Context of the East Nimba Nature Reserve

The policy framework for the East Nimba Nature Reserve (ENNR) is solid. The Act by the FDA lays down 5 clear goals; a clear mission for Protected Area conservation; and a Co-Management Agreement established with the neighboring communities. The ENNR is a Key Biodiversity Area, a part of the Alliance for Zero Extinction site, an Important Bird Area and an Endemic Bird Area. There is a Tri-National Agreement between Liberia, Côte d'Ivoire and Guinea. And the existing forest Policy provides a clear economic incentive and framework for the management of the reserve.

The ENNR is an integral part of the Nimba Mountain range located in Nimba County of north-central Liberia. Mount Nimba is the highest point in Liberia and is shared with Côte d"Ivoire and Guinea. Ranging from 450m to 1,752m in altitude, the topography varies, comprising of valleys, plateaus, rounded hilltops, rocky peaks, cliffs, waterfalls and bare granite blocks (EPA 2007). The area has a sub-equatorial montane climate with distinct wet (April - November) and dry (December-March) seasons. The soils are fertile and those around ENNR are rich in iron ore and other minerals.

From a community perspective, an agricultural value chain assessment (PROSPER 2014), identified two community forests existing adjacent to the ENNR. One is the Zor Community Forest (13,569 ha) near Dulay in the Northeast of the reserve. The other is the Gba Community Forest (10,939 ha) near Zolowee in the southwest of the reserve.

1.3. Forest Landscape Restoration Objectives

Given the context of existing landscape degradation and incident hazards, an important goal of the IWRM regional project is to strengthen the management of transboundary natural resources for sustained ecological benefits and improved livelihoods of forest-dependent communities in this transboundary landscape as well as the river basins, watersheds, and adjacent high conservation value forests.

In 2015, Liberia pledged to restore degraded landscapes by committing 1 million hectares to the African Forest Landscape Restoration Initiative (AFR100) and the Bonn Challenge. These adherences should automatically align Liberia's restoration commitments to the Convention on Biological Diversity (CBD), particular its commitment to Aichi Target 15 on restoration, carbon stocks enhancements, sustainable forest management and conservation goals of Reducing Emission from Deforestation and Forest Degradation (REDD+), as well as Liberia's Intended Nationally Determined Contributions (INDC); the Rio + 20 and Land Degradation Neutrality (LDN), which is part of the United Nations Convention to Combat Desertification (UNCCD).

At the national and site levels, landscape restoration interventions seek to help Liberia achieve Sustainable Development Goals (SDGs) including the following broad objectives;

- Support Liberia in the sustainable management of natural resources by restoring vegetation cover in sensitive ecosystems (PAs, Watersheds, River Basins) to improve ecosystem services in degraded areas, increase rural income and improve biodiversity richness even in community areas.
- Improve data and information gathering and sharing on land-use in Liberia to help inform larger land-use planning decisions by working with the MRU
- Contribute to the REDD+ program in Liberia through the restoration of degraded lands and supporting local livelihoods at the community level.
- Support Liberia to meet its international commitments, particularly the Climate Change Mitigation and Adaptation goals in the INDC.

More specifically, and as part of the process of Forest Landscape Restoration, the Restoration Opportunities Assessment Methodology, (ROAM) is a recommended entry point to Landscape Restoration. The specific objectives of ROAM are:

- To identify and characterize relevant stakeholders of the process
- To identify priorities and opportunities for restoration in the landscape
- To identify the most relevant and feasible restoration options across the regions
- To analyze the costs and benefits of the most relevant and feasible restoration options
- To analyze ecosystems (biodiversity and carbon) benefits of the restoration options
- To analyze appropriate and available finance and investment opportunities and constraints
- To analyze and identify policy and institutional bottlenecks and enablers of landscape restoration

1.4 Drivers of Deforestation and Land Degradation

The most noticeable feature of ENNR is that it is the site of the former LAMCO iron ore mine. Based on data from the ENNR's Management Plan, it is estimated that 10% of the reserve has been severely damaged by mining operations. Iron ore was discovered in 1953 and the mine operated from the 1960s to 1989. Mining expanded to Mt. Tokadeh in 1973 and a huge opencast mine was created in the area (FDA, 2014).

The key threats to the different blocks of the ENNR forest landscape are at both large and small-scale levels. Large scale drivers of deforestation and degradation include artisanal mining, establishment of new settlements (e.g. Camp 4 and Duly, shifting cultivation, logging (chain sawing), and agricultural land use. The small scale drivers include charcoal production, unsustainable extraction of non-timber forest products, and wildlife hunting. Although these small scale drivers have lower magnitude with respect to forest degradation, they are sporadic drivers of forest degradation and often lead to forest fragmentation.

Upland farming in the landscape also contributes to forest destruction as a result of shifting cultivation, where the common crops planted are annual crops of rice, corn, cassava and vegetables, while the perennial commercial tree crops such as cocoa, oil palm, rubber and cola, are common traditional practices. Lowland subsistence farming is mainly annual crops and market gardening; both rainy and dry season rice, vegetables as well as maize in the dry season.

In addition to the above farming activities, some other land use activities are also carried out in the area (e.g. artisanal mining, power-chain sawing, alluvial gold mining, fishing and backyard gardening).

However, significant land and water contamination goes on as a result of artisanal mining activities, but the presence of ArcelorMittal Liberia (AML), an industrial mining company operating in the northwest and southwest of the landscape could be a strong restoration partner in the future. For example, ArcelorMittal Liberia has a current arrangement ongoing with the FDA to assist in the conservation of the landscape, which supports actions towards offsetting the environmental impacts of iron ore extraction in the northwest of the ENNR (East Nimba Nature Reserve).

1.5 Theory of Change

The concept of 'Theory of Change' (ToC) is very important in decision making for restoration in landscapes affected by degradation, such as the landscape of the ENNR. ToC is essentially a comprehensive description and illustration of how and why a desired change is expected to happen in a particular context. It is a living tool that links: What you do; who you are targeting for results; why and how you do it; and what you expect to achieve.

The landscape restoration vision of the communities in the periphery of the East Nimba Nature Reserve (ENNR) is as multidimensional as the activities ongoing in the area. Landscape degradation in the area is driven by small holder bush clearing for annual crop agriculture; fuelwood harvesting for cooking and other household energy; transformation to savannah; partly due to mining activities and possibilities of water pollution. The restoration vision is therefore to have terminally deforested areas rehabilitated with economically desirable and ecologically appropriate tree crops (e.g., cocoa, oil palm, and rubber, for the most part) that will generate both ecosystem and direct economic benefits for the individuals and communities. There is a desire amongst community members to promote agroforestry systems, reduce slash and burn agriculture, and restore to productive lands, areas converted to unproductive savannah. The development of renewable energy mechanisms by first reducing bio-energy consumption is also a part of the local vision. Finally, minimizing pollution of land and water caused by iron ore mining activities; or at least mitigate them by investing in restoration (heavy metal extraction), is also a local desire. There are two community forests in the area (the Zor near Dulay and the Gba near Zolowee); and there is thus, a strong desire that small forest enterprises built on sustainable forest management can prosper and improve forest dependent livelihoods, meanwhile proceeds are ploughed back to develop strong sustainability through landscape restoration that supports other diverse land use activities.

In order to attain this vision and achieve all anticipated objectives in a context of addressing landscape degradation drivers (mining, agriculture, fuelwood exploitation, etc.) within the ENNR Landscape, three (3) sets of outcomes are evaluated. For purposes of differentiation, these are: inputs (context and resources), through-puts (actions and investments) and outputs (impacts and scope).

Firstly, inputs (context and resources) comprising of institutional, policy and bio-physical factors of success that will create an enabling environment for restoration interventions should be in place as well as the identification of finance mechanisms and other relevant resources.

Secondly, to this context is introduced, through-puts of economically, financially and ecologically viable restoration interventions (actions and investments). There should be no constraints posing any conflicts of interest; either ecological, technical, financial or social – with potential to prevent the restoration interventions from flourishing.

Finally, once in place, the through-puts (actions and investments) should be guaranteed to ultimately lead to the delivery of ecosystems benefits in services and direct products. These benefits should be directly or indirectly relevant to local, national and international stakeholders; who must possess and exhibit awareness of their value and benefits. The acknowledgement of value and delivery of benefits

(impacts and scope) of restoration should be demonstrated across the landscape and should address the problems of degradation and deforestation identified in the diagnosis.

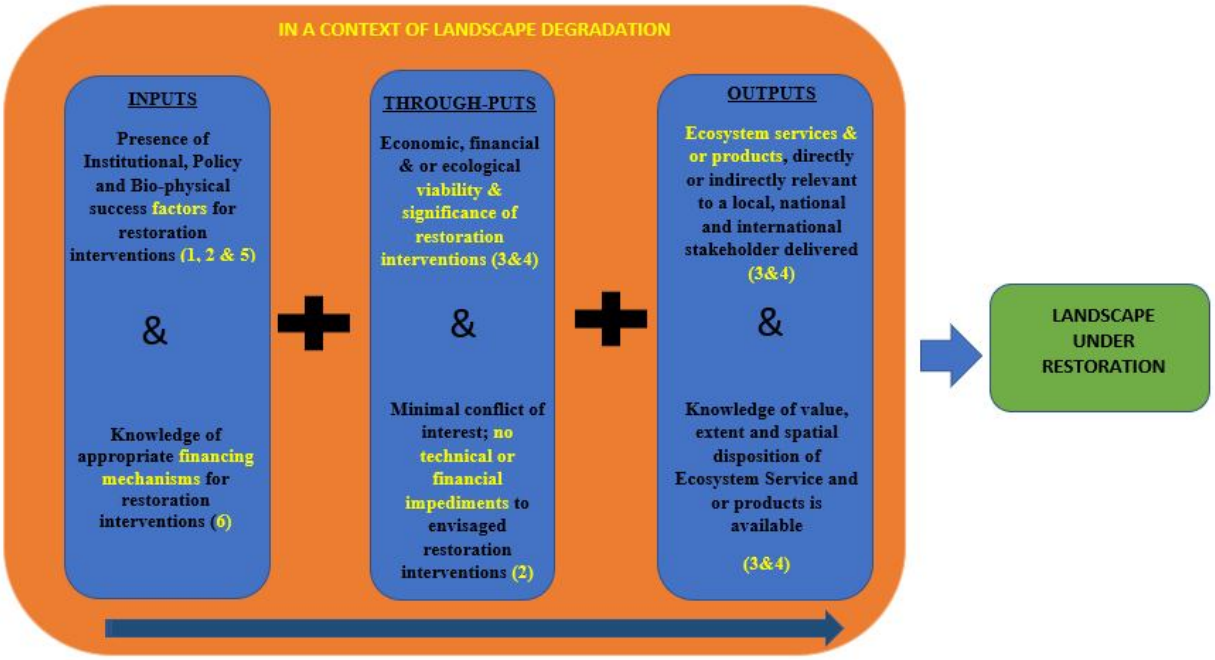


Figure 1: Theory of Change (ToC) from a state of degradation to that of a landscape under restoration

1.6 Limitations of the assessment

de facto ecological entities to be considered in their completeness in transboundary areas include; biodiversity continuums and hotspots (e.g. habitats or migratory routes for fauna), watersheds or river basins such as the Cestos transboundary river basin extending from Liberia into Cote d'Ivoire. However, this ROAM exercise was performed according to a "distinct state" prerogative; (countries) where political limits took precedence over ecological continuity (landscape, eco-region, river basin or watershed perspective).

Ideally, under the auspices of the MRU, multi-country, multi-disciplinary teams should have been constituted to perform the mapping and associated landscape analyses. Nevertheless, in developing the restoration interventions, efforts will be made to transcend this "national" boundaries limitation.

2. Multi-criteria spatial Analysis of FLR

As a methodology, there are several criteria; spatial, socio-economic and biophysical, that can be used to determine restoration opportunities in the ENNR Landscape. Regardless, the participatory spatial planning and implementation methodology - ROAM, will seek to achieve the most spatially optimal, politically appropriate, economically viable, socially acceptable and ecologically relevant decisions for

restoration interventions. The criteria for identifying opportunities for the ENNR Landscape can thus be put under three broad categories; Policy and Institutional, Economic and Social; and Ecological.

2.1. **Policy and Institutional criteria:**

In general, agreements for transboundary management of forests, biodiversity and other natural resources including landscape restoration between Liberia, Guinea and Cote d'Ivoire are signed through the MRU secretariat. More specifically, the ENNR's five-year Management Plan of 2014 – 2018 brought together public and private sector actors and has been a rallying mechanism raising interest in sustainable management of natural resources in this landscape. The plan was developed within the framework of the 2006 Forest Policy of Liberia. Key actors that validated the management plan comprised the Biodiversity Conservation Programme (BCP) of ArcelorMittal Liberia (AML), the Forestry Development Authority (FDA), Fauna and Flora International (FFI), Conservation International (CI), the Co-Management Committee (CMC), USAID/PROSPER and members of the local communities. The "spirit" of the ENNR Management Plan is an important enabling factor for any subsequent restoration activity and is likely to influence initiatives at transboundary level to mitigate effects human activities harmful to the vulnerable Mount Nimba ecosystem. Finally, management of the reserve envisages using incident collaboration to strengthen transboudary alliances. For instance, the former LAMCO mining areas at Mount Nimba was included into the ENNR with a view of ecological restoration in relation to the protected areas of the Nimba range in Guinea and Côte d'Ivoire.

- *To support management of the ENNR and evaluate landscape restoration in the context of conservation and voluntary carbon markets and support for global processes (e.g., REDD+, Aichi/CBD, etc):*

Given the official definition of forests under REDD+ in Liberia (>30% canopy cover, and of at least 5 m tall in a minimum area of 1 ha) the restoration process provides an opportunity to account for enhancement of carbon stocks and sequestration inside the ENNR and outside, within 5 km of its immediate periphery. The restoration process also provides a legitimate opportunity to make contributions to Liberia's pledge to the Bonn Challenge and AFR100 global initiatives to restore one million hectares of degraded landscapes by 2030. According to spatial analysis by Metria-GeoVille (2015), 2,463 ha of lands within the ENNR can be technically classified as degraded or turned into shrub-lands or savannah. Of these, 613 ha are categorized as degraded (<30% canopy cover), 1,486 ha as shrubs and grassland, and 364 ha as bare land. Depending on the history and location of these "degraded" patches, they may qualify for either reforestation and/or for ecological restoration. Either way, the ecosystem service to be rendered needs to be carefully taken in consideration as part of the restoration process.

- T*o build synergies with community forests in the vicinity of the ENNR as direct support to livelihoods and as natural and financial resource base for developing restoration programs.*

There are two community forests existing adjacent to the ENNR. One is the Zor Community Forest (13,569 ha) near Dulay in the Northeast of the Reserve and the other is the Gba Community Forest (10,939 ha) near Zolowee in the southwest of the reserve. These community forests are supported by the State's policy on community rights to forests. They are a source of tree germplasm (planting material) and will provide an indication of most adaptable species as well as most used indigenous

species with which communities are familiar and that can be cultivated elsewhere in the landscape. Managing the community forests as small enterprises will also generate financial resources with which to invest in other initiatives. The skills developed through community forests enterprise development will also be useful in other restoration activities, such as developing value chains for commodity tree products.

2.2. Economic and Social criteria

- *Strong communities, population size and market-led development of restoration options; near access roads/marketing channels, and proximity to eventual market centers;*

Restoration interventions are expected to be economically viable and be able to provide direct benefits for individuals and to communities. So, taking adavantage of available access roads; marketing routes into the rest of Liberia, and across into Guinea and Cote d'Ivoire, is a very important consideration. The landscape of the 5 km periphery of the ENNR and immediately beyond are a part of Upper Nimba and are partly under the spheres of three major communities; the Zor, Gba and the Sehyi (north of Sanniquellie). The Gba community is part of the Sanniquellie-Mahn District with approximately 25,367 inhabitants, and the Zor community is part of the Gbehlay-Geh District and has about 32,176 inhabitants (Government of Liberia, 2009). The communities are located in the northern part of Liberia's "central corridor." Major infrastructure here includes the railroad from the port city of Buchanan to Yekepa and the paved road from Monrovia through Gbarnga to Ganta, and continues (unpaved) to Sanniquellie, and Yekepa. The mining activities by LAMCO from 1960–1989 and currently by ArcelorMittal Liberia (AML, starting in 2007) have always had an impact on the towns in the northern part of the Gba community. Commercial logging, although experiencing a lull has occurred in many places in the Zor and Gba communities. Charcoal production north of Sanniquellie largely serves the Sanniquellie and Ganta City markets. The increased work force for AML also has increased the demand for charcoal in Yekepa (USAID, 2012b).

- *Gender responsive strategies and landscape management framework with potential to support landscape restoration*:

A Landscape Effectiveness Framework[1] approach is proposed as a landscape management philosophy to support understanding of the ROAM in this analysis and later-on during implementation of restoration activities. The LMF considers restoration as an additional strategy – either for livelihoods or for resilience, and not necesarrily as part of a *trade-off* or *quid pro quo* to make-up for, or replace unsustainable land use activities.

The majority faith in the Northern Nimba area is Christianity. Like elsewhere in rural Liberia, women are less involved in land-related activities and tend to gravited towards petty trading of all sorts, including provsion of financial services. In such circumstances, implementation of restoration-related activities involving women must be pro-active and aimed at providing direct support to specific

[1] Buck LE, Milder JC, Gavin TA, Mukherjee I (2006) Understanding Eco agriculture: a framework for measuring landscape performance. Cornell University, New York and Eco agriculture Partners, Washington DC, USA

activities carried-out by women and thereafter based on incentive mechanisms, establishing linkages to landscape restoration.

2.3. Ecological criteria:

- *To ensure enhancement of the health of river basins, and limit the damage already done to water resources and biodiversity*:

The ENNR and the surrounding landscape comprise of Guinean rainforest, savannah woodland and gallery forests. Two of the main rivers in Nimba, the Yah and the Yiti, contrast in terms of their importance for wildlife and vegetation. The Yah River has been polluted by silt and waste products from the previous LAMCO mine, and is no longer a viable habitat for most plant and animal life. The Yiti River is a healthy mountain stream, flowing between two main ridges of Nimba, surrounded by steep slopes of rainforest. Two types of "savannah" with different origins, occur in the Nimba ranges; the degraded, deforested and now grass-covered areas where mining once took place, and the natural savannah occurring close to the Nimba range, at the foot of the mountain and along the border with Guinea.

Streams and rivers from the Northern Nimba eventually wash into the Cestos river basin that extends from the Nimba to the Atlantic coast. The Cestos is also one of the five major river Basins in Liberia and one of the nine of the Mano River Union area. The health of the Cestos and of the Yiti (including possible recovery of the Yah river) partly depends on the health of the forests within the ENNR landscape, the direction of water flow, and the land use practices (e.g. agriculture, mining, etc., on the land). Influencing how surface water behaves can have a significant impact on the health of water resources in this mini-ecosystem. Therefore, determination of restoration opportunities to support ecological functions downstream will be served also, by considering the direction of water flow, shape and extent of the river basins and spatial disposition of restoration interventions. Finally, floral biodiversity is an important consideration given that different species of trees and other plants have different survival rates and perform different hydrological functions. The Nimba landscape is one of the WWF Ecoregions – comprising the Upper Guinea rivers and streams, with a large number of wetlands and rivers. Owing to its altitude and isolation, there is a high level of species diversity and endemism.

3. Functional degradation

3.1. Degradation of ecosystems products and services

The ENNR Landscape, including the Yah, Yiti, Cestos river basins; swamps, forests and savannahs, performs various functions. These comprise provisioning functions, through their plant and animal biodiversity, such as; food, construction materials, fertile soils for fallows and wood energy. The forests also perform regulatory and service functions, such as; water capture, filtration, erosion and storm control. These functions help enhance water quantity and quality downstream in streams, springs and in groundwater. The forests also influence micro climatic conditions such as protecting soil and water from insolation. The ENNR and the surrounding forest landscape also performs sequestration of carbon dioxide and carbon storage functions. Where healthy forests, performing these functions abound, or

are a part of a contiguous block (such as across borders), they facilitate ecological corridors, pollination and wildlife migrations.

When these forests degrade by losing dominant individual trees or undergrowth; or are lost, and soil becomes bare, scrubby, stunted or patched, many of these functions will no longer be performed efficiently or at all. This is referred-to as functional degradation of forests. Table 1 below summarizes the functional degradation pathway as it may be occurring in the ENNR and the surrounding forest landscape.

Table 1: Functional degradation in the ENNR and the surrounding forest landscape

	(i) Examples of Forest landscape function	*(ii) Activities harmful to function*	*(iii) Characteristics of degradation of the function*
1	Water/Soil quality provision	Soil exposure/erosion/soil degradation and invasive species	Water silting & loss of soil fertility
2	Forest products provisioning and services	Selective over exploitation for timber/fuel wood, species habitat destruction through slash and burn farming	Loss of trees, animal species, soil fertility and pollination services
3	Micro-climate	Deforestation; creation of farms	Increased insolation, exposure & dryness
4	Carbon sequestration and storage	Deforestation and forest Degradation: excessive exploitation of NTFPs, timber and sub soil resources	Lost carbon sequestration and storage. Harsh and unpredictable micro climate
5	Forest biodiversity	Illegal forest offtakes; hunting, deforestation and degradation	Loss of provisioning, loss of resilience, loss of value of forest to people and other wildlife
6	Wildlife and Ecological corridors	Deforestation, forest degradation, habitation	Plant and animal species isolation, vulnerability and extinctions

Data Source: Adapted from socio economic survey, 2019

3.2. Degradation detection and analysis in the ENNR and surrounding landscape, Liberia

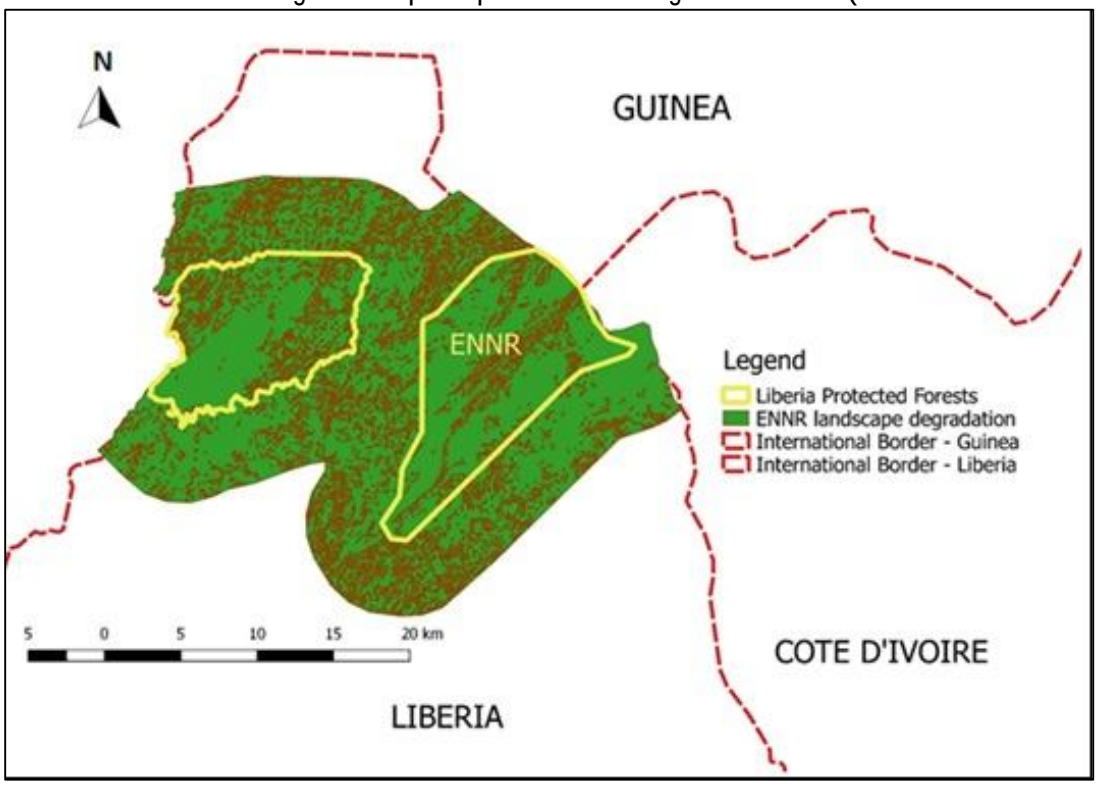
According to the official definition of forests in Liberia (Liberia REDD+ Strategy, 2016) degradation matures into deforestation and are considered part of the same continuum. Therefore, landscape degradation here would occur when dominant plant components (trees) within an area of at least 1 ha are reduced to a state of below 5 m in height with a maximum canopy cover of less than 30%. Such degraded areas can be observed locally; or be detected, mapped and estimated using remote sensing methods. The causes of 'degradation' are varied and can be triggered by any one or a combination of the factors in column (ii) in Table 1.

Table 2: Characteristics of forest canopy cover inside and within 5 km of the borders of the East Nimba Nature Reserve

	% Canopy cover (used as forest degradation proxy)	Area (Ha)
1	>80%	7,320
2	30 – 80%	2,367
Degradation proxy (<30% Canopy cover)		
3.1	< 30% Forest cover	613
3.2	Shrub	908
3.3	Grassland	578
3.4	Bare soil	364
3.5	Total < 30% Forest cover	2,463

Data source: Metria-GeoVille, 2015

The exact extent of degraded forests (<30% canopy), outside the ENNR is not known, however, according to Metria-GeoVille's 2015 analysis, 2,463 ha of lands within the ENNR can be technically classified as "degraded", comprising; 613 Ha of <30% canopy cover (24.89%); 1,486 ha as shrubs and grassland (60.33%), and 364 ha (14.78%) as bare land. An extract of this degradation analysis for the ENNR and surrounding landscape is presented in Figure 2 below (brown-coloured areas).



Author: GREENLIFE Data source: Metria-GeoVille, 2015

Figure 2: Degradation (brown areas) in the ENNR and within 5 km of its periphery

A restoration opportunities assessment capitalizes on the best available local knowledge in determining prevalent landscape degradation characteristics.

Photo 1: Gender responsive focused group discussioons and participatory mapping in Zolowee, ENNR Landscape (By Nathaniel Mulbah)

Whereas detection of degradation via remote sensing can use varying criteria, based on what the satellite sensors are calibrated to "see", one based on the official definition, (such as % canopy closure) can be more limited.

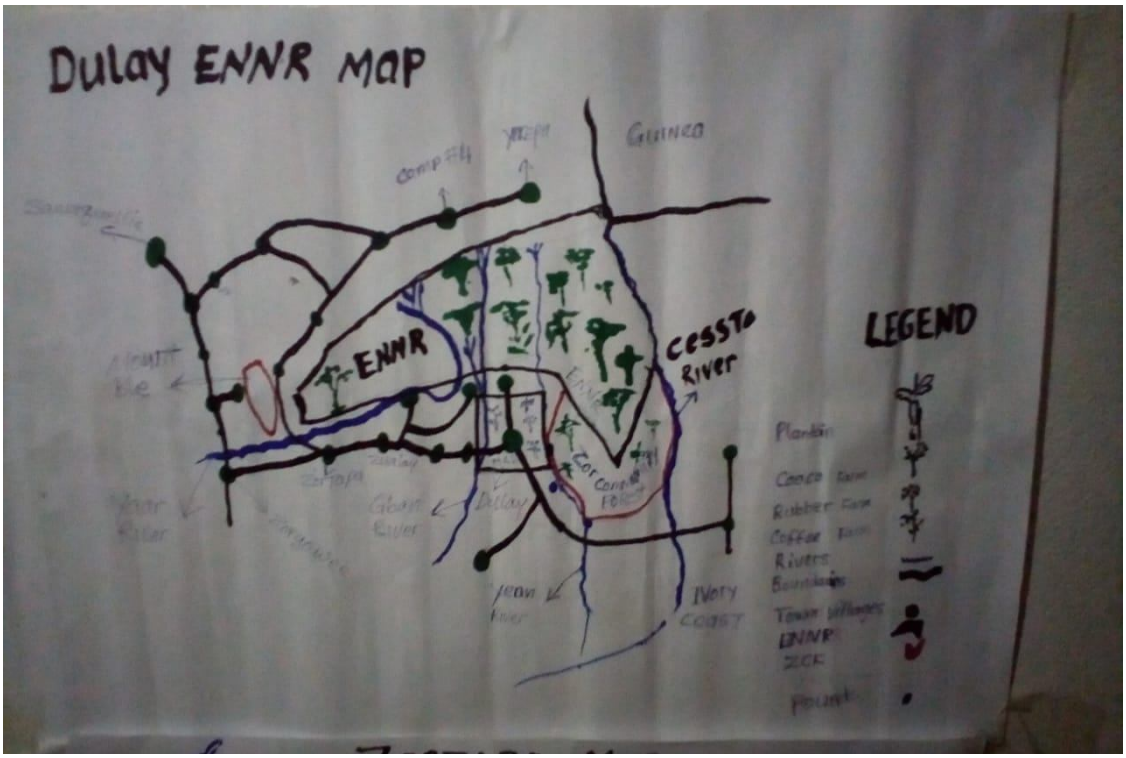
Photo 2: Deforestation through small holder clearing for food crop farming outside the ENNR (By Nathaniel Mulbah)

Photo 3: Shrub and Grasslands resulting from degradation in the ENNR landscape (By Nathaniel Mulbah)

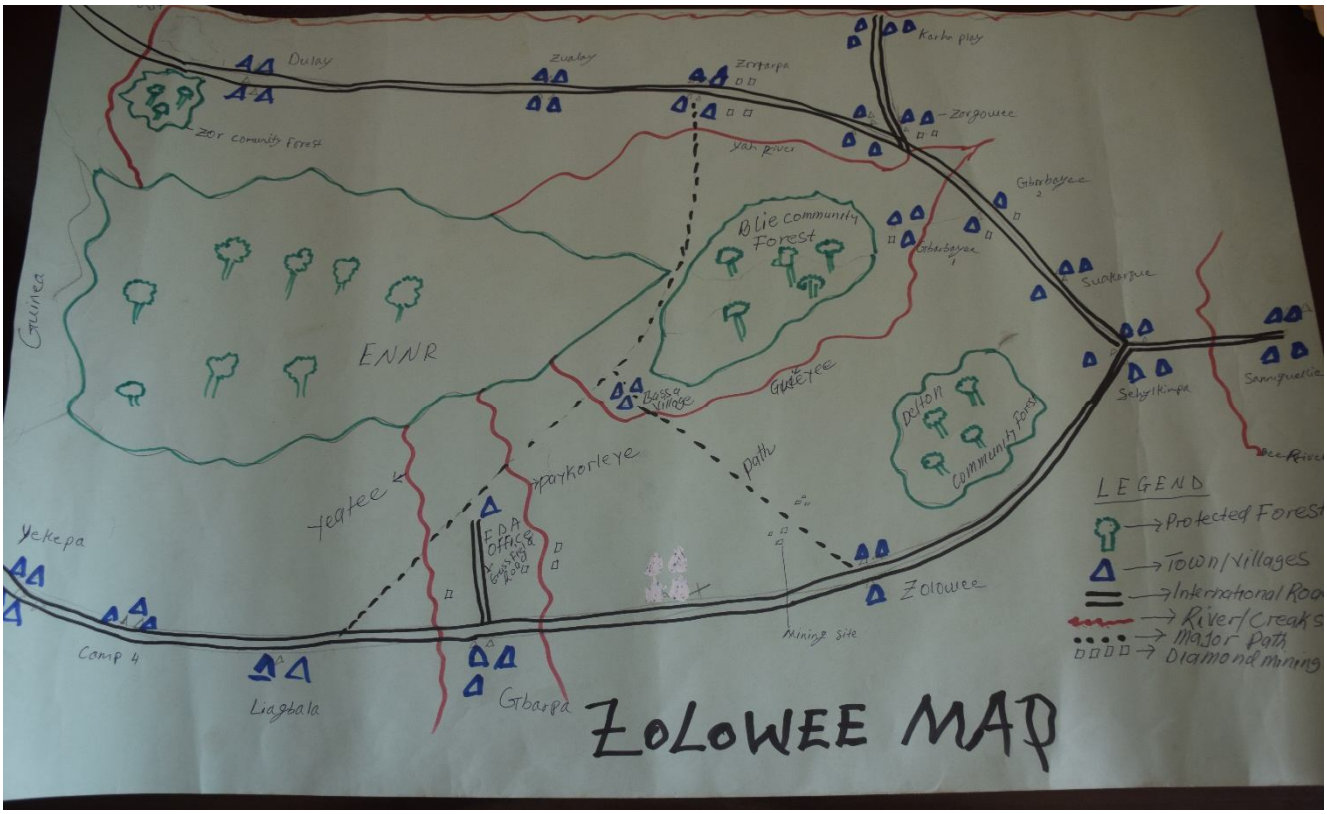
It is therefore, useful to strengthen analysis and understanding of degradation through participatory mapping and focused group discussions at the local level. Participatory mapping of how local people perceive degradation; characteristics and scope, are represented in the community sketch maps that follow below.

Map 1: Participatory land use map of Zortapa, showing ENNR at center

Map 2: Participatory land use map of Camp-4 showing ENNR at center



Map 3: Participatory land use map of Dulay, showing ENNR at center



Map 4: Participatory land use map of Zolowee showing ENNR at center

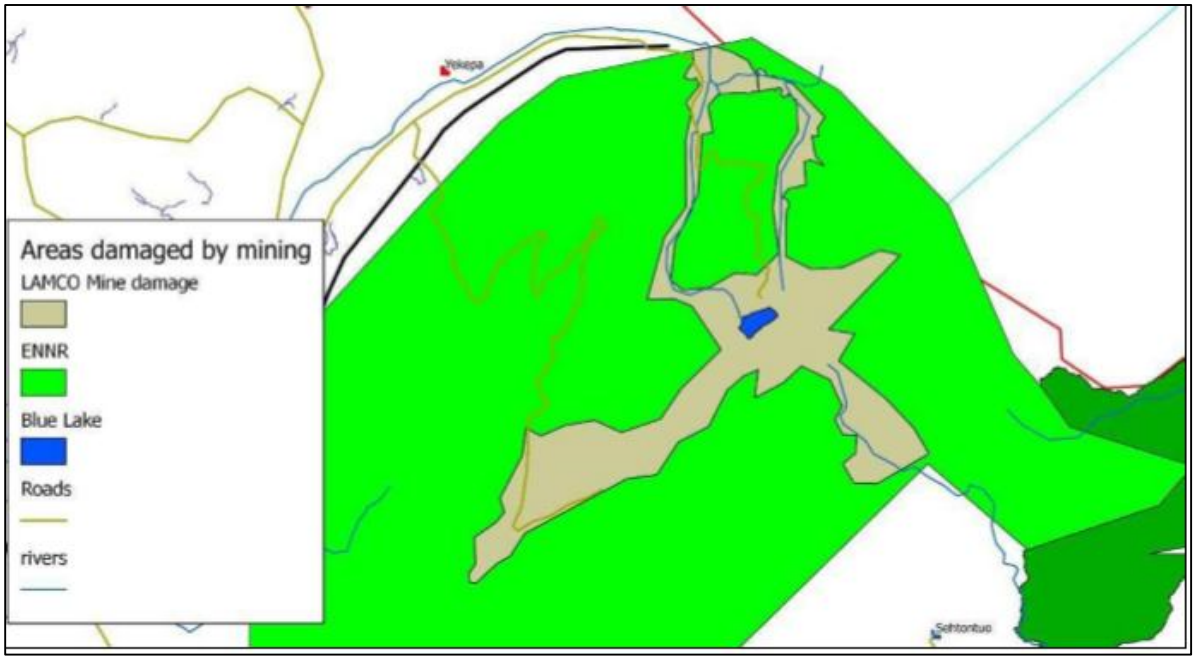
The participatory maps are oriented from the village centers. Nevertheless, based on guidelines provided, the maps sought to situate land use and degradation in the context of the wider surrounding landscape characteristics; using as orientation, the ENNR, the 5 km periphery, roads, the international boundary, streams and even footpaths. However, the local perceptions of “degraded lands” tend to be strongly linked to lands where local people have strong familiarity - often associated with their own land uses and farming activities.

Furthermore, due to shortcomings during preparations, the participatory mapping process did not use a topographic basemap of the area. This approach would have guided mapping and facilitated comparisons between the participatory maps and real-world features. As a result, transposition of participatory information based on local knowledge into real world coordinates is not immediately achievable by reading the participatory maps in this report.

However, the use of participatory mapping in the process remains important. Although the maps by themselves, do not satisfy all our needs for spatial information, they confirm the intuitive interpretations of degradation by local people. This confirmation helps facilitate discussions and establish spatial relationships between mining, small scale agriculture activities, and aging farmlands, with degradation across the ENNR Landscape; and encourages discussion of solutions.

Furthermore, the local empowerment aspects of participatory mapping has been useful. Local knowledge of degradation by local people, and how these are distributed across landscape mosaics, underlines the need for further characterization and inventory of degradation; to locate them, estimate their extent (ha) and determine tactics for restoration.

3.3. Degradation in the ENNR landscape by previous LAMCO Iron Ore mining



Source: ENNR 2014 – 2018 Management Plan

Figure 3: Degradation in the ENNR in former LAMCO mining areas

The map above shows the most severely damaged parts of the ENNR by previous LAMCO mining. Approximately 10% of ENNR is affected (1,100ha).The LAMCO mine required clearance of vegetation and soil including excavation of the mountainside for iron ore extraction. The engineered features have created a new pioneer vegetation dominated by grassland and scrub.There have been induced landslides in the area which have affected vegetation cover and the landscape. According to pundits, the degradation damage is permanent[2]. Given that it will never be possible to reproduce the original vegetation, it may be possible to increase the diversity (abundance and evenness) of trees compared with the present situation. Trees will produce leaf litter, which will gradually create some basic soil. It is likely that recovery will take a very long time, but eventually the degraded mining site may support more biodiversity than it does at present.

[2] AML/Scott Wilson, 2010: Western Range DSO Iron Ore Project, Volume 3, Part 6: Landscape Character and Visual Amenity Assessment

If habitat restoration shows promise in the mining sites, it will be worth noting that the highest and steepest parts of the former mine were natural grassland, and not forest.

4. Landscape restoration priorities and opportunities

4.1. Analysis of restoration priorities in the ENNR Landscape

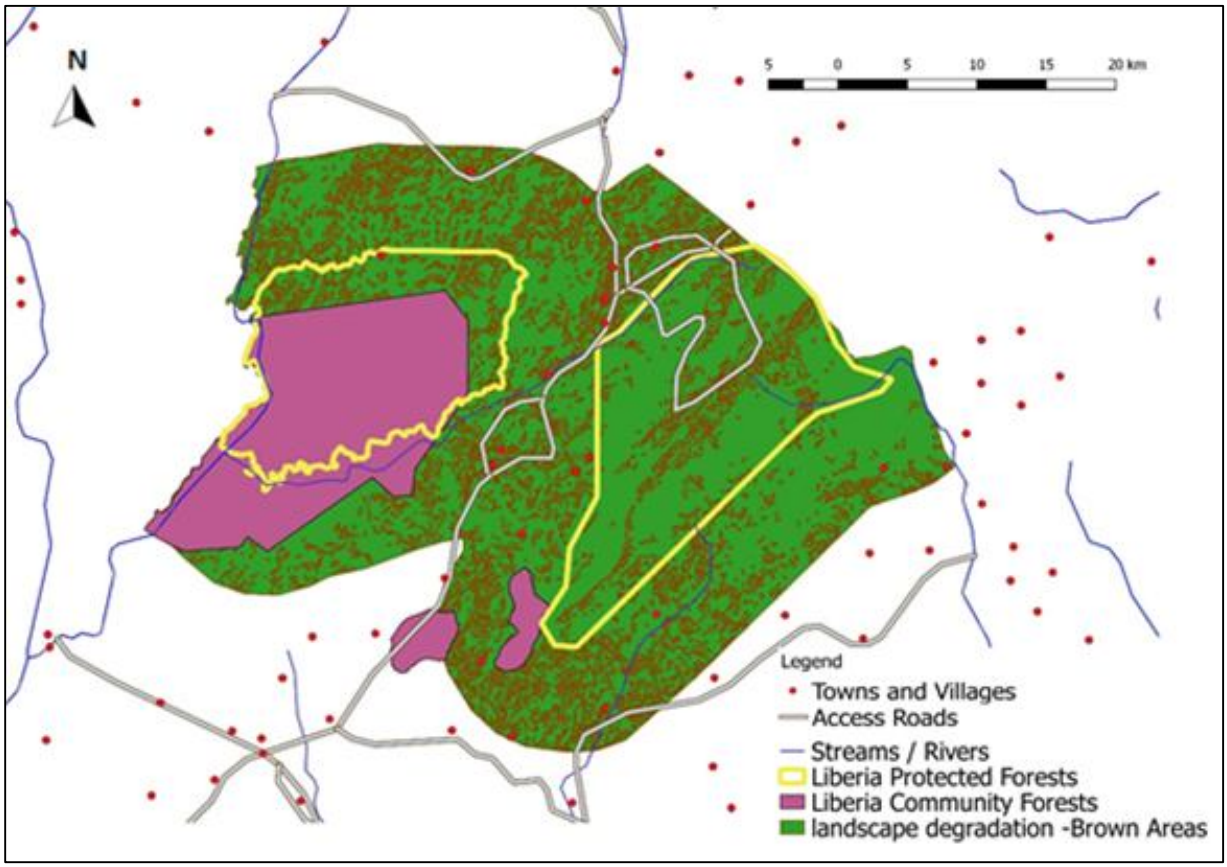
In the first instance, and based on the restoration assessment criteria, Table 2 below is a summary of the restoration priorities for the surounding landscape of the ENNR, where applicable and appropriate within the ENNR itself; including some suggestions for the interventions.

Table 2 : Multi criteria analyses and priorities for restoration in the ENNR Landscape and Periphery

	Criteria	*Description of Restoration priority (type, location and options)*	*Observations (local preferences and suggestions as relevant)*
1	*Policy & Institutional aspects*		
	To promote transboundary collaboration in landscape restoration that protects important water resources; facilitate understanding of ecological corridors; enhance peace and security between Liberia, Guinea and Cote d'Ivoire; and provide opportunities for BioCarbon markets and contribution to global restoration commitments / processes, e.g., BC/AFR100, REDD+, Aichi/CBD, etc.	*Widescale Restoration*: Need for restoring shrub and grassland patches; restoration activities that involve at least two (2) of the three countries (Liberia, Cote d'Ivoire and Guinea); restoration of river banks and bare lands inside and outside the ENNR. Bare ground sites, shrubby savannahs and gallery forests inside the ENNR are prime sites.	Protection of water resources will involve use of ecological restoration tactics. Any restoration actions liable to enhance transboundary collaboration should be given priority; especially those that favour transboundary migration and survival of biodiversity; including strategies and investments liable to support exchange of people (tourist and scientists), goods and services. Due to the elevation and directions of flow of streams and rivers, strategies to detoxify mines, reforesting river and stream banks should be based on international collaboration between the countries.
2	*Economic and Social aspects*		
	Possibility for market-led development of restoration options; with priority on high value commodity tree crops; nearness to; and access to eventual markets in villages/towns with access	*Mosaic Restoration*: Small farmer holdings, (home gardens and aging tree crop plantations); shrubby areas and appropriate barelands	Individual Cocoa, Oil palm, Rubber, Cola nut tree plantations. Rehabilitation should use high yielding hybrids or other appropriate materials in all cases

	roads. International borders also provide opportunities. Existence of population centers where direct gender responsive support and other strategies (e.g., Savings & Loans targeting women's groups) can be promoted.	outside ENNR. Upstream sections of streams and rivers, with preference given to streams and rivers serving bigger downstream population centers and settlements. Nearness to production centres where the need/justification for support to value chains for commodity tree crops is strong; where opportunities for synergies with women-led Village Savings and Loan Schemes exist.	supported by strong marketing programs. Entry-points should be where similar/comparable activities are ongoing; e.g., Cocoa, Oil palm, Rubber, or other cooperatives that can serve as pull factors; those involving women should be given priority. Opportunities should be promoted to have mixtures of trees species, with as much of indigenous species as possible in the mixtures.
3	*Ecological aspects (see Figures 4 and 5)*		
	To ensure ecological restoration of highly degraded sites such as the former LAMCO mines through Assisted/Natural Regeneration (ANR) and other interventions and help detoxify soils, improve water (quality/quantity) services; such as by using water flow direction towards centers of human population, protection of stream/river banks and strengthening of other gallery forests where they can have the most significant impact on people and biodiversity.	ANR of LAMCO mining sites Upstream water heads, slopes, stream/river banks in both zones of mosaic and widescale restoration areas.	Testing of different fast growing species common in disturbed forests, and using different planting methods is ongoing by AML. Species being used include *Piptadeniastrum africana, Albizia ferruginea, Albizia zygia*, *Albizia adiantholia*. One fast-growing pioneer species *Ceiba pentandra* is showing promise and is being planted in the trial sites. Early results show *Ceiba pentandra* to be doing well in mined areas. Overall enhancement of water quality, biodiversity and mitigating of species invasiveness, is an important consideration. Consider indigenous species biodiversity in restoration of degraded gallery forests.

The participatory analyses of restoration priorities focused largely on areas of perceived degradation outside the ENNR, within community spheres. Here, they have significant customary control through traditional custody, long-term use and/or access. These priorities for restoration focuses on degraded tree-crop plantations such as aged or aging cocoa, oil palm and rubber farms, are often interspersed between small-holder agriculture mosaics. Another important criteria is economic infrastructure which can leverage marketing and strengthen opportunities for restoration.



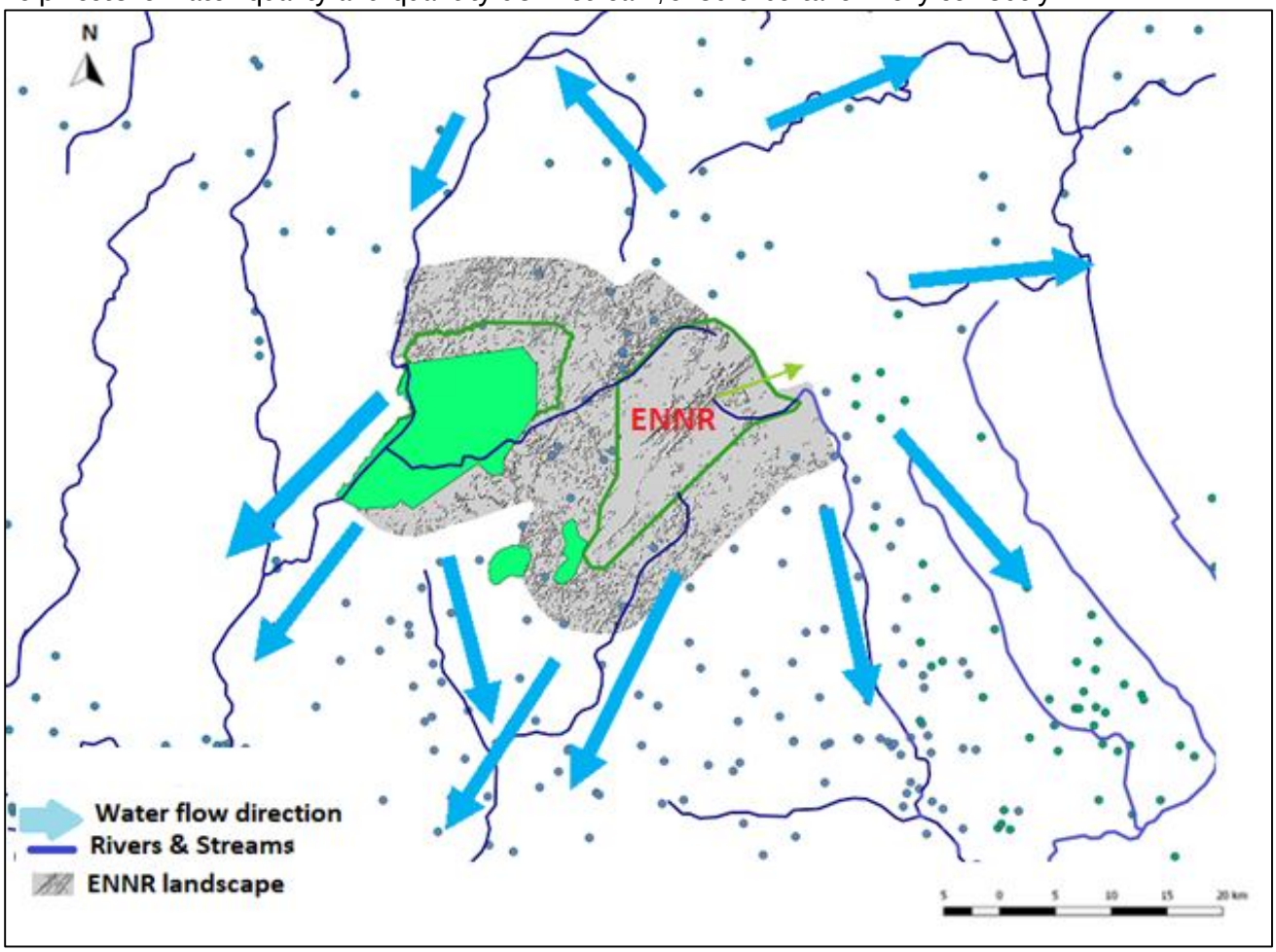
Author: GREENLIFE: Data Source: Data source: Metria-GeoVille, 2015

Figure 3: ENNR, degraded landscape and socio-economic criteria features

Figure 3 above is a snap-shot of how some of these opportunities are juxtaposed in space. Opportunities for the development of commodity tree crops systems such as Cocoa, Oil palm, Rubber, or even Cola nuts, are determined by farm locations and factors such as access roads, eventual markets; population centers and associated economic activities, some created in the ENNR Landscape by mining companies - AML in particular, NGOs and Government.

Figure 4 below depicts likely water flow directions from the Nimba Mountains into three countries. At 5,748 feet, Mount Nimba straddles three Mano River Union countries; Liberia, Guinea and Cote d'Ivoire. Nimba is also the highest point in all three countries. The Nimba ranges are rich in iron ore, and while the Liberia section has been extensively mined, Guinea and Cote d'Ivoire have wisely declared their sections to be nature reserves. As a result of this, protected parts of the Nimba Range

have been declared a UNESCO World Heritage Site. One of the most significant considerations in restoration in the ENNR Landscape is topography and slope. Given that integrated water resources management is one of the main rationales of this GEF/IUCN/MRU project, how restoration investments help restore water quality and quantity downstream, should be taken very seriously.



Author: GREENLIFE: Data Source: Data source: Metria-GeoVille, 2015

Figure 4: ENNR landscape elevation and water flow direction

4.2. Restoration opportunities in the ENNR Landscape

Based on the contributions of the socio-economic survey to the multi-criteria analysis (Table 2); combining policy, socio-economic and ecological criteria, the opportunities for restoration in the ENNR Landscape are summarized in Table 3 below. Precise estimates of hectares for restoration are thus impossible to determine. Additional work will be necessary especially in matters of transboundary collaboration, given that the ROAM assessments were implemented with a national focus.

Table 3: Opportunities for landscape restoration and learning lessons from the ENNR Landscape

	Identified for restoration in the ENNR Landscape (priorities)	*Description of opportunities for restoration*	*Further observations and justification of the opportunities*
1	*Widescale Restoration*: Previous LAMCO mining sites. Need for restoring shrub and grassland patches; Restoration Activities that involve at least two (2) of the three countries (Liberia, Cote d'Ivoire and Guinea); Restoration of river banks and bare lands inside and outside the ENNR. Bare ground sites, shrubby savannahs and gallery forests inside the ENNR are prime sites.	Degraded former LAMCO mines. Bare ground sites, shrubby savannahs and gallery forests inside and outside the ENNR. Assisted Natural Regeneration (ANR) with policy support is a recommended intervention.	The opportunity for transboundary collaboration is important to restoration interventions. Especially because the Cote d'Ivoire and Guinean sections are UNESCO WHS; Sites for restoration common to all three countries would be an advantage. To attract support from all three countries, such opportunities should support their pledges; conservation of the Nimba Mountains biodiversity, as well as contribute to BioCarbon markets and global commitments/processes, e.g., BC/AFR100, REDD+ and Aichi/CBD
2	*Mosaic Restoration*: Small farmer holdings, (home gardens and aging tree crop plantations); shrubby areas and appropriate barelands outside the ENNR. Upstream sections of streams and rivers, with preference given to streams and rivers serving bigger downstream population centers and settlements. Nearness to production centers where the need/justification for support to value chains for commodity tree crops is strong; where opportunities for synergies with women-led Village Savings and Loan Schemes exist.	Mainly small holdings in individual plantations and home gardens across pilot communities including Zolowee, Camp 4, Dulay, Zortapa and others within 5 km buffer of the ENNR.	This opportunity for landscape restoration is largely for economic and livelihoods purposes. Opportunities here are targeted at market opportunities and population centers. The investments depend on aspects of the value chain comprising; the production, packing, transformation, distribution, marketing and consumption. The recommended species include cocoa, oil palm, rubber and cola nut trees.

3	Upstream water heads, slopes, stream/river banks in both zones of mosaic and widescale restoration areas.	Where visual evidence exists of resource deterioration/degradation; and where by-laws or State /Regional regulations and guidelines protect the banks of stream and rivers	The considerations for restoration here are ecological. Preference here is for diversity, indigenous species, and location to address degradation of stream/river banks and reduce insolation of water bodies. Where appropriate, plant species may also be used for detoxification.

5. Forest landscape restoration options and interventions

In consideration of restoration options, two main goals are examined. The first is bringing back or protecting ecological functions, where these may have been lost or where they face imminent degradation or loss. The second is how to improve the livelihoods of the relevant communities. Whereas, by option, we refer to every action capable of mitigating degradation, and by intervention, we refer to the actual actions to be taken based on an assessment of 'opportunity", feasibility or likelihood that they will succeed.

5.1. Forest landscape restoration models

Table 4 below are the priority restoration options for the five sites; the ENNR and four communities; Zolowee, Camp 4, Dulay and Zortapa. These are the samples in the ENNR Landscape. It should be noted that, except for specific conditions or landscape criteria, which will be explained as a part of the design of the technological packages, conditions across the ENNR Landscape are similar in the sense that topography is a major consideration.

Table 4: Restoration options and interventions for the ENNR landscape

	Degradation Hotspots	*Restoration Options/Interventions*	*Objective (s)*
Inside the ENNR (non-forest; based on canopy cover, shrubs, former LAMCO mines)			
1	< 30% canopy cover forest (est. 613 ha)	Assisted Natural Regeneration; implement Environmental Impact Assessment guidelines as part of management practices in disturbed areas; Continuous enforcement of protected area regulations	Reinstating ecological function
2	Bare lands/soil (est. 364 ha)		
3	Shrub & Grasslands (est. 1,486 ha) A total of 2,483 ha degraded in ENNR		
Outside the ENNR, within 5 km periphery			

4	Aging tree-crop plantations, old and young fallows with known "owners"	Hybrid oil palm, cocoa, rubber and cola-nuts plantation development	Supporting livelihoods in vulnerable landscapes
5	Underutilized home gardens	Enrichment planting and rehabilitation with selected fast-growing tree species	Supporting livelihood
6	Degraded gallery forests	Assisted Natural regeneration by enrichment planting with economic (NTFP) forest tree species	Reinstating ecological function

5.2. Design of technological packages

In the multi-criteria analyses, three sets of criteria were considered for determining restoration opportunity. These issues are; Institutional and Policy, Socio – Economic and Ecological. The Institutional and Policy criteria focused on how much a restoration option/intervention contributed to the regional MRU vision of transboundary collaboration between Liberia, Guinea and Cote d'Ivoire; and to global processes such as REDD+ and Aichi/CBD. Meanwhile, Social and Economic criteria focused on how to leverage market opportunities provided by mining infrastructure, activities and associated population centers, by developing commodity tree-crops; including how to be gender responsive. Finally, Ecological criteria examined how restoration options/interventions must be sensitive to aspects such as; slope, direction of water flow and hydrological characteristics in the Nimba Mountains. Diversity is also an issue to be considered when deciding on development of tree crop systems or on ANR for gallery forests and degraded river/stream banks. These considerations provide the basic "in-put" criteria for the restoration options/interventions in Table 5 below. These are the criteria which then serve as bases for the design, implementation and assessment of efficacy of restoration interventions.

Table 5: Design of restoration interventions

	Restoration Options/Interventions	*In-put Criteria for design of restoration interventions*	
		Criteria or considerations for content of action	*Monitoring & Evaluation (measurability and impact)*
Inside the ENNR (non-forest; based on canopy cover, shrubs, former LAMCO mines)			
1	Assisted Natural Regeneration (ANR); implement management and Environmental Impact Assessment guidelines as part of management practices in disturbed areas	Enhance transboundary cooperation, address Aichi/CBD and Environmental and Social Impact Assessment (ESIA)	Cooperation & Governance, ESIA reports; diversity assessment; hydrological assessment

Outside the ENNR, within 5 km periphery			
2	Hybrid oil palm, cocoa, rubber and cola-nuts plantation development	Considers market access, gender participation; addresses REDD+, Aichi/CD, Bonn Challenge /AFR100	Value Chain Analysis (including stakeholder mapping), BioCarbon benefits and market potentials; hydrological assessment; diversity assessment; assessment for invasiveness
3	Enrichment and rehabilitation of underutilized home gardens	Same as 2 above	
4	Assisted Natural Regeneration (ANR)	Same as above	

5.3. Genetic Diversity and Species Selection

In the process of investments in restoration options/interventions, ensuring genetic diversity and making sure the right species are selected are important considerations, irrespective of whether it is for ecological, social or economic purposes. Forest degradation in inhabited forest areas that are mildly accessible, is also characterized by selective exploitation of valuable tree species and other plants for medicines, timber, fuelwood and construction.

Photo 4: Wood exploitation in the East Nimba Landscape for construction and charcoal (By Nathaniel Mulbah)

Many of the plant species of Nimba are of great importance to the local communities for food, medicines, construction and other cultural/traditional purposes. A few notable species are the African spice tree (*Xylopia aethiopica*), Ganagana (*Cassia fikifiki*), Yellow wood (*Terminalia ivorensis and T. superba*), Dahoma (*Piptadeniastrum Africana*), Abura (*Hellea ciliate* and *H. stipulosa*), Worlor (*Beilschmelia mannii*) and Raphia pine (*Raphia palma-pinus*). Some tree species mainly cultivated for economic and commercial purposes in the East Nimba Forest landscape are; cocoa, coffee, oil palm, rubber and cola. Although for productivity purposes, FLR intervention hybrids of these species will be preferred, species mixes for diversity and resilience will be encouraged under restoration options 2 and 3 (Table 5).

During restoration, considerations for maintenance of biological diversity and species selection should be made in all cases of restoration interventions. For instance, Assisted Natural Regeneration (ANR) inside the ENNR; bare lands, shrubby areas and grasslands; in degraded gallery forests, river and stream banks, should involve encouraging/bringing back indigenous species, preferably those with the potential a) for providing sustainable economic benefits that will contribute to the livelihood of the local

populations and b) to significantly contribute to ecosystem services such as watershed protection, defense against climatic hazards, and provision of suitable wildlife habitat). It may also require assisting the process by introducing other species with strong establishment record. To the extent that fast growing species are indigenous, so too would their adaptation be enhanced, and their invasiveness diminished.

Landscape restoration interventions can benefit considerably from observing the guidelines of Aichi/CBD's Article 14 on handling biological diversity, especially during actual cultivation. As part of the implementation process, an assessment of diversity before and after restoration are important steps to consider as part of monitoring and evaluation of diversity aspects of restoration investments.

In addressing livelihood aspects of landscape restoration, in respect of social and economic criteria, diversity and species selection are especially important. Although oil palm, cocoa and rubber emerged as prime species options for restoration in Nimba, experience shows that, more resilient farms are developed using a minimum of species mixtures. In fact, forest landscape restoration such as in Ghana by the Forestry Company FORM Ghana, use 90% *Tectonis grandis* and 10% indigenous species. In Cote d'Ivoire, UTZ Cocoa certification has been achieved by incorporating at least 17 indigenous trees in plantations of previously shade-free cocoa.

In diversifying oil palm plantations, home gardens, cocoa fields; or even rehabilitating degraded stream and river banks, the needs of women should be considered. Women have constituted themselves into a Women's Conservation Forum. They provide support such as training in oil palm processing, raising snails for the market, Village Savings and Loans; construction and use of improved cooking stoves that use less wood for home cooking compared to the open fireplace. Women are also involved in collection and marketing of Non-Timber Forest Products, such as *Xylopia aethiopica* and others.

6. Economic analysis

Economic analysis of landscape restoration options and interventions in the ENNR Landscape is the process of examining the context, costs, benefits and market indicators in relation to the overarching objectives of the identified restoration options and interventions. Here, the economic analysis, which is not a feasibility assessment, is specific to the identified restoration opportunities; (arising from the options and/or interventions).

The overarching objectives of landscape restoration in the ENNR Landscape are to foster transboundary collaboration between Liberia, Guinea and Cote d'Ivoire; help restore degraded areas of ecological importance such as degraded forests, bare lands, shrubby areas, grasslands and river/stream banks inside and outside the ENNR; commodity tree crops and indigenous trees of economic value outside the reserve. While economic analysis can be used as justification for each specific restoration investment, it is especially critical to help determine lucrative activities, and thereby attract most likely and appropriate financing mechanism for the identified restoration opportunities or interventions; e.g. private or public.

6.1. Livelihood analysis

Due to existing infrastructure and population centers which links the three countries, supports and provides labor for industrial mining and associated activities, the ENNR Landscape is endowed with more economic activity than comparable rural, transboundary areas as the Gola and Wonegizi and Grebo-Krahn-Sapo Landscapes. Nimba is also the second most populous county in Liberia after Montserado (Montserado County hosts the capital Monrovia).

The Nimba communities are located in the northern part of what is referred-to as Liberia's "central corridor." Major infrastructure here includes the railroad from the port city of Buchanan to Yekepa and the paved road from Monrovia through Gbarnga to Ganta that continues (unpaved) to Sanniquellie and Yekepa. This infrastructure has been critical to the movement of goods to Liberia's largest urban areas and to external markets via the ports (PROSPER, 2014). The unpaved part of the major truck road from Monrovia to Yekepa is now completed. Unpaved lateral roads and bridges connecting towns and villages to the trunk road are in poorer conditions but useable. The mining activities by LAMCO (1960–1990) and currently by ArcelorMittal Liberia (AML, starting in 2007) have had or have a strong economic impact on towns such as the Gba community.

Logging (power-chain sawing) occurs sporadically across the landscape, especially in Zor and Gba with community forests. Valuable timber harvested and marketed comprise a wide range of species amongst which are; *Terminalia spp*, *Piptadeniastrum africana and Hellea spp*., *Chlorophora species,* , *Ceiba pendentra*, *Nauclea diderrichii*, and *Heritiera utilis*. The production of planks for the domestic market by chain saw operators is a major activity. Charcoal production north of Sanniquellie largely serves the Sanniquellie and Ganta City markets. The increased work force for AML also has also increased the demand for charcoal in Yekepa (USAID, 2012).

Non Timber Forest Products are also an important source of revenue, especially to women. Some NTFPs often collected and marketed, are bush pepper (*Piper guinensis*), African spice (*Xylopia aethiopica*), bitter kola (*Garcinia kola*), walnut (*Coula edulis*), rattan (*Calamus* spp), pine wine (a beverage from *Raphia palma-pinus*) and Worlor (fruit of *Beilschmiedia mannii*). Roots, leaves, and barks of other forest plants are also collected for various purposes, especially for food and medicinal purposes. Although these NTFPs are consumed by the harvesters, some are traded in local markets to generate funds for the family.

Despite revenue from small scale logging and NTFPs, the major land-use activity in the area is farming, comprising: upland and lowland practices. Upland farming involves more shifting cultivation, where the common crops planted are upland rice, corn, cassava, peanuts, plantain/banana, pepper, okra, bitter ball and eggplant. Cash crop farming is dominated by tree crops; cocoa, oil palm, rubber, cola and coffee. Lowland farming which is encouraged for its sedentary nature, involves the cultivation of rice in both rainy and dry season as well as vegetables and corn in the dry season.

Livestock is dominated by domesticated animals and comprises; goats, sheep, pigs, chicken and ducks. Some hunting and fishing are also practiced in nearby forests and streams/rivers respectively, although hunting is prohibited in the ENNR, and the Yah River has been extensively polluted by iron ore mining over the years. In addition to wide scale industrial iron ore mining, some artisanal alluvial gold mining is

also practiced; but this is very highly controlled at community levels. Backyard gardening (home gardens) are also important livelihood activities in the landscape.

Of all the above mentioned land use activities; however, small scale farming is the most important driver of deforestation and forest degradation. This is followed by mining.

Land tenure is also precarious as some of the communities have been largely created by mining activities; pulled-in or pushed out; and this has implications for land tenure and landscape restoration. For instance, the case of Camp 4 illustrates the pulled-in factor. The Camp 4 facility was established by LAMCO to host none employees of the company. The occupants are allowed to grow rice and vegetables in the community but not to plant cash crops (permanent tree crops) on the land. However, over time, farming activities destroyed the reforestation plantation established by the company in collaboration with FDA between 1974 and 1989. *Gmelina arborea* and *Tectona grandis* were the most dominant tree species planted in the area. Almost all the planted trees were converted to charcoal by residence of Camp 4. Therefore, despite limitations placed on Camp 4 dwellers, opportunities for landscape restoration thus exist to restitute the failed LAMCO reforestation initiative.

Finally, the case of the Dulay community was one of push-out. Located in the northeast of ENNR, Dulay was relocated to the present site in 1978 by LAMCO due to intensification of iron ore mining activities near the original site which was threatening to the inhabitants. The relocation of Dulay to a new site had the effect of increasing multi-ethnicity of the new site, a social characteristic which also has implications for landscape restoration going forward.

Photo 5: Small holder sugar cane farm in Dulay (By Nathaniel Mulbah)

Against the diversity of sources of income, Average Annual Expenditure on transportation, indicative of high levels of social and economic activities, was the most prominent.

The average expenditure (LD 250,620) on mobility – mainly movements between communities, exceeds all other expenditure categories. Further analysis indicates that the average expenditure (LD 318,375 or US$1,633) exceeds the average income (LD 101,814 or US$522) by 68%. Main reason proffered was the high level of responsibilities on the households that led them to borrow money to satisfy their demands. In addition, respondents revealed that, it was difficult to actually estimate the income in a year, but expenditures were easily estimated. This indicates that most of the respondents had unstable sources of income and had no records of them. However, when their income was calculated per day (US$1.4/day), it exceeds the World Bank Poverty line rate analysis for Liberia, of $1.25/day [3] (GREENLIFE, 2019).

Below are summaries of some social characteristics of the communities in relation to landscape restoration.

6.2. Food security analysis

Small scale farming, mainly for subsistence is the mainstay for food security for populations. Annual crops grown include; upland rice, corn, cassava, peanuts, plantain, pepper, okra, bitter ball and eggplant. Small quantities are sold to provide additional income (mainly by the women). Some fishing and limited hunting (mainly using traps) are practiced for household protein. Livestock rearing focuses on goats, sheep, pigs, chicken and duck; mainly sold for cash although the occasion chicken or duck can be prepared when visitors come around. Otherwise, its fish, and or bush meat. Overall, like in most rural, low energy consumption areas, food security remains precarious; subsistence-based, and not supported by any sort of processing or storage technology.

6.3. Value chains analysis

The two (2) main restoration interventions identified for the ENNR landscape shows a 50:50 representation of lucrative versus non-lucrative restoration interventions. While all of the recommended options and interventions inside the ENNR are directly non lucrative, the proposed commodity tree crop development (cocoa, oil palm, rubber, cola and coffee) on individual plots and home gardens outside the reserve are lucrative.

Small plantations of cocoa, oil palm, rubber, cola and coffee already exist in the area although the quality of their starting materials and production base still needs to be fully estimated and strengthened. The worthiness of the five “cash crops” above as subjects for value chain development were confirmed by the socio-economic analysis and community preferences evaluated during this assessment. The findings prioritizing these crops; even further narrowing them down to cocoa and oil palm are further confirmed by an earlier study (PROSPER, 2014).

[3] The World Bank has announced that about 54 percent of the population of ***Liberia*** is living below the ***poverty line***. This means they live on less than $US2. 00 per day, 2016

There is evidence of internal marketing (within the region and inside the country) of cocoa and oil palm (to name these two) and in the case of cocoa, into international markets, such as Cote d'Ivoire and Guinea. The market for other crops including plantains and hot pepper are also well developed internally. Stakeholder mapping, (Table 8) reveals opportunity for technical training and other support (in kind) for production and marketing skills in handling commodity tree crops. Although, some one-off financial support to local groups was reported to have been made, no dedicated financing and other credit sources were identified. There was no evidence also of any indigenous credit capacity including traditional ones, such as women's groups constituted as Village Savings and Loans Associations.

Finally, very minimal data were available with which to perform far-reaching, multi crop/commodity cost-benefits analysis to cover all the restoration options/interventions possible using tree crops. Nevertheless, limited comparative analysis was performed for cocoa and oil palm. Table 6 below, is a summary of qualitative and quantitative ecological and economic appraisals of the different proposed restoration interventions.

6.4. Cost-benefit analysis

Table 6 below is a breakdown of the Cost Benefits analysis recommended restoration options for the ENNR Landscape (outside and inside the reserve).

Table 6: Appraisal of economic, social and environmental costs and benefits of restoration interventions

	Restoration Options/Interventions	*Type of Appraisal*	*Assessment conclusions*
Inside the ENNR (non-forest; based on canopy cover, shrubs, former LAMCO mines)			
1	Assisted Natural Regeneration (ANR); Environmental and Social Impact Assessment guidelines as part of management practices in disturbed areas	Qualitative	ANR of bare lands, shrubby grasslands, and degraded forest patches (<30% canopy cover); degraded stream and river banks helps protect them from excessive insolation and enhances water quantity and quality.
Outside the ENNR, within 5 km periphery			
2	Hybrid oil palm, cocoa, rubber and cola-nuts plantation development	Quantitative; Cost – Benefit Ratio (CBR)	Oil palm as a restoration option produced a benefit cost /ratio of 1) cocoa, 2) oil palm and 3) rubber. All three options are positive and also indicates room for expansion.
3	Enrichment and rehabilitation of underutilized home gardens	Qualitative	The health of the home garden or "kitchen garden" is often indicative of the level of food security. It is diverse and serves as a fall-back; even storage for the household.

4	Assisted Natural Regeneration (ANR)	Qualitative	Same as above

7. Modeling and optimizing investment; impacts on ecosystems services

The river-basins of the wider Mano River Basin Ecosystem from Sierra Leone to Cote d'Ivoire, of which the Cestos extending as far as Nimba is a narrow-shaped, small-sized and highly vulnerable to degradation (MRU, 2011). In general, the key biodiversity hotspots for which the Upper Guinea Forest Ecosystems are renowned for, are largely in their upstream catchments. Nimba is also the most heavily settled rural county and second most populated in the country, after Monstserado. Due to relatively fertile soils and agreeable climate, the upstream landscapes of these river basins are also relatively heavily-settled by small holder agriculture land-users. Land degradation caused by small holder agriculture upstream, often result in water quality and quantity issues in their immediate vicinities and downstream (MRU, 2011).

The principal ecosystem service at play in the Mano River Union in general and in Nimba in particular, is by far, water services; quality and quantity. The Nimba Mountains are located in one of the Global 200 Ecoregions - Guinean Moist Forests. The gallery forests are dominated by indigenous species, such as; *Parinari excelsa*, and primary forest by *Triplochiton scleroxylon*, *Chlorophora regia, Morus mesozygia* etc. The drier mid-altitude forests are dominated by *Triplochiton scleroxylon, Piptadeniastrum africanum* and *Parkia bicolor.*

Two of the main rivers in Nimba, the Yah and the Yiti, have had mixed fortunes after many years of iron ore mining in the area. The Yah River has been significantly polluted by silt and waste products from the previous LAMCO mine, and is no longer a viable habitat for most plant and animal life. Meanwhile, the Yiti River is a healthy mountain stream, flowing between two main ridges of Nimba, and surrounded by steep slopes of rainforest. These rainforests contain important chimpanzee habitats, tree ferns, unusual and rare birds such as the Tiger Bittern (*Tigriornis leucolophus*).

Not to be confused with the degraded, deforested and now grass-covered areas where mining once took place, *Hyparrhenia diplandra* is the most widespread grass and is extensive, forming a favored habitat for several species of snakes.

The Nimba Area is one of the WWF Ecoregions - Upper Guinea Rivers and Streams, with a large number of wetlands and rivers. Owing to its altitude and isolation, there is a high level of species diversity and endemism including snakes, fish, crabs, frogs and toads.

In designing restoration packages in Nimba, like elsewhere in the Mano river union, water quality and quantity issues are primordial. As a result, where tree systems development is recommended, such as on river/stream banks and degraded gallery forests, water quality considerations as well as socio-economic ones are topmost in our minds.

Irrespective of where trees are planted, restoration interventions to slow-down and eventually roll-back degradation will also directly enhance biomass carbon stocks. Given the total degraded areas concerned (inside and outside the ENNR), the potential number of farmers involved, as well as economic opportunity, carbon dioxide sequestration is the second most significant ecosystem service considered by the restoration interventions in Nimba, after water services. Biodiversity Conservation and management in the ENNR on the other hand, will emerge as a prime beneficiary of successful and strategic restoration of degraded portions of the Reserve itself; and rivers/stream banks of the Nimba watershed.

Finally, no original quantitative data was collected on ecosystems services benefits. Economic valuation of ecosystems services remains highly controversial with pundits arguing against quantifying ecosystem services. However, with monetization of CO2 through REDD+ and other related processes gaining ground, making quantitative assessments have become more credible and less controversial. Table 7 below, is a summary of the qualitative and quantitative appraisals of the ecosystem services contributions of the different proposed restoration interventions.

Table 7: Assessment of ecosystem services and benefits of restoration interventions in the ENNR and landscape

	Restoration Options/Interventions	7.1. Water quality and quantity	7.2. Carbon Sequestration[4] (potentials)	7.3. Biodiversity
Inside the ENNR (non-forest; based on canopy cover, shrubs, former LAMCO mines)				
1	Assisted Natural Regeneration (ANR); implement Environmental and Social Impact Assessment guidelines as part of management practices in disturbed areas	Carefully selected and managed indigenous species on bare lands, shrubby savannahs, river/stream banks. The vegetation enhances infiltration and groundwater volumes, reduces bank erosion/ silting of streams; shields waters from excessive insolation, thereby diminishing evaporation and water quantity.	Each hectare of mature Upper Guinea Forest is estimated to hold 160 tC02eq/ha (JA. Lindsell & E Klop, 2013). 364 ha of bare land inside the ENNR when restored, will store 58,240 tCO2eq. 1486 ha of shrub and grassland inside the ENNR if planted with forests has the potential to store, 237, 760 tCO2eq Of the 1,529,949 ha of landscape is defined as "degraded" in Liberia (REDD+ strategy, 2016), 613 ha (0.04 %) of this is in the ENNR; When restored, this area inside has the potential to store, 98, 080 tCO2eq. It should be noted that areas such as rivers/stream banks inside the ENNR and liable to benefit from ANR are included in this total. Liberia's total pledge to the Bonn Challenge/AFR100 is 1 million ha. The final estimates of sequestration and storage will depend on species used.	Giving preference to indigenous species. Carefully managing or avoiding use of invasive species in ANR.
2	Law enforcement and ESIAs in active mines	Due diligence ensures practices are less toxic and	Not applicable	Implementation of "Dig-hole Cover-hole" as part ESIA due diligence will

[4] Slope remains a significant criteria inside the ENNR where original vegetation on the highest and steepest slopes was grassland and not forests.

		damaging to water resources.		reduce wildlife accidental deaths.
Outside the ENNR, within 5 km periphery				
3	Hybrid oil palm, cocoa and rubber; individual tree crops plantation development/home gardens	Use of indigenous trees such as cola is encouraged on river/stream banks outside the ENNR.	Surface areas for individual tree-crop plantations are yet to be determined. However, the estimated per ha Time-Averaged Carbon Stocks (TACS) for the three leading commodity tree crops are as follows: Oil Palm Agroforest: 113 tC02eq/ha (Hairiah et al. 2001 ; Yemefack & Alemagi, 2013), Cocoa Agroforest: 148 tC02eq/ha (Sonwa et al. 2009 ; Magne et al. 2014 ;Yemefack & Alemagi, 2013; Norgrove et al. 2013) Rubber Agroforests: 116 tC02eq/ha (Hairiah et al., 2001)	Promoted through mixed plantations (Agroforestry). Ensuring minimum mixture with indigenous timber or medicinal plants species.

8. Social Aspects of FLR

8.1. Gender Analysis

The 2008 Population and Housing Census of Liberia indicates that, in the rural sectors of Liberia, the average female involvement in agricultural activities is 23% of the household across the country. This includes females from bellow 18 years to above 60 years. On age class basis, the following table summarizes the LISGIS 2008 Census: data for gender involvement in rural agricultural activities. Whatever the age class, the table suggests that less females than males are involved in rural agriculture, and this also applies to the Grebo-Krahn-Sapo Corridor landscape. (LISGIS 2008 Population and Housing Census of Liberia)

Age class (year)	Male (%)	Female (%)
Less 18	53.8	46.2
18-24	72.3	27.7
25-39	80.8	19.2
40-59	77.0	23.0
60 +	71.2	28.8

Across the four communities surveyed in the ENNR landscape, 59% of the population is made up of women. The national composition is 50.27 Male and 49.73 Female. The reason for the higher proportion of women in Nimba is not immediately obvious.

Men and women are generally involved in activities together with men dealing with heavier, one-off chores, while women handle the more monotonous ones. Men are more involved in tree planting than women. The agreement of women is however critical if the trees are to survive and grow to maturity, once they are in the field. Nevertheless, women remain key agents of deforestation, linked to the development of annual crops, at the base of food security. Women are very active with NTFPs collection and marketing. A particularly important product collected, dried and marketed by women is *Xylopia aethiopica.* Others are bush pepper (*Piper guinensis*), walnut (*Coula edulis*), and Worlor (fruit of *Beilschmiedia mannii*). Bitter kola (*Garcinia kola*) is collected mainly by men.

Photo 6: Mapping through women's perceptions of land use in Nimba (By Nathaniel Mulbah)

8.2. **Stakeholders Mapping**

Table 8: Stakeholder Mapping for Landscape Restoration in the ENNR Landscape.

	Restoration Options/Interventions	*Main Stakeholders*	*Possible Functions/roles*
Inside the ENNR (non-forest; based on canopy cover, shrubs, former LAMCO mines)			
1	Assisted Natural Regeneration (ANR); implement ESIA guidelines as part of management practices in disturbed areas	MRU	Policy incentives and other forms of support to enable ENNR authorities mobilize resources for various landscape restoration options.
		FDA, EPA	
		GREENLIFE West Africa, Conservation International (CI)	Technical, logistical and advocacy support for restoration inside the ENNR.
		FIFES	
		Arcellormittal	Financial or in-kind support for restoration inside the ENNR
Outside the ENNR, within 5 km periphery			
2		MRU	

	Hybrid oil palm, cocoa, rubber and cola-nuts plantation development	FDA	Facilitating (such as through guarantees) or providing policy support to group or individual credits or grants for landscape restoration
		MOA Liberia	Technical support to groups or individuals, with business plans and other value chain development support for landscape restoration using commodity tree crops, and indigenous species
		SOLIDARIDAD, GREENLIFE West Africa	
3	Enrichment and rehabilitation of underutilized home gardens	PARLEY	In-kind or cash, direct or indirect investment in landscape restoration by providing technical and financial support to individuals, women and youth groups
		FIFES	
		CODA	
		VOSELO	
		Arcellormittal	Direct financing of restoration through Corporate Social Responsibility or other mechanisms
		GREENLIFE West Africa	
4	Assisted Natural Regeneration (ANR)	Same as 1	

8.3. Cultural dimensions

There are six (6) ethnic groups across the Nimba landscape - the Gio, Krahn, Mano, Kpelle, Lorma and Madingo. While the Gio ethnic group comes in second to the Mano in terms of population, the Gio people co-exist well with the majority Mano ethnic group. More common grounds for socialization exists while a few are sex-specific such as the secret societies; Poro for men, and Bondo for women. These secret societies use specific locations (no-go zones for others) in the forest, where none-members are prohibited. Over two-thirds of the communities surveyed, claim to use secondary forests outside the ENNR as the main sources and points of collection of NTFPs and other wild products. However, probing revealed that, much of the high value NTFPs are collected from the ENNR or other nearby virgin forests. Finally, there are at least two (2) community forests within the immediate landscape of the ENNR. The first is the Zor Community Forest (13,569 ha) near Dulay in the Northeast of the Reserve. The other is the Gba Community Forest (10,939 ha) near Zolowee in the southwest of the reserve. Information on community management practices are scarce and so far little relationship has been established between the community forests and landscape restoration; such as for sourcing planting materials of indigenous trees, generating funds for restoration investments; Silviculture skills useful to restoration; or even degraded areas within the community forests that need to be restored.

9. Enabling Environment for FLR

Enabling conditions for forest landscape restoration begins with an acknowledged status of widespread landscape degradation. Such acknowledgement can be significant, such as in Liberia if degradation can be perceived almost as an existential threat to a resource as important as forests. Unfortunately, in Liberia, keen observers would agree that, to be that case. The Upper Guinea Forest (UGF) region of West Africa is one of the most climatically marginal and human-impacted tropical forest regions in the world (Liu et al, 2017). Liberia is today the epicenter, harboring 40% of all remaining UGFs. Of the 9 river basins in the Mano River Union, five (5) are wholly or partly in Liberia; Mano, Lofa, St. John, with the Cestos and Cavally extending as far north as Nimba. By their shape and width, these river basins are vulnerable to degradation, and given settlement and migratory patterns, their upstream sections are sites of widespread and increasing degradation (MRU, 2011).

For restoration to take root, a country must be signatory to major conventions framing the practice; and must be committed to doing something about it. Finally, knowledge and commitment must be translatable to concrete restoration actions on the ground through assessments, policies, incentives, action plans and especially technical and financial partners at local levels. With a minimum of courage, skills and resources available to stakeholders, Liberia can currently be said to be ready for landscape restoration. A number of factors such as national policies and strategies, local governance, and tenure underlines Liberia's readiness, as well as the ENNR Landscape's relevance.

9.1. National Strategies and Policies

Liberia is a signatory to the Convention on Biological Diversity, which is committed through the Aichi/CBD Article 14 to restore degraded habitats. Under the CBD, Liberia pledged that at least 10% of her suitable landscape(s) be set-aside for Strict Protection and 30%, for protection and multiple-use. The creation and existence of the East Nimba Nature Reserve (12,154 ha) in part addresses some of these commitments.

In 2015 Liberia pledged to restore one million hectares of degraded lands through the Bonn Challenge and AFR100 platforms. Nevertheless, Liberia's REDD+ strategy defines at least 1,529,949 ha of its forested landscapes (exceeding her pledge) with <30% canopy cover as officially degraded. Liberia has ratified the UNDP's Land Degradation Neutrality (LDN) Convention, has a National Drought Plan and as recently as 2019, reaffirmed her commitment to LDN. A number of policies however, underline why restoration has a good foundation for success in Liberia;

- The National Forestry Policy and Implementation Strategy (2007), wherein the State commits to Conservation, Community benefits and Commercial use of forests
- The Community Rights Law with respect to forestlands (CRL 2009) wherein the State commits to upholding community benefits from forests.
- A duly approved 2014 – 2018 East Nimba Nature Reserve Management Plan; including Management Action 7.3.1. Habitat Restoration; a Policy that seeks the best methods to achieve ecological restoration, including an action plan that seeks amongst other things to:
    - Support/observe AML's research to find the best methods for habitat restoration
    - Design a funding proposal to carry out restoration, when the experimental plots have provided results
    - Design new action plan as a part of the proposal

9.2. Local governance, availability of technical and financial partners

At the local level, the District Commissioners are the Focal Persons between the local communities in the respective districts under their jurisdiction and the Nimba County Government. The Paramount Chiefs provide oversight of all developmental and social activities in the district.

Each village at the local level belongs to a Chiefdom. The ENNR traverses two districts; Gbehlageh and Sanniquelleh – Mahn, both in Nimba County. The reserve therefore, occurs under two administrative jurisdictions – Districts, each with a Paramount Chief and a Commissioner, appointed by the President of Liberia. Each of the six clans (Gio, Krahn, Mano, Kpelle, Lorma and Madingo) is headed by a Chief, and a Clan Chief is selected by the Paramount Chief, while the General Town Chief is selected either by the Commissioner or the Paramount Chief. Town Chiefs are selected (or elected) by the community.

Across the ENNR Landscape, there is a relatively high representation of long-staying residents compared to seasonal ones who come in and leave for business. The more stable population are dominated by the Mano ethnic group thus making law enforcement and respect of regulations relatively easy to achieve. The larger the group of more permanent residents, the higher the likelihood that a local population will be more compliant, and maintain good relations with the FDA authorities head quartered in Zortapa and responsible for the ENNR.

The diversity of issues; forestry, agriculture, mining, livelihoods, biodiversity, water services and transboundary issues in the Nimba mountains, also creates a diverse stakeholder base comprising; the FDA, the Ministry of Agriculture, PARLEY, FIFES, CODA, VOSELO, Arcellormittal, and others. This range of stakeholders can provide a challenge if managed poorly, but more likely to be an opportunity, as each entity can create a constituency around it to address one or more issues. The opportunities offered by these entities vis-à-vis landscape restoration would depend on how well their agendas align with that of the local populations' commitment to landscape restoration.

9.3. Land Tenure

To begin with land tenure, the Land Rights Act of Liberia defines four main categories of tenure: Private Land, Customary Land, Government Land and Public Land. This provision has strong implications for the millions of rural Liberians such as in the ENNR Landscape who currently do not have formalized land rights – especially communities such as Camp 4, Dulay and others, pushed into their current locations by previous mining activities. The significant areas of degraded sites inside the ENNR and the plots under customary control outside the reserve earmarked for commodity tree-crops have clear tenure. Where interventions in Government and Public Land is required or in secondary forests on sensitive areas such as river/stream banks or other areas under threat, the local governance structure provides enough opportunities and possibilities for local negotiations. (Land Rights Act of Liberia 2019)

Below is a response from a participant interviewed during the exercise and many other participants shared the same view:

Speaking in the context of land disputes, a woman in Camp #4 said, "We are very peaceful in this community, so we need forest landscape intervention that should not destroy our long-term peace established."

9.4. Readiness diagnostic

According to the Theory of Change, for attaining landscape restoration outcomes in Nimba (inside and outside the ENNR) a number of factors must be satisfied; put otherwise, a diagnostic (evaluation) of readiness needs to be established. Table 9 below is a Readiness diagnostic for the ENNR Landscape.

Table 9: Readiness Diagnostic for Landscape Restoration in the ENNR Landscape

	Theory of Change Assumption	*Proposed Restoration Interventions for the ENNR Landscape*			
		1. Assisted Natural Regeneration (ANR) in abandoned LAMCO mines (Inside Reserve)	2. Hybrid oil palm and cocoa, & or rubber; individual plantation development (outside reserve)	3. Rehabilitation of home gardens (outside reserve)	4. Assisted Natural Regeneration - ANR (outside reserve)
1	*Institutional, Policy and Biophysical success factors in place for restoration interventions*	Yes. ENNR has carry-over restoration activities from its Management Plan	Yes/No. Policies exist but optimum locations still need to be mapped out in the field	Yes	Yes
2	*Knowledge of appropriate financing mechanisms for restoration interventions*	Co-funding from AML and with FDA support, partners like CI will come onboard	Yes/No. This is lucrative and all tree crops have Liberian markets. A value chain analysis needs to be carried-out with different financing options.		No. But financing source is likely to be similar to ecological restoration of the ENNR.
3	*Viability and significance of restoration intervention.*	AML testing of *Piptadeniastrum africana, Albizia ferruginea, Albizia zygia*, *Albizia adiantholia*. One fast-growing pioneer species *Ceiba pentandra* is showing promise	Viable/significant for livelihoods		
4	*Minimal conflict of interest; no technical or financial impediment*	Potential for conflict of interest		Yes, minimal conflict & Techical/Financial impediment	No. Planting on river/stream banks and for other ecological ends is likely to raise need for conflict management

5	*Ecosystem Service and or Product directly or indirectly relevant to local, national or international stakeholders is clarified*	YES	
6	*Knowledge of value and spatial extent of Ecosystem Service or products is available*	Knowledge of value – Yes, but spatial extent of investment and impact yet to be determined	YES

10. Financing forest landscape restoration

The proposals are made here; one tied to the restoration option that emerged from this assessment and a second based on existing carbon markets.

10.1. Financing options based on assessment findings

Table 10: Options for financing landscape restoration in the ENNR Landscape

	Main proposed restoration interventions	*Possible financing mechanisms*
1	Assisted Natural Regeneration (ANR) in abandoned LAMCO mines (Inside reserve) and elsewhere	Principal funder is the FDA. Co-funding should be expected from AML. The Liberia Conservation Fund is also mentioned as a possible funding source for Protected Areas in Liberia. The existing Management Plan expired in 2018 and requires revision. Someone needs to fund that process. ANR outside the reserve is also likely to be funded by technical and financial partners of the FDA including CI and other NGOs.
2	Assisted Natural Regeneration - ANR (outside reserve)	
3	Hybrid oil palm and cocoa, and/or rubber; individual plantation development; including with cola and other economically viable species (outside reserve)	This are lucrative and all tree crops have existing national, regional and international markets). cocoa agroforestry, rubber and oil palm are the most profitable based on the current assessment and can be a starting point. A value chain analysis needs to be carried-out with different financing options and possibilities for certification pathways based on the extent of integration with indigenous species. The example of J-Palms (Led by Mahmud Johnson) currently ongoing in Liberia is one model. The potential for engaging with AML to finance lucrative community-based restoration, based on agreements, whose proceeds then gets ploughed back into ecological restoration outside the reserve should also be explored.
4	Rehabilitation of home gardens (outside reserve)	

10.2. Public Private Partnership (PPP) financing opportunity

Private sector financing for landscape restoration currently exists with very specific demands. One case involves the possibility for purchase of long-term forest carbon by the private sector. To use the case of AIRBUS Industries, Toulouse, France; this focuses on reforestation of degraded landscapes.

The preference is for timber species of medium age duration 25 – 40 years. As a classic PPP[5] such restoration agreements require solid agreements, including the following minimum criteria.

- The land should be at least 5000 ha, or more (preferable)
- Preferably with a single owner with who a binding agreement is entered into, to avoid long term social problems
- The preferred previous land use types are grasslands and degraded secondary forests
- The land needs to have some residual fertility, such as a long fallow area (7 years above)
- Others, to be negotiated on a case-by-case basis

In this case, funding of afforestation/reforestation is done with the goal of acquiring Carbon Credits. Such plantations may also seek some form of Verified Carbon Standards (VCS) certification. It makes them attractive for investments from various private sector entities, besides the AIRBUS example. The prices paid tC02eq are based on the level of attractiveness of the project; such as what Sustainable Development Goals (SGDs) can be achieved through the project. The ENNR is surrounded by UNESCO world heritage sites on the Guinean and Ivorian sides of the borders. The reserve has very high conservation value; for water services and biodiversity, while its fertile soils continue to support livelihoods. Thus, excellent opportunities exist to negotiate a high price per tC02eq of tree biomass in the ENNR Landscape as a whole. Generally, price ranges per tC02eq are wide and can be from 2 – 15 USD per ton, and makes allowance for good and not so good quality credits. The incentive however, is to get better prices by improving environmental and social metrics.

11. Conclusion

The ROAM application in the landscape within 5 km of the ENNR Landscape set out to identify and evaluate opportunities for restoring and safeguarding ecosystem services, and how livelihoods can be improved in the process.

The landscape within 5 km of the ENNR and the reserve itself, impacts two major river basins; the Cestos and the Cavally, with more proximal effects on two important rivers; the Yah and Yiti. Various parts of the ENNR Landscape face different forms of degradation threats; from slash and burn agriculture, practiced by communities of the second most populated county; to artisanal gold mining. An even bigger degradation problem to be addressed is the 1,100 ha of degraded landscape left behind by the LAMCO mining company. The assessment observes that, restoration and management of sensitive areas in the river basins can prevent and/or roll back degradation; while development of viable portions using appropriate species will store carbon, improve livelihoods and promote biodiversity. Right across the landscape and basins, the combined, long-term effect of restoration will help safeguard the ecosystem and support livelihoods downstream. It should be noted that Mount Nimba is the highest peak in this part of West Africa, thereby making the Nimba ranges into a very

[5] Characterized by Public – Private Partnership, long term, based on a signed contract, outside the regular business domain of the Private Sector, Private sector expertise is employed against Public sector facilitation and elimination of red-tape, etc.

significant watershed. Liberia and the other Mano River Union Member States cannot afford to be left in a degraded state.

However, based on the objectives laid-down from the outset of the assessment, the following specific deductions can be made;

Inside the East Nimba Nature Reserve (ENNR);

- Working with the FDA and AML experts and others, already on the ground to test different fast growing species common in disturbed forests, and using different planting methods to restore the sites in the reserve previously degradaed by LAMCO mining. Species recommended include *Xylopia aethiopica, Beilschmiedia mannii*, *Piptadeniastrum africana, Albizia ferruginea, Albizia zygia*, *Albizia adiantholia*. Fast-growing pioneer species such as *Xylopia aethiopica and Ceiba pentandra* are showing promise and should be planted in the trial sites. Primary invaders such as *Parinari excels and Nauclea diderrichii* are also potential forest trees species for rapid restoration.
- Early positive results showing *Ceiba pentandra* and *Xylopia aethiopica* to be doing well in mined areas, need to be capitalized upon and additional techniques of Assisted Natural Regeneration are recommended for use on degraded gallery forests, river and stream banks inside the reserve. It should be noted duing restoration of degraded previous mining sites, that the original vegetation in the highest and steepest parts of the LAMCO mines was grass and not forests.
- These restoration investments will contribute to overall carbon sequestration and eventually to storage in a measurable way.

Outside the ENNR; within 5 km of its periphery

- The development of commodity tree crop plantations of oil palm, cocoa, rubber or other appropriate species (e.g. cola) on aging agroforestry systems, from degraded secondary bushes, appropriate old fallows and home gardens will be vigorously promoted, and the development of value chains for their products supported.
- Development of these plantations will contribute to overall carbon sequestration and eventually to storage.
- Ensuring community tree plantations include at least 10% indigenous tree species (e.g. cola), per hectare to enhance on-farm biodiversity and increase chances of certification of community plantations.

To achieve improved knowledge and understanding at the national and regional levels, the following are recommended;

- Improved data and information gathering and sharing on land-use, e.g., on artisanal mining, small scale timber and NTFPs actors in HCVFs in Liberia to help inform planning decisions by working with the FDA and with the MRU for transboundary lessons.
- Improve understanding of tree crops value chains, such as cocoa, oil palm, rubber, cola (including NTFPs such as *xylopia aethiopica and Beilschmelia mannii*) and how sustainable small-scale agriculture, and commodity tree crop production practices can be promoted and financed (including through certification) around HCVF.

- Improved knowledge, data and awareness of opportunities and mechanisms for financing landscape restoration from private and public sources.

- Excellent factors of success exist at national and international levels. For instance, landscape restoration contributes to the REDD+ program, to National Adaptation Plans, to CBD Aichi Art. 14, and to the UNDP's LDN. Through the monitoring of restoration of degraded lands inside and outside of the ENNR, an evaluation of the contributions to local, individual and community livelihoods, as well as the Bonn Challenge and ARFR100 initiatives by Liberia can be achieved.

- The main expected source of finance identified are through Public sources (the State, FDA and even the MRU); from Bilateral and Multi-lateral donors for restoration investments in the ENNR Landscape. So far, the ArcelorMittal Liberia (AML) mining company has been very engaged in support of the management plan development of the ENNR. This support continues through ecological restoration trials and are certain to continue. Outside the reserve (also applicable inside), there is growing interest from the private sectors (e.g., AIRBUS Industries Toulouse) to purchase/secure bio-carbon (as offsets) from Reforestation Projects. The requirements for this from the private sector can be very specific, yet represents a very viable source of financing. Given that such private sector buyers also seek strong certification, there is room for negotiating more flexible arrangements, more adapted to local context, yet acceptable to private sector entities. Finally, the development of commodity tree crops of oil palm, rubber and cocoa represents the biggest restoration opportunity outside the reserve. There is a huge internal and regional market for these commodities. What is required is solid value chain analyses to better understand these investment streams. Such value chain analyses were outside the scope of this ROAM.

12. Proposed Restoration Action Plan

Table 11: Proposed 5 – year restoration action plan for the ENNR Landscape

	Main proposed restoration interventions	*Actions*	*Time frame*				
			Y1	*Y 2*	*Y 3*	*Y4*	*Y5*
1	Assisted Natural Regeneration (ANR) in abandoned LAMCO mines (inside reserve) and elsewhere	1.1. Brief review of regulatory guidelines					
		1.2. Identify funding sources, negotiate and sign funding agreements and implementation plans					
		1.3. Identify, select, characterize, validate and use appropriate species for restoration					
		1.4. Evaluate and survey for any existing conflicts of interest and technical challenges; and feasibility					
		1.5. Due diligence: Evaluate and confirm local, national and international					

		acceptability of benefits/costs (ecological and social)					
		1.6. Map and evaluate quantitative and qualitative aspects and extent of impacts of benefits/costs of interventions					
2	Assisted Natural Regeneration - ANR (outside Reserve)	2.1. Evaluate extent of illegal wood harvesting; harvesters' level of organization and willingness to be engaged					
		2.2. Identify funding sources, negotiate and sign funding agreements and implementation plans					
		2.3. Evaluate effectiveness of law enforcement strategy and proposed ANR approaches					
		2.4. Evaluate any existing potential for conflicts of interest and propose mitigation measures					
		2.5. Due diligence: Evaluate and confirm local, national and international acceptability of benefits/costs					
		2.6. Map and evaluate quantitative and qualitative aspects and extent of impacts of benefits/costs of interventions					
3	Hybrid oil palm and cocoa and/or Rubber; individual plantation development; including with cola and other economically viable species (outside reserve)	3.1. Evaluate and map all optimum locations for commodity tree crop establishment; establish ownership and build database					
		3.2. Develop full value chain analyses and business plans; including analyses of 2 – 3 tree crops					
		3.3. Produce stories about viability and importance for livelihoods, reserve and landscape and use as a marketing tool for funding					
		3.4. Evaluate any existing potential for conflicts of interest and propose mitigation measures					
		3.5. Due diligence: Evaluate and confirm local, national and international acceptability of benefits/costs of agroforestry based plantations					
		3.6. Map and evaluate quantitative and qualitative aspects and extent of impacts of benefits/costs of interventions					

4	Rehabilitation of home gardens (outside reserve)	4.1. Review and share lessons of the value, legitimacy and significance of Home Gardens as a land use option.					
		4.2. Access funding for development; especially potential of VSLA as sources of investment					
		4.3. Produce stories about viability and importance for livelihoods, the reserve and landscape and use as a marketing tool for funding					
		4.4. Evaluate innovations in homes gardens and potentials for expansion					
		4.5. Due diligence: Evaluate and confirm overall contribution/potential of this agroforestry practice to landscape restoration					
		4.6. Map and evaluate quantitative and qualitative aspects and extent of impacts of benefits/costs of home gardens as restoration interventions					

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Annexes

Annex 1: Socioeconomic Assessment Report – ENNR Landscape

EXECUTIVE SUMMARY

The East Nimba Nature Reserve (ENNR) is located at North- eastern part of Liberia with a total area of 13, 500 hectares. This forest Reserve is characterized by a composition of natural ecosystems evolving from several ecological and geo-physical processes that have resulted in the creation of many habitat types such as montane gallery forest, secondary thickets and woody grass land, secondary hill forests, moist evergreen forest, swamp and wetter secondary forests covering Guinea and Cote D'voire. Based on numerous studies and aging observations over the years, in 2019, the Manor River Union (MRU) in collaboration with the Forestry Development Agency (FDA) with funding from International Union for the Conservation of Nature (IUCN) agreed to implement forest restoration activities in the East Nimba Forest Landscape to address the forest degradation issues across the landscape. Prior to the intervention, series of baseline assessments need to be undertaken to fully uncover the existing sociocultural and environmental characteristics of communities and the landscape at large. Hence, the socioeconomic assessment was geared towards understanding the general social, cultural and economic characteristics of the communities across the East Nimba forest landscape in Liberia. A convergent research approach was used to collect both qualitative and quantitative data cross sectionally. Data were analyzed using Statistical Package for Social Scientist (SPSS) to generate chart and tables and content analysis for the qualitative data to draw conclusions. The assessment serves as a baseline to establish benchmarks for the implementation of forest landscape restoration activities. Key results are summarized below;

Social and economic factors of forest landscape restoration opportunities

Generally, the total population of the communities assessed was estimated as 10,330 residents with approximately 59% female population. These communities portrayed very similar social, cultural and economic characters. Among the four communities sampled, only camp #4 has some restrictions in terms of access to land for agricultural diversification; they have not been allowed to cultivate perennial crops on the land allocated to them. However, all the communities were revealed as permanent settlements with a long-term history of establishment between 1815 and 1978. More than half (51%) of the household heads interviewed were above the national youth age cohort (15-35 years) and only 1% aged less than 19 years. 37% of all the respondents across the communities attained secondary education and a large proportion of that was found in Camp #4 and Dulay. This further indicates that camp #4 and Dulay have residents with some form of high school education capable of reading and writing. The analysis below further shows that very few (1%) of the households interviewed had professional training and 32% had no form of formal education. 71% of the respondents were revealed as married with Dulay having 78% of the respondents married. The average household size was 7, which exceeded the national average household size for rural

communities in Liberia (5)6. This may be true for most of the households across the East Nimba forest landscape. Based on the estimated total population revealed, about 10,330 residents depend on the forest resources for their daily livelihoods. Series of agricultural projects have been implemented in the landscape with varying benefits to the residents. At least 9% of the household sampled had benefited from some form of development support in the landscape.

Awareness of participants in forest landscape management

Specifically, 41% of the residents interviewed had participated in awareness raising program on good forest management and 45% on good land use management. Radio and Television programs were also revealed as contributing channels through which most of the community members have heard about forest restoration. However, the scientific practice of forest landscape restoration was not revealed by any of the residents interviewed.

Livelihood, Social, cultural and economic dimension of landscape degradation

Very few social facilities were mentioned across the communities; schools, health centers and training centers. Major economic activity mentioned was farming and 59% of the households interviewed accepted the clearing of forest for agricultural activities. It was revealed that, forest was mostly cleared for subsistence farming and very few cleared for mining and other activities. The average land size cleared was calculated as 1.3 Ha with at least 1.4 hours distance from the communities and fallow period of 5 years. The average expenditure on mobility (LD 250,620) exceeds all other expenditure categories mentioned. This means that movement across the landscape requires huge financial implication. The daily income calculated (US$1.4/day) exceeds the World Bank Poverty line rate analysis for Liberia, of $1.25/day[7]. Two main secret societies were revealed; the 'poro' for men and 'bondo' for women, which socially unit the community members for joyous activities in the dry seasons. These societies have specific sites in the forest landscape where ceremonies are observed.

Gender-responsive restoration strategies

Generally, the common request from both men and women were; restoration activities with direct economic benefits to the communities, interventions that respect the culture and tradition of all the communities in the landscape; sacred areas should not be tampered with, human rights policies adhered to, no discrimination in employment opportunities, forest guards and the communities should co-exist, there should be an appreciable forest area demarcated for livelihood activities, forest management awareness raising should integrate local communication approaches for program effectiveness.

Cultural, economic and social landscape priorities and their alignment with restoration activities;

[6] Liberia Institute of Statistics and Geo-information Services (LISGIS), 2011

[7] The World Bank has announced that about 54 percent of the population of ***Liberia*** is living below the ***poverty line***. This means they live on less than $US2. 00 a day, 2016

Most of the residents interviewed were aware of the protected nature of the East Nimba Forest landscape, hence very few mentioned the collection of forest products from the protected forest reserve, rather 78% mentioned the agricultural farm as their first choice of forest products' collection. The priority economic intervention was cash crop (cocoa), which they considered as the most economically viable tree crop.

Costs and benefits (social, economic, and biophysical) of forest landscape restoration opportunities in the landscape

Three main intervention options were frequently mentioned across the communities assesses; Agroforestry (cocoa, coffee), oil palm plantation, and rubber plantation. Among these three, agroforestry (cocoa) and rubber were both considered as the best intervention crops that will yield the appropriate net benefit to the communities. However, the cocoa plantation was highly preferred by most of the respondents across the communities, except for Camp #4 community that suggested economic empowerment and awareness raising as their preferred restoration option.

Cataloging the socially and economically important biodiversity within the landscape

Species mentioned by the communities that are of great importance to the local food, medicinal herbs, construction and other cultural/traditional purposes were; the African spice tree (Xylopia aethiopica), Ganagana (Cassia fikifiki), Yellow wood (Terminalia sppivorensis and T. superba), Dahoma (Piptadeniastrum Africana), Abura (Hellea ciliate and H. stipulosa), Worlor (Beilschmelia mannii) and Raphia pine (Raphia palma-pinus). Tree species mainly cultivated for commercial purpose in the East Nimba Forest landscape are; cocoa, coffee, oil palm rubber and kola. Other wildlife species common in this area include most of the wildlife in Liberia such as Chimpanzee, Pangolin, Monkey, Grass cutter, Black deer just to name a few. Common domesticated animals are chicken, pig, goat, sheep, duck fowl

BACKGROUND AND CONTEXT

East Nimba Nature Reserve (ENNR) is located at North- eastern Central Liberia with a total area of 13, 500 hectares or 337,500 acres. The Reserve is characterized by a composition of natural ecosystems evolving from several ecological and geo- physical processes that have resulted in the creation of many habitat types such as montane gallery forest, secondary thickets, or woody grass land, secondary hill forests, moist evergreen forest, swamp or wetter secondary forests covering Guinea and Cote D'voire. As a result of the diverse vegetative uniqueness of the site, accommodation is provided for many species of conservation relevance that are endemic to the Liberian side of the mountain which are either threatened or endangered under IUCN status such as the Nimba toad (Nimbaphrynoides occidentalis liberiensis), Nimba otter shrew (Micropotamogale lamottei) (Endangered), Nimba flycatcher (Malaenornis annaamarulae) (Vulnerable) African Swallow-tail butterfly (Papilio antimachus) and the endangered Chimpanzees (Pantroglodytes verus) which are famous for their distinctive tool use repertoire. Also adding credit to the site is its biodiversity potential, form, and array of endemic and threatened fauna. The site is currently considered to be the richest forest domain of the country; particularly, in terms of rarity and endemic species composition. The other side of Mount Nimba in Guinea and Ivory Coast is already designated as a

World Heritage Site[8]. Over the years, these important ecosystem and biodiversity have been exposed to human induced and natural threats, which may lead to rapid degradation if not controlled. In addition, the forest and biodiversity of this landscape are threatened by shifting cultivation practices and hunting, which have become unsustainable. The opening of a second mining site by Arcelor Mittal Liberia (AML) has also impacted the forest[9].

Based on studies and observations over the years, in 2019, the Manor River Union (MRU) in collaboration with the Forestry Development Agency (FDA) and funding from International Union for the Conservation of Nature (IUCN) agreed to implement forest restoration activities in the East Nimba Forest Landscape to address the forest degradation issues across the landscape. These interventions would require intensive engagement with communities, national stakeholders and interest groups for maximum success. Therefore, prior to the intervention, series of baseline assessments need to be undertaken to fully uncover the existing sociocultural and environmental characteristics of communities and the landscape at large. Hence, the socioeconomic assessment was geared towards understanding the general social, cultural and economic characteristics of the communities across the East Nimba forest landscape in Liberia. It serves as a baseline to establish benchmarks for the implementation of forest landscape restoration activities. It further provides details on the existing situation with respect to the parameters outlined in the objectives. Results generated from this survey will inform the design, Monitoring and Evaluation of the forest landscape restoration activities across the East Nimba Forest Landscape.

1.1 Aim and objectives of the socioeconomic assessment

The aim of this activity is to collect information on human populations and socio-economic dynamics that contribute to forest landscape restoration, integrated land use planning and sustainable income generation from various restoration interventions. Objectives include:

The integration of demographic and social factors in to the assessment of forest landscape restoration opportunities;

The collection of data and knowledge on livelihoods and natural resource use and dependence

An assessment of the social, cultural and economic dimensions of landscape degradation;

An assessment of the cultural and social landscape priorities and their alignment with restoration activities;

Assessments of socio-economic priorities of stakeholders throughout the landscape(s);

The identification of gender-responsive restoration strategies

A landscape assessment of the costs and benefits (social, economic, and biophysical) of forest landscape restoration opportunities in the landscape(s);

Cataloging the socially and economically important biodiversity (genes, species, ecosystems) within the landscape(s).

1.2 Scope of the assessment

[8] https://whc.unesco.org/en/tentativelists/6246/

[9] The Sustainable Trade Initiative, Annual Report 2017

The socioeconomic assessment covered four communities located in and around the East Nimba Propose Protected Area (PPA); Zortapa, Camp #4/Unification Town, Zorlowee and Dulay. These communities were purposively selected to represent the entire communities across the East Nimba forest landscape in terms of their physical and socioeconomic characteristics and access to the forest resources. Other secondary selection criteria were; accessibility for relevant data collection and availability of the respondents. Below shows the map of East Nimba Forest Landscape;

2.0 APPROACH AND METHODOLOGY OF SOCIOECONOMIC SURVEY (SES)

The entire study adopted an IUCN forest restoration assessment approach; Restoration Opportunities Assessment Methodology. The Restoration Opportunities Assessment Methodology (ROAM) is an approach that was developed by IUCN and the World Resources Institute (WRI) to guide the processes of developing forest restoration interventions at landscape level. It is a stepwise and iterative application of a series of analyses used to identify the best set of Forest landscape restoration (FLR) opportunities applicable to a specific site (IUCN & WRI 2014). This approach was piloted in Mexico, Ghana, Guatemala, Rwanda and most recently Uganda (2016). ROAM provides a flexible and affordable framework to rapidly identify and analyze forest landscape restoration (FLR) potential and locate specific areas of opportunity at a national or sub-national level. It provides vital support to move forward with developing restoration programmes and landscape-level strategies[10]. Prior to this study, a training in this approach was conducted by IUCN in Monrovia, Liberia in February 2019 to establish a clear understanding on the approach to be applied to the specific sites identified for the FLR project. Consultants from delivering the various components of the ROAM participated and coordination strategies established between the four MRU states.

Greening Environments, Economies and Lives in the Fifteen States of West Africa (GREENLIFE West Africa) is accountable for delivering the baseline activity 1.14, working in consort with the Forestry Department Agency (FDA), the Mano River Union (MRU) and the International Union for the Conservation of Nature (IUCN) to ensure the success of baseline data harmonization. A team of consultants comprising Socio-Economic and Social Science Experts with proven experience in the respective sites was set up. The team developed data collection tools, utilized data collection templates adopted from the Forest Poverty Toolkit, and generated a field data collection schedule to capture information from communities within the landscape on socio-cultural dimensions of restoration including economic data, household livelihood data (through the Forest Poverty Toolkit), gender, and the social and economic components associated with identified Forest Landscape Restoration (FLR) interventions in the East Nimba Forest Landscape in Liberia.

2.1 Data Collection Tools

[10] IUCN and WRI (2014). A guide to the Restoration Opportunities Assessment Methodology (ROAM): Assessing forest landscape restoration opportunities at the national or sub-national level. Working Paper (Road-test edition). Gland, Switzerland: IUCN. 125pp.

In order to fully capture details on the socio-economic conditions, the poverty toolkit was used[11]. A set of questionnaires/tools for conducting the socio-economic surveys in the target project sites was structured and developed by the project team. The Structure included questionnaires for the household survey (HHS) and Focus Group Discussions (FGD) for community key stakeholders and interest groups.

The Forest Poverty Toolkit (FPT) was used to triangulate primary data for each sampled community. The FPT has eight (8) FLR Assessment tools, but only four were used during the socio-economic data collection for East Nimba Forest Landscape considering the scope and necessary parameters required for this study. These tools and their objectives are presented in the table below.

Table 1: Forest Poverty Toolkit

Tool 1: Wealth ranking to understand how poor households depend on natural resources	**Tool 2:** Situational analysis of the local landscape to understand how people use local natural resources
Tool 3: Trend analysis to understand the dynamics of change on forest and land use (process and factor of deforestation / degradation)	**Tool 4:** Livelihood Analysis to understand how people are dependent on natural resources, and evaluate the income from these resources

2.1.1 The Household (HH) questionnaire

This questionnaire focused on both the livelihoods analysis and the situation analysis of the communities to understand how people use local natural resources and their dependency on the forest for social, cultural and economic purposes. This tool was mostly used to capture quantitative data at the household level on the socio, cultural and economic conditions of communities by interviewing heads of households of each household (or a proxy) as the interviewee in each household in the sampled communities. Based on the size of the village/town, at least 30% of the households were randomly selected in each sampled community for the interviews (this sampling technique was adopted due to the availability of respondents across the communities). A purposive sampling approach was used to determine the villages/towns to be assessed in each county and the landscape at large. The household questionnaire was electronically administered using the Kobo Collect software and synchronized into excel for onwards transfer into an SPSS for analysis.

2.1.2 Focus Group Discussion (FGD) guide

This tool was used to capture qualitative data at gender specific levels (men and women separately) in the project landscape across the four communities. In each location of the FGDs, women and men

[11] PROFOR 2010 https://www.profor.info/content/poverty-forests-linkages-toolkit-0

were separately engaged and consisted of youth, adults, elders and community authorities representing other members of the communities.The number of participants in each group did not exceed eight (8) persons (this means that each targeted community was represented by at least 16 stakeholders; 8m, 8f). The FGDs approach was used to clearly unveil and further clarify the household level data collected on the social, cultural, economic and livelihood conditions of the communities across the sampled communities.This further yielded relevant existing information about the entire East Nimba forest Landscape that can be used to confidently extrapolate the results generated across the communities sampled.

2.2 Data collection methods

The data collection and analysis were done by a team of four (4) people working in the landscape. Each of the sampled communities provided local personnel to support the study team in working within the community. The FDA Junior Technical Assistant assigned to the MRU project based in Nimba, Mr. Teahton Gonkarnue participated in all the community engagement activities as well as members of the Local Consultative Committee (LCC). The four data collectors were fully trained by the GREENLIFE West Africa consultants in the contents of the HH Questionnaire and the FGDs guide to enable them to grasp a better understanding of the various questions and harmonize thoughts and interpretation of qualitative and quantitative responses. The data collection team was based in the landscape for two weeks to increase their accessibility to the targeted communities and also enable them to interact with community members outside formal interviews for diverse opinion gathering. Hence, captured detailed information about the landscape with diverse opinions across the landscape. Two main approaches were employed; the HH questionnaire administered to HH heads and the FGD guide administered to key community stakeholders based on their sex distribution. The separate discussions in the men's and women's focus groups made it possible to answer general questions concerning the entire landscape with respect to communities at the forest and forest edge settlements.

2.3 Sample approach

This refers to the strategies used to select the respondents for both household survey and the Focus Group Discussions. Given that it was difficult to reach the entire population in this study area; specific/non-random sampling approaches were employed to select the most relevant respondents across the landscape as described in the following sub-sections;

2.3.1 The household questionnaire administration

Household questionnaire administration focused on randomly selected households across four (4) communities across the East Nimba Forest Landscape. Review of relevant literatures revealed that the East Nimba Forest Landscape has twenty-one (21) communities. However, this study selected only four communities that fully represent the socioeconomic and cultural characteristics of communities in the entire landscape. Below indicate the sample size calculations;

Table 2: Population and Sample Size

Calculated sample size for the selected communities in East Nimba Liberia

Sampled Communities	Total households	Sample size (30%)	Population
Zortapa	160	***49***	1053
Zolowee	450	***135***	6000
Camp#4	298	***90***	2260
Dulay	170	***51***	1017
Total	**1078**	**325**	**10330**

2.3.2 Focus Group Discussion (FGD)

Respondents for the FGDs were non-randomly selected from each of the targeted communities across the landscape considering the roles and responsibilities of key informants across the communities; people who are knowledgeable in community livelihood, governance and socioeconomic issues. Two categories of respondents were engaged in each of the 8 communities; male FGDs and Female FGDs to ascertain gender sensitive opinion in relation to Forest Landscape Restoration in the East Nimba Forest. The FGD guide mainly captured information on general opinion about FLR and livelihood situation of the communities at large. At least eight (8) participants from each category of sex were selected, which made up of sixteen participants per community (where applicable). Some of the communities with very low population had less than 16 participants in the FGDs, but relevant details were captured.

2.4 Data analysis and interpretation

This section presents the different stages employed to analyze all the primary data; data entry, coding, re-coding, computation, statistical techniques used, and interpretation of data analyzed for both the household and FGDs.

2.4.1 Household data

Processing and analyzing data for any survey or fieldwork activity is as critical as the data collection process itself. Data from the field were generated electronically and synchronized into excel spreadsheet and thoroughly cross-checked and cleaned by the consultants. After the data cleaning, all data were exported into a Statistical Package for Social Scientist (SPSS) for analysis. Thereafter, data re-coding, computation, followed by critical analysis were done across the data to generate frequencies and percentages based on thematic areas of focus:

- Demographic and socioeconomic characteristics of the population
- Livelihood analysis
- Gender and Social inclusion
- Organizations/institutions supporting restoration

Parametric and non-parametric statistics were used to fully describe the existing situation on the above parameters by presenting results in charts and tables with descriptive text based on the various analyses. Disaggregation based on an assortment of variables was conducted, some of which

were guided by the IUCN ROAM baseline guidance document to identify trends. The report is structured with specific focus on the survey content and requirements for the ROAM process.

2.4 2 Focus Group Discussion (FGD) Analysis

The FGD data were recorded on the FGD guides and entered into an excel template based on categories.These data were analysed using both context and content analysis methods with specific focus on the project objectives and information needed to establish a comprehensive baseline for the Forest Restoration Program. Most of the FGD data served as strong narratives to explain the quantitative results with respect to specific parameters assessed.

2.4.3 Cost Benefit Analysis

Implementing forest landscape restoration interventions require land, labour, input materials and time, with both direct costs from the physical process of restoring degraded land and indirect costs from foregone production (opportunity costs) and transaction costs (i.e. negotiating and planning). Restoration interventions impact the functionality of landscapes and the production of ecosystem services and commodities over time. These changes need to be quantified to understand the value of various interventions. To facilitate the analysis of costs and benefits from restoration interventions, it is necessary to have accurate, localized data on the costs of production inputs (e.g., labour, seeds, fertilizer, land) and the benefits from production of related outputs (e.g., crop yields, timber yields, fuel wood, charcoal, carbon). This is usually gathered through a combination of field surveys and value-chain and market analysis[12]. In order to capture the various FLR options, key questions on applicable restoration choices were posed in the FGDs. Responses from the FGDs across the landscape were analysed to determine the FLR options. These results were used to further investigate the market values of the outputs mentioned in the FGDs to determine the Costs and benefits of each option.

3.0 RESULTS AND DISCUSSIONS

This section presents the various results generated from both the household interviews and the Focus Group Discussions across the four communities sampled. Results are presented based on the stated objectives required for the socioeconomic assessment;

3.1 DEMOGRAPHIC AND SOCIAL FACTORS IN FOREST LANDSCAPE RESTORATION

This section describes the origins of communities sampled, population and their habitat status**.** There were captured to understand the possibility of restoration investment across the sampled

[12] IUCN and WRI (2014). A guide to the Restoration Opportunities Assessment Methodology (ROAM): Assessing forest landscape restoration opportunities at the national or sub-national level. Working Paper (Road-test edition). Gland, Switzerland: IUCN. 125pp.

communities and the East Nimba Forest Landscape at large. Based on this reason, questions about the communities' history and habitat status were posed to the FGD participants who were knowledgeable in the communities' foundation history and settlement status. Responses were summarized as indicated in the table below;

3.1.1 History and population of the communities

Generally, the total population of the communities assessed was estimated as 10,330 residents with approximately 59% female population. The community are very similar in social, cultural and economic characters, for which they were selected. Below indicate brief descriptions of the communities assessed;

Table 3: Description of communities sampled

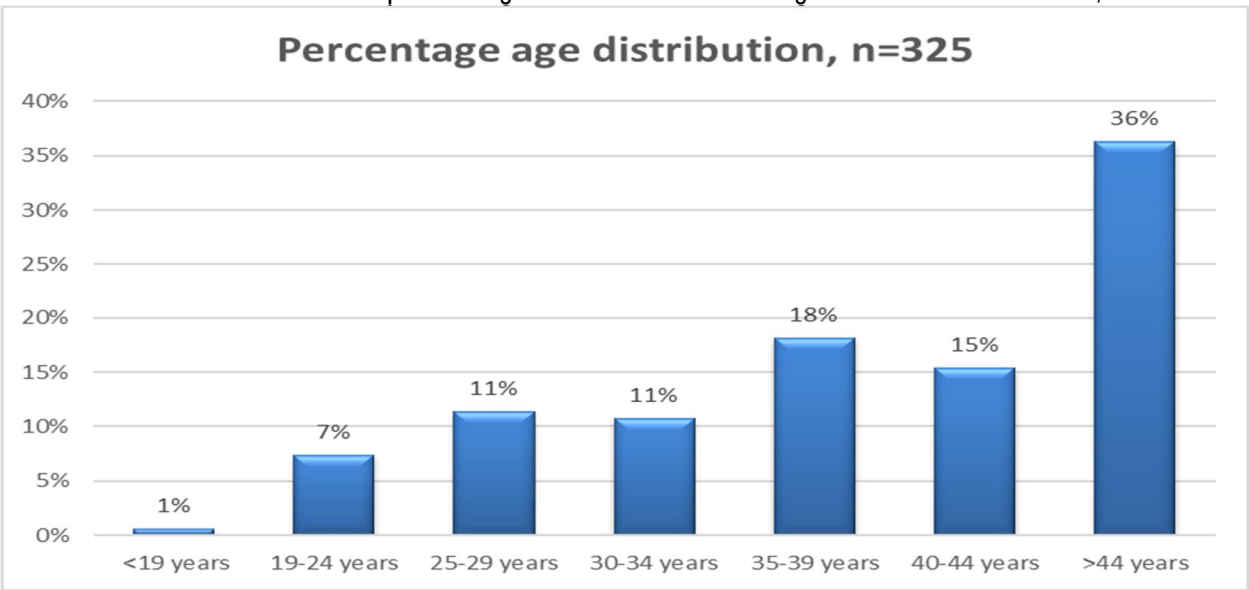
Zortapa *Founded in 1960 and located outside the East Nimba Natural Reserve (ENNR) about 2km south of the reserve. Has an estimated population of 1,053 residents of 533 females and 520 males. About 219 households and 160 houses were reported. The community has a heterogenous ethnicity and is dominated by mano ethnic group. Most of the residents are permanent residents with very few seasonal migrants who visit for few weeks or months for business transaction (especially trade in timber and agricultural produce). This community is hosting the ENNR Headquarters of the FDA (Forestry Development Authority).*	***Camp #4*** *This community is also known as Unification Town and located outside the ENNR less than 1 km in the northwest. It was established in 1964 and originally named Camp #4. The name 'Unification Town emanated from Late President William V.S Tubman when he attended the Unification Day celebration in the community. It has an estimated population of 2,260 residents with 1,100 females and 1160 males with 293 households as revealed in the FGDs. This community has a heterogenous ethnicity with Lorma as the dominant ethnic group. FGDs' revealed that residents in camp #4 lack the land ownership right because the area occupied has been classified as a concession for LAMCO (Liberia American-Swedish Mining Company). The residents are only allowed to plant arable crops on a subsistence basis.*
Zorlowee *Zolowee is located about 5km away from the ENNR. FGD revealed that Zorlowee was established in 1815 and the estimated population at the time of assessment was 6,000 people comprising 4,000 females and 2,000 males. There were 1,200 households occupying 450 houses. The community has an heterogenous ethnic groups and dominated by Mano ethnic group. Majority of the residents were revealed as permanent settlers and very few were seasonal residents.*	***Dulay (Duly)*** *Dulay, commonly known as the old Town was initially established near mount Nimba in the year 1952, but was destroyed by mudslide in 1977 due to the mining operations carried out by LAMCO (Liberia American-Swedish Mining Company), which destroyed over 100 houses. After the disaster, the late president William R. Tolbert intervened and supported the relocation to a safer place where LAMCO successfully constructed one hundred (100) house units in 1978. Dulay is a border community between Liberia and Ivory Coast and dominated by the Gio ethic group. The current Dulay community was revealed as permanent community.*

Source: FGD 2020

Across all the FGDs, the communities' descriptions clearly revealed that 3 out of the 4 communities have a permanent habitat status. However, all of the communities have long term history of establishment (from 1815 to 1978). This clearly indicates that some of the communities across landscape are stable and permanent. Camp #4 as its name implies, was revealed as temporal because the residents have no land rights to cultivate perennial crops such as cocoa, coffee, oil palm etc. Understanding these statuses of communities across the landscape will guide the selection of the forest restoration intervention sites for sustainability.

3.1.2 Age distribution of household heads interviewed

Ages of household heads were captured in years to clearly understand how long respondents have lived with respect to their understanding of their household's socioeconomic situations. Across all the communities sampled, 36% of the respondents aged above 44 years and only 1% aged less than 19 years. The chart below shows the percentage distribution of the ages of household heads;



Source: Field survey data, 2020

Figure 1: Percentage age distribution

From the chart above**,** approximately 29% of the household heads interviewed fell between the Liberian national youth age cohort (15-35 years). These results corroborate with the 2008 national census result on rural household heads, that most of the rural household heads were above 44 years.

3.1.3 Educational levels of household heads

Education is the prerequisite to national development. As such, every person in Liberia must be given equal opportunity in acquiring quality Education. It also serves as an indispensable means of unlocking human potential and protecting human rights by providing the environment that is required to secure

good health, liberty, security, economic well-being and participation in social and political activities[13]. This definition was adopted in this assessment to understand the educational level of residents in the sampled communities. Results were analyzed as shown in the table below;

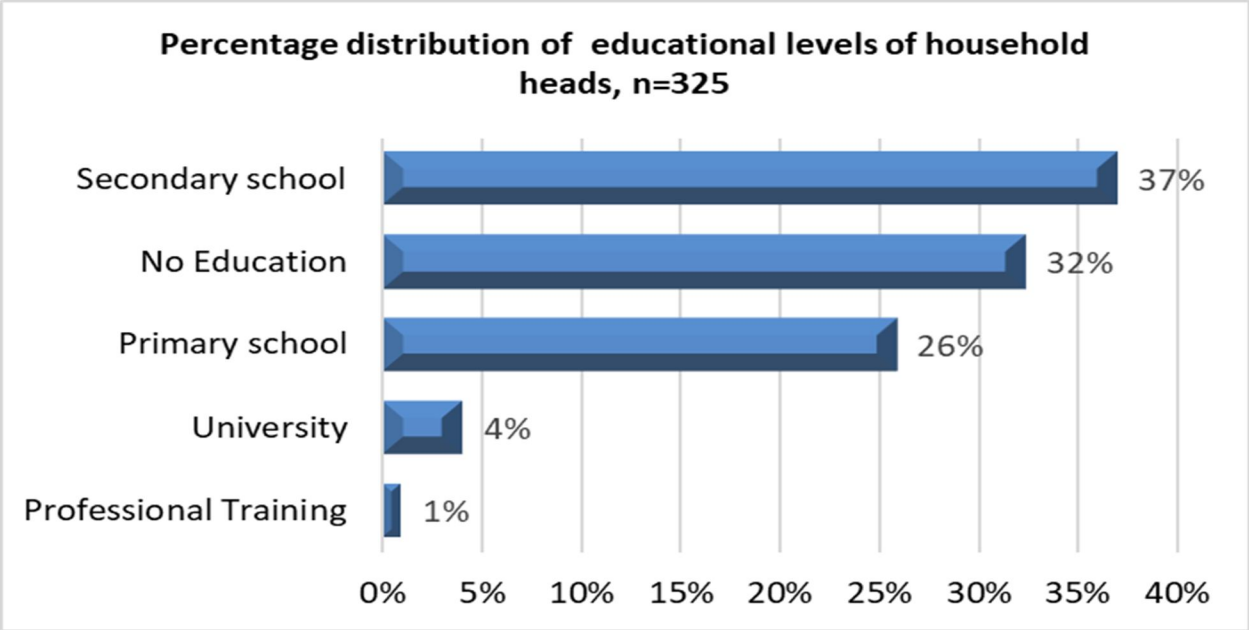
Table 4: Educational levels of the household heads

Analysis of the educational level by community					
	Name of community				
Educational level	**Camp #4**	**Dulay**	**Zoloweee**	**Zortapa**	**Total**
No Education	29%	41%	35%	22%	32%
Primary school	23%	20%	27%	33%	26%
Professional Training	2%		1%		1%
Secondary school	39%	39%	35%	37%	37%
University	7%		2%	8%	4%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Field survey data, 2020

The table above clearly indicates that most (37%) of all the respondents across the communities attained secondary education and a large proportion of that was found in Camp #4 and Dulay. This further indicates that camp #4 and Dulay have residents with some form of high school education capable of reading and writing. The analysis below further shows that very few (1%) of the households interviewed had professional training and 32% had no form of formal education.

[13] Liberia Inclusive Education Policy 2018



Source: Field survey data, 2020

Figure 2: Percentage distribution of educational status of the household heads

The above results are contrary to the national census findings on education and literacy that 50% of the population aged 13 years and above had not completed primary school level education, especially in the rural communities[14]. In the East Nimba communities sampled, less than 50% had no formal education and 68% had some form of education at various levels.

3.1.4 Marital status of the households

This was investigated to ascertain the level of responsibilities assigned to the respondents and to establish the understanding of how the household head interact with the forest resources for survival. As indicated in the table and chart below, most (71%) of the respondents were revealed as married with Dulay having 78% of the respondents married. Results were analyzed as presented in the table below;

Table 5: Marital status

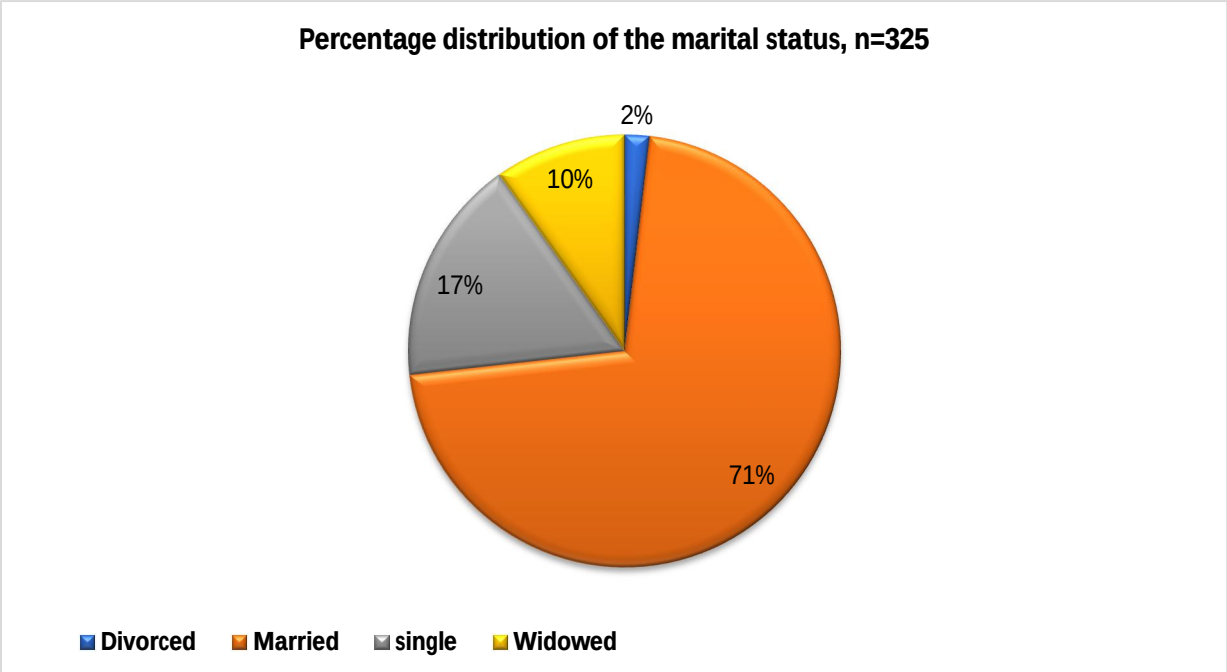
Marital status across communities					
	Name of community				
Marital status	Camp #4, n=90	Dulay, n=51	Zolowee, n=135	Zortapa, n=49	Total
Divorced	0%	2%	3%	2%	2%

[14] Liberia Institute of Statistics and Geo-information Services (LISGIS), 2011

Married	68%	78%	70%	76%	71%
single	27%	4%	16%	16%	17%
Widowed	6%	16%	12%	6%	10%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Field survey data, 2020

As shown in the chart below, only 2% of the respondents cited their marital status as being divorced and 17% single. This means that 19% had no partner at home. However, these households had established number of dependents.

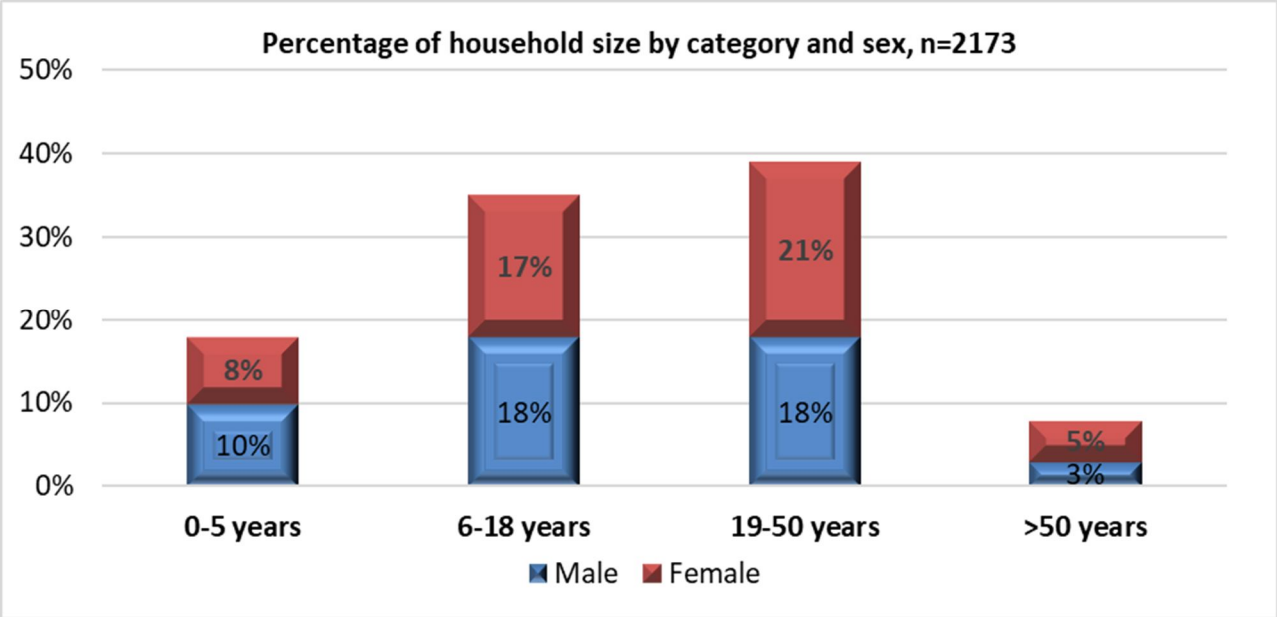


Source: Field survey data, 2020

Figure 3: Percentage distribution of marital status

3.1.5 Household size and composition

Household size was captured to understand the number of people in every household sampled. This was analyzed and presented in the chart below;



Source: Field survey data, 2020

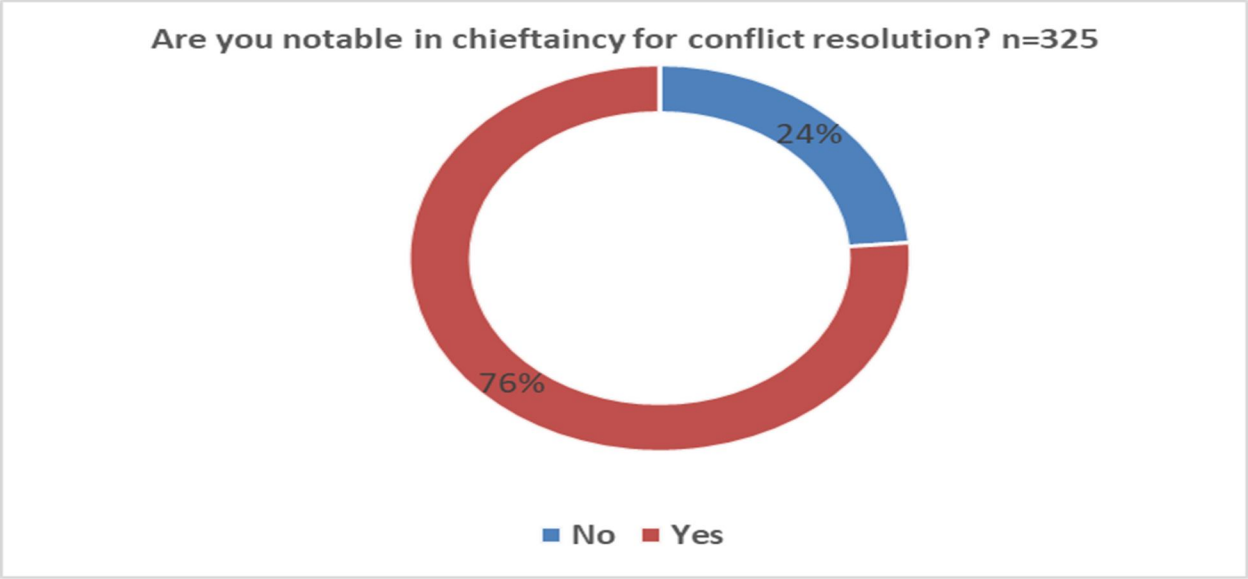
Figure 4: Percentage household distribution by category and sex

Interesting, the average household size calculated was 7, which exceeded the national average household size for rural communities in Liberia (5)[15]. This may be true for most of the households across the East Nimba forest landscape. Across all the communities sampled, a total population of approximately 10,330 residents depend on the forest resources for their daily livelihoods. In the FGDs, respondents asserted that household population across the communities generally exceed the national average household for rural communities as stated in the national census report 2008. Discussants further expressed that communities around the forest landscape have unstable population due to the quest for natural resource access. Hence, high demand and pressure on the forest resources that leads to forest degradation overtime.

3.1.6 Chieftaincy for conflict resolution

Conflict management is very key across the forest landscape communities. The respondents were critically asked whether they have any chieftaincy position for conflict resolution. From the analysis, 76% of the household heads were part of the chieftaincy cohorts in their communities. Responses were analyzed as presented in the chart below. Questions about conflict occurrence and management were also asked in the FGDs to clearly understand the community's peace status. Generally, across all the communities, there was no major conflict issues mentioned. However, the issue between LAMCO (Liberia American-Swedish Mining Company) and camp #4 in terms of access to land for long term cropping still remains a challenge. The chart below shows the percentage of households notable in chieftaincy;

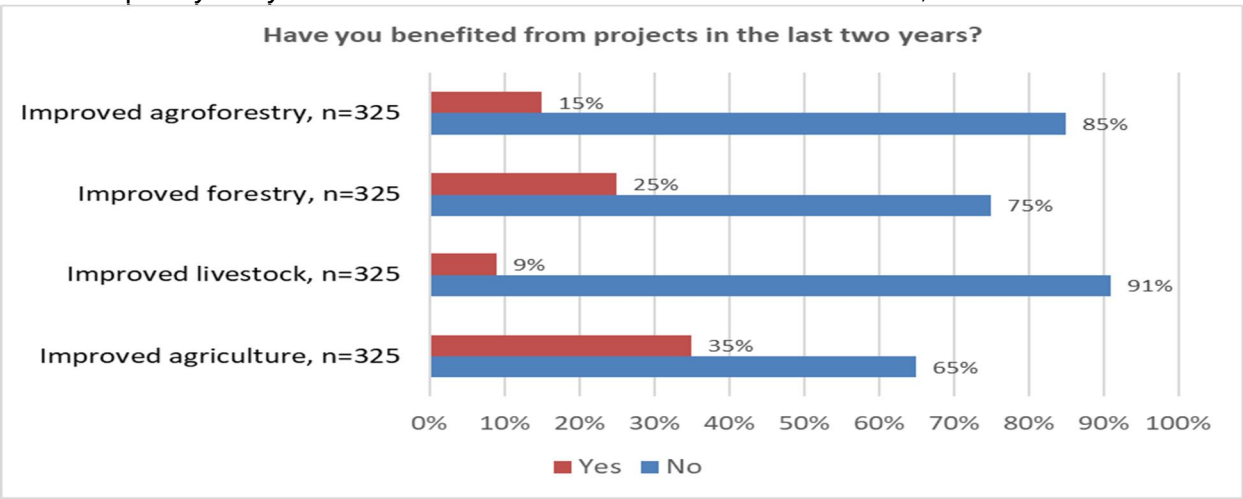
[15] Liberia Institute of Statistics and Geo-information Services (LISGIS), 2011



Source: Field survey data, 2020
Figure 5: Notable in chieftaincy for conflict resolution

3.1.7 Benefit from projects in the last two years

Community members targeted were asked to explain whether they have benefited from any projects that have supported their communities in the last two years. This question was geared towards understanding the various external supports received by the communities with respect to improved forest management, improved agroforestry, improved livestock and improved agriculture. Responses were both descriptively analyzed and summarized as shown in the chart below;



Source: Field survey data, 2020
Figure 6: Benefits from projects in the last two years

From the analysis, only 35% of the respondents had benefited from an improved agriculture project support and very few (9%) form improved livestock supports. However, at least 9% of the household sampled had benefited from some form of development support related to livestock and forest

management. This serves as an opportunity for restoration intervention across the landscape. FGDs further revealed series of interventions across the communities with diverse benefits to residents as follows;

3.1.8 Interventions across the communities as mentioned by the FGD respondents

The People, Rules and Organization Supporting the Protection of Ecosystem Resources (PROSPER) provided training in fire management, forest species inventory, business management, community awareness on forest management and training in sustainable fishing.

Conservation international (CI) provided training in forest monitoring and protection of forest species (forest animal and tree species) and co-management of the ENNR.

Fauna and Flora International (FFI) provided training in the operation of GPS, computer and camera trapping in forest to monitor wild life.

Green Advocate (GA) helped communities to self-identify own customary land in the community forest and protected area.

PARLEY created awareness on community land boundary (clan & clan level).

ARD (Tetra Tech Associates Rural Development) provided training in post-harvest and storage, woman conservation forum and eco-stove building.

RICCE (Rural Integrated Center for Community Empowerment) provided training of local farmers in vegetable farming using three methods including: a) Conventional method—brush and burn, plant and mulch; b) traditional method (controlled)---brush, burn, and randomly plant; and c) conservation method --- brush-slash-plant and mulch.

Women Conservation Forum is providing support/training in oil palm development, raising snails and Eco stove construction.

ArcelorMittal provided training for Zor Community Forest Guards and is funding RICCE's activities in the ENNR community.

FIFES (Forest Incomes for Environmental Sustainability) is providing training in cocoa rehabilitation.

A local organization called ULINDO provided six-week training in carpentry for sustainable utilization of forest trees

***Elit Agribusiness Project** (community-based organization) provided community support project in road rehabilitation, animals husbandry, nutrition and health*

***FIFES p**rovided training for Forest Guards for forest protection, vegetable production and VSLA.*

***CODA** (local NGO) provided support for community voluntary group in forest conservation.*

***VOSELA** provided $100,000LD as support to group of people who were affected by ArcelorMittal mining concession areas; about 22 persons benefited from this donation.*

Most of the above interventions are contribution factors to forest landscape restoration. This means that, the ROAM interventions should collaborate with some these intervention proponents to holistically restore the East Nimba Forest Landscape.

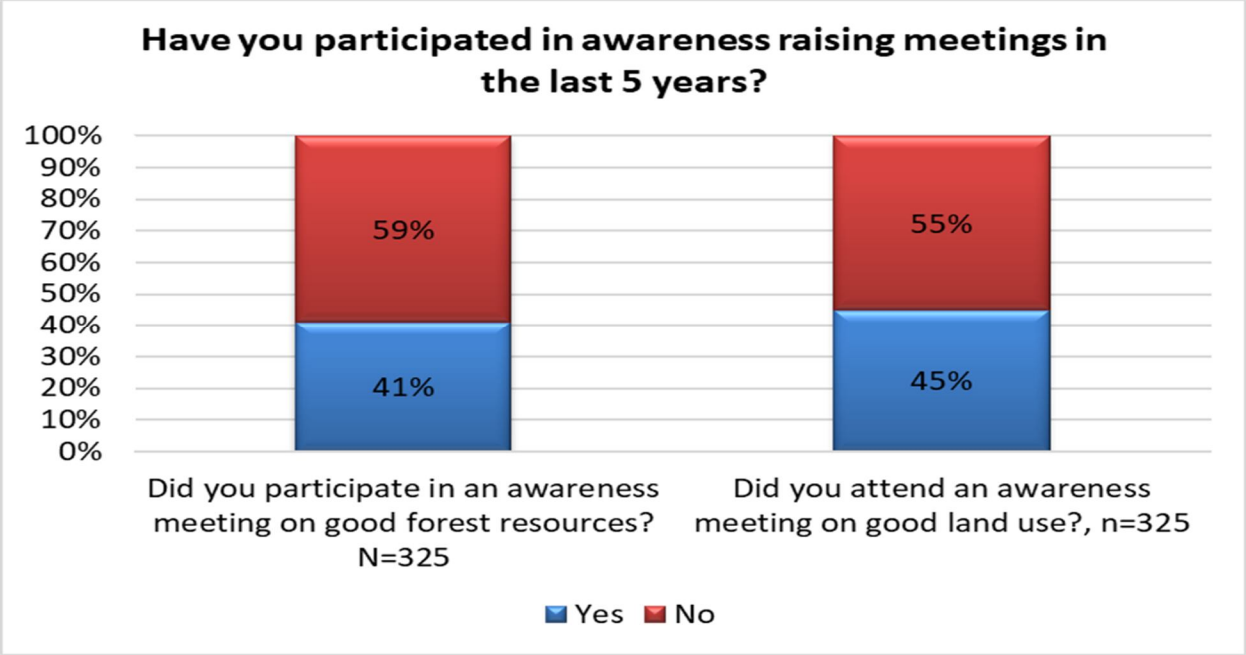
3.2 AWARENESS OF PARTICIPANTS IN FOREST LANDSCAPE MANAGEMENT

This question was posed to all the respondents to understand their participation and level of awareness in forest landscape management. Responses show that almost half of the household respondents have participated in some form of awareness raising programs. Specifically, 41% asserted

that they have participated in awareness raising program on good forest management and 45% on good land use management.

3.2.1 Participation in awareness raising

Community members were asked to state whether they had participated in any awareness raising program in the last 5 years. Responses were analyzed as presented below;



Source: Field survey data, 2020
Figure 7:Participation in awareness raising

In the FGDs, opinions from the respondents revealed that most of these awareness raising programs have been held on project by project basis and only benefited residents who were invited for those programs. According to voices from a female FGD in Dulay, one of the sampled communities, 'we want an awareness raising program that can help us get money for our daily survival, we are tired of just listening to oral discussions about forest management practices, let us put the talking into action for the benefit of the residents'

3.3 SOCIAL, CULTURAL AND ECONOMIC DIMENSIONS OF LANDSCAPE DEGRADATION;

The social and cultural behaviors of residents largely influence forest landscape restoration interventions. Respondents were asked to state their social and cultural practices in relation to the forest.

3.3.1 Social dimension

It was clearly revealed that all the communities had stable community status, they were all revealed as permanent. Dominant ethnic group revealed was the Mano ethnic group. Across all the communities, Christianity was revealed as the most practiced religion

3.3.2 Economic dimension

This was investigated through estimated income and expenditures revealed by the respondents. Below indicate the estimated incomes and expenditures of the respondents;

3.3.3 Incomes of the household heads

These were estimated by the household heads based on their various sources of incomes. Results were descriptively analyzed to generate the range, minimum, maximum, mean and the standard deviation as indicated in the table below;

Table 6: Income of the respondents

Descriptive Statistics of the total household income in 2019 (Liberian Dollars-LD)						
	N	**Range**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Cash income from agricultural products	325	500,000	-	500,000	34,107	54,873
Cash income from forest products	325	108,000	-	108,000	1,568	8,363
Cash income from livestock	325	84,000	-	84,000	4,969	9,515
Cash income for other sources of income (mining, remittances etc)	325	3,500,000	-	3,500,000	61,170	234,495

Source: Field survey data, 2020

From the table above, average income from mining and remittances (LD 61,170) exceeds all other average incomes estimated. Despite the low engagement in mining activities across the communities, respondents revealed that mining generates huge amount of money at a time when the miner is 'lucky'. Remittance mentioned were those sent to relatives from the city (Monrovia) or from outside Liberia. Average income from the forest product was estimated very low because, most of the forest products were claimed to be used for domestic consumptions

3.3.4 Expenditures of the household heads

These were estimated by the respondents based on their memories and few written records. However, they presented a fair understanding of their annual expenditures across various expenditure categories as indicated in the table below;

Table 7: Expenditures of household heads

Descriptive Statistics on the total expenditures by category in 2019 (Liberian Dollars)						
	N	**Range**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Health	325	200,000	0	200,000	8,028	19,432
School for children	325	340,001	0	340,001	14,923	25,850
Petroleum	325	66,000	0	66,000	470	4,318
Electricity	325	30,000	0	30,000	366	2,787
Fuel wood	325	18,000	0	18,000	269	1,325
Purchase physical goods	325	200,000	0	200,000	6,064	20,403
Mobility/travels	325	80,000,000	0	80,000,000	250,620	4,437,363
Clothes	325	1,500,012	0	1,500,012	12,156	83,240
Ceremonies	325	360,000	0	360,000	2,970	20,332
Agricultural activities	325	250,000	0	250,000	9,672	23,149

Hunting activities	325	11,000	0	11,000	335	1,354
Planting trees	323	1,500,000	0	1,500,000	7,582	83,829
Expenditure on others for one year	325	300,000	0	300,000	3,162	17,728

Source: Field survey data, 2020

From the table above, the average expenditure on mobility (LD 250,620) exceeds all other expenditure categories. This was further explained that, movement from one community to another in the landscape is expensive. Further analysis indicates that the average expenditure (LD 318,375 or US$1,633) exceeds the average income (LD 101,814 or US$522) by 68%. Main reason proffered was the high level of responsibilities on the households that led them to borrow money to satisfy their demands. In addition, respondents revealed that, it was difficult to actually estimate the income in a year, but expenditures were easily estimated. This indicates that most of the respondents had unstable sources of income and had no records of their incomes, but can remember most of their expenditures. However, when their income was calculated per day (US$1.4/day), it exceeds the World Bank Poverty line rate analysis for Liberia, of $1.25/day[16].

Table 8: Comparative analysis of the incomes and expenditures

Comparative Descriptive Statistics of income and expenditures in 2019 (LD)						
	N	**Range**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Total Income	325	3,522,300	0	3,522,300	101,814	241,816
Total Expenditure	325	82,370,545	1,955	82,372,500	318,375	4,581,247

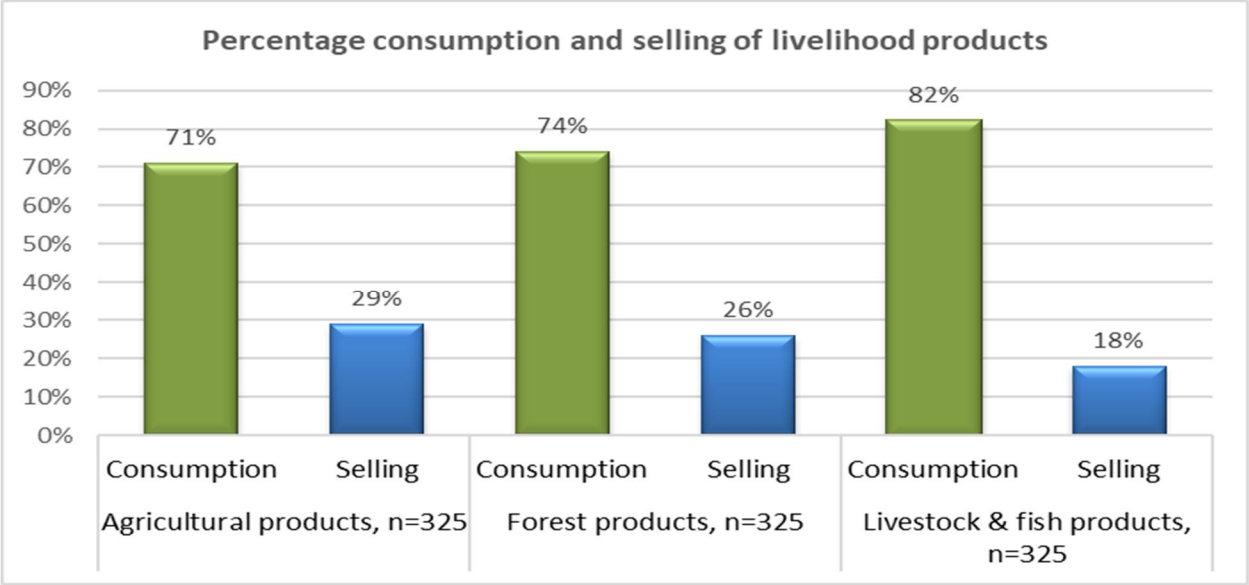
Source: Field survey data, 2020

3.3.5 Consumption and selling of livelihood products

Generally, most of the livelihood products, especially the agricultural products were claimed to be used for consumption and less than half is sold for economic services. As shown in the charts below, 71% of the agricultural products are used for consumption and 82% of livestock and fish products used for consumption. Respondents further explained that selling of their products have been

[16] The World Bank has announced that about 54 percent of the population of ***Liberia*** is living below the ***poverty line***. This means they live on less than $US2. 00 a day, 2016

constrained by the poor roads network. Therefore, most of their products are used for domestic consumption.



Source: Field survey data, 2020

Figure 8: Percentage consumption and selling of livelihood products

3.3.6 Access to facilities and infrastructure

Across all the communities sampled, accessibility to various social and economic facilities was revealed constrained by poor road network. The market access condition is deplorable and the level of accessibility of the villages is sometime by car but mostly commercial motor bikes are used for transportation. In most parts of the roads, huge gullies have limited the flow movement of vehicles and sometimes very difficult to ply with the commercial mor-bikes, especially in the wet season. According to a key stakeholder in the women's FGD in Dulay (the old Town) 'the poor road condition (narrowness, steep and eroded) has exacerbated economic hardship and difficulties in transportation of our agricultural produce to the market in the last ten years. We some time use our children when there is no vehicle/motor bike to help carry our produce to the market for sale'. These difficulties in accessing markets has led to high rate of perishable agricultural produce, thereby reducing the value of produces.

Across all the communities sampled, access to medical facilities was revealed as a very prominent challenge. FGDs and the household interviews revealed that Dulay and zotapa did not have health center, but Zolowee and Camp# 4 have health centers. The FGDs further revealed that in the entire landscape, available health centers have limited professional capacity to adequately address most of the diseases reported. Educational facilities are also very poor across the sampled communities. Parents mostly send their children to nearby communities to attend primary schools. Generally, access to communication networks across the landscape is limited to few communities and specific locations in the forest. Radio and television stations' access were also revealed constrained in most of the communities across the landscape. This is true for most parts of the rural communities in

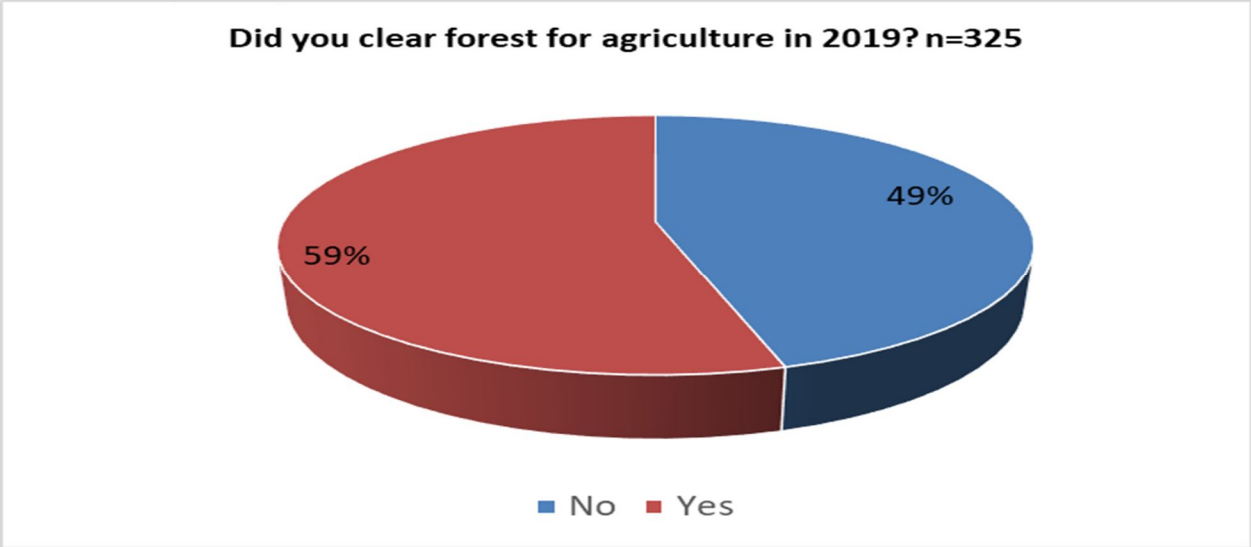
Liberia[17]. Series of forest assessments have revealed similar constrains to communications across the forest landscape.

3.3.7 Livelihoods and natural resource use and dependence

Rural people around the forest landscape are dependent on forest resources for their livelihoods (daily survival). For many of them, not only do the resources provide economic sustenance, but the forest is also a way of life socially and culturally. It meets basic needs like fuelwood, farm land and small timber that are important for them and their livestock.

3.3.7.1 Clearing of forest for farming

The household respondents were asked whether they cleared forest for any agricultural activities. Responses were analyzed as presented in the chart below;



Source: Field survey data, 2020

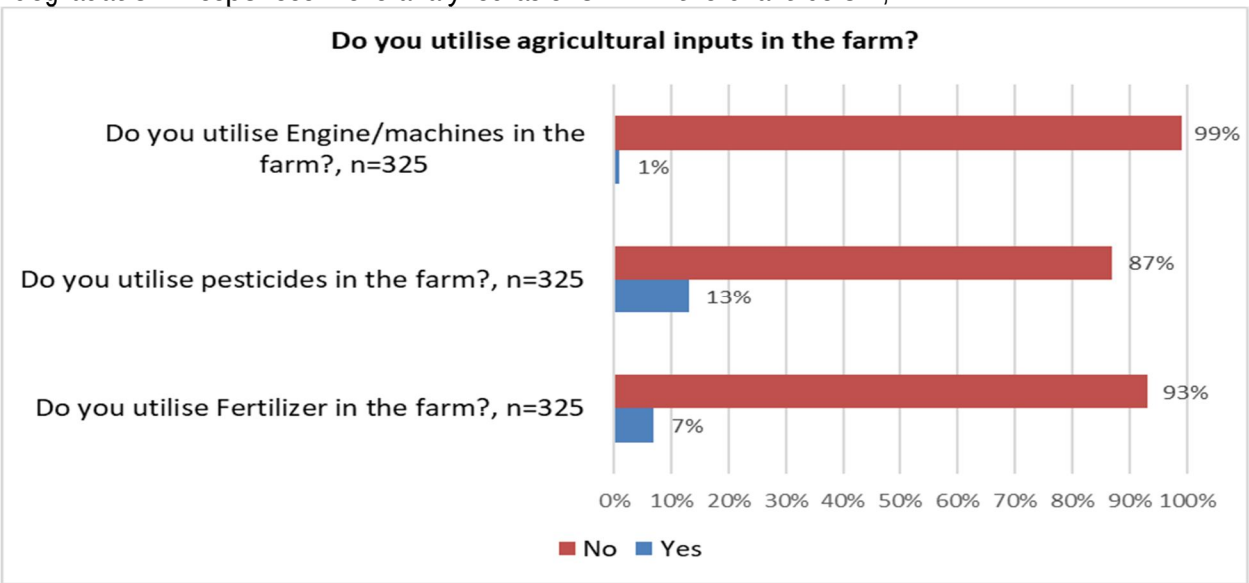
Figure 9: Did you clear forest for agriculture in 2019

[17] Ministry of Information, Cultural Affairs and Tourism, Liberia: Mount Nimba Strict Reserve (extension) report 217

From the chart above, 59% accepted the clearing of forest for agricultural activities. According to the respondents, forests were mostly cleared for subsistence farming and very few cleared for mining and other activities. Of the 192 farmers who cleared forest for agriculture in 2019 the minimum size of forest cleared was estimated as 0.4 Hectares and the maximum was 14 Hectares with an average acreage cleared calculated as 1.3 Ha. Average distance of the farms from the communities was revealed as 1.4 hours working distance and the average fallow period was calculated as 5 years across the communities. This clearly indicates the rate at which forest degradation expands across the landscape. Five (5) years of fallow period means that the farmers will farm on new forest land for the next five years before returning to cultivate on the pervious farm land. Respondents expressed that, the slash and burn farming method, coupled with shifting cultivation have been widely practiced by all the farmers across the landscape. This was also evident in the FGDs and by observation during the assessment as shown in the embedded photo (Forest cut for rice farming in Dulay).

3.3.7.2 Utilization of agricultural inputs in the farm

Respondents were asked whether they utilize agricultural inputs in their farms. This was purposely asked to understand the farmers' chemical utilization and to relate their actions to water pollution, and soil degradation. Responses were analyzed as shown in the chart below;



Source: Field survey data, 2020

Figure 10: Do you utilize agricultural inputs in the farm?

In the chart above, very few (1%) of the respondents used mechanized farming. This was further revealed that, he only used tractors to transport farm tools and produces. 7% said they used fertilizer, but this was also further explained that, they used it on vegetable gardening in some infertile areas. Generally, most of the respondents did not use any agricultural inputs in their farms.
In the FGDs, discussants mentioned other livelihood activities in addition to farming. These were comprehensively summarized below;

Livestock production: Across all the communities, the most domesticated animals were: Goat, sheep, pig, chicken and duck fowl and they are free-range domesticated animals moving everywhere for feeding except the pigs that are confined in a pig pan to enhance multiplication for the community.

Hunting: Hunting of wildlife/bush animals was reportedly done on subsistence basis but some hunters sell portion of animals to generate income that contributes to their household income. Guns and animal traps were revealed as the means of hunting animals in the forest. In the FGDs most of the discussants shouted that 'we are aware of the wild life law to protect some species of animals, but we also need to survive and protect our crops from destruction by the wild animals'

Fishing: Fishing is done on a subsistent basis but excess caches are sometimes marketed to generate income. Fishing was just mentioned by few people because it was revealed as one of the minor livelihood activities. However, according to their explanation, the fishing practices have been unsustainable; they use hooks, and "one finger' fishing net (a small fishing net that captures the youngest fish).

Collection of forest products
Timber Products: As reported people are involved in chain-sawing to produce timber mainly for domestic use.

Non-Timber *Forest Product (NTFP):* Many community members across the communities were involved in the NTFP collection for their livelihoods. Some NTFPs often collected are bush pepper, country spice/zylopia, bitter kola, walnut, rattan, and they also collect roots, leaves, and backs of trees are mainly for medicinal purposes. Although these NTFPs are consumed by the harvesters, some are traded in local markets to generate funds for their households.

Mining: Mining across the sampled communities was not revealed as the major livelihood activity, but some of the residents were involved in mining diamond using the open cast mining in the forest. Some of the communities uses the did-hole cover-hole method

Petty trading: This was mainly mentioned by the women in the FGDs. It was revealed that, most of the women plant pepper and extract forest products for marketing in the nearby market.

3.3.7.3 Ranking of livelihoods activities
Further discussions with eth community members revealed the following raking of livelihood activities in order of their priority;

Farming (upland)
Farming (in valley swamps)

Mining
Harvesting of NTFPs
Livestock production

3.4 GENDER-RESPONSIVE RESTORATION STRATEGIES

Gender responsiveness restoration was explained as the type of restoration that takes into consideration gender equality and equity without any bias. Based on this understanding established in the opening statements of FGDs, across all the FGDs with men and women independently, It was very clear that every sex category has special needs in forest landscape restoration. Summary of the discussions across the men's groups revealed job creation as the main priority for their involvement in any forest landscape restoration in East Nimba forest landscape. While the women stated support to micro-enterprise and entrepreneurship for economic empowerment. Generally, the common request from both men and women were summarized as follow;

- Restoration activities should ensure economic benefits to the communities
- Restoration interventions should respect the culture and tradition of all the communities in the landscape; sacred areas should not be tampered with.
- Human right should be maintained
- No discrimination in employment opportunities
- The forest guards and the communities should co-exist in peace and community members should be allowed to access the reserve for sustainable harvesting of NTFP.
- There should be an appreciable forest area demarcated for livelihood activities
- Forest management awareness raising should integrate local communication approaches for effectiveness

3.5 CULTURAL AND SOCIAL LANDSCAPE PRIORITIES AND THEIR ALIGNMENT WITH RESTORATION ACTIVITIES;

Edwards (2006) defined culture as the values, attitudes, beliefs, artefacts and other meaningful symbols, beliefs and traditions of people or a particular community. This definition was adopted by this study to assess the various cultural and social characteristics of the communities in relation to forest landscape restoration. In the FGDs, various opinions were expressed by both the men and women's FGDs with clearly defined cultural and social interests of each category of sex. Each of these categories has their own interest with respect to their cultural beliefs and practices. From the men's FGDs the common interest revealed was the practice of secret societies, which were very specific to men and women independently. The men revealed 'poro' society and the women revealed 'bondo' society. These tow societies are true for almost all the rural communities across Liberia. For the women, the bondo society prepares the girls for marital responsibilities and educate them about adulthood life. This is similar to the men. The communities sampled in the landscape revealed six (6) ethnic groups (Gio, krehn, Mino, Kpelle, lorma and Mano) which are dominated by the Mano ethnic group. The Gio are in the minority, but co-exist with the mano ethnic group. Religion predominantly practiced was Christianity with few households who practiced the Islamic religion.

Discussions across the communities revealed the following cultural and social priorities for forest restoration;

Establish restoration portions that do not affect the 'poro' and 'bondo' society sacred sites.
The intervention activities should regard the existing social structures in the communities (secret societies, social organizations etc)

3.6 SOCIO-ECONOMIC PRIORITIES OF STAKEHOLDERS THROUGHOUT THE LANDSCAPE(S);

3.6.1 Social priorities

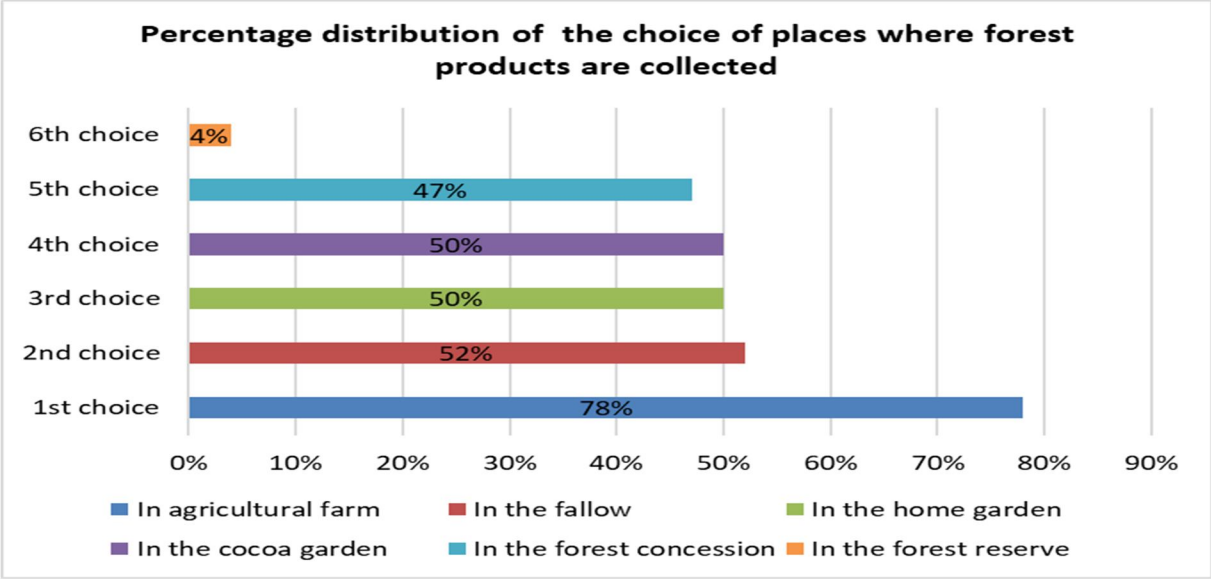
We are very peaceful in this community, so we need forest landscape intervention that should not destroy our long-term peace established' said by one of the community members in a women's Focus Group in Camp #4. In summary the social priorities mentioned was geared towards the restoration intervention ensuring appropriate social cohesion in the communities and respect for the communities' existing social structures (social clubs, secret societies etc).

3.6.2 Economic priorities

This was discussed with respect to the economic activities carried out by the community members. It was clearly mentioned that farming is the major livelihood activity across the communities sampled. It was further revealed that farming has been mostly done in fallowed bush/forest (untouched forest for at least over 5 years). Hence, community members would prefer the allocation of farm land that is fallowed enough for high productivity. According to one of the community chiefs in Zortapa, 'I prefer the cocoa plantation as a forest restoration option for most part of our degraded forest areas, but we also need a short-term agricultural intervention that keeps us alive while the cocoa grows into maturity'

3.6.3 Places were forest products are collected

This question was largely responded by almost all the household heads and the FGD discussants. This was posed to clearly understand the rate at which community members utilize the forest resources with respect to specific locations within the landscape. It was clear that responses from the individual household heads were not very reliable because most of the respondents perceived this question as very sensitive and personal. They were aware of the protected nature of the East Nimba Forest landscape, hence very few mentioned the collection of forest products from the protected forest reserve, rather 78% mentioned the agricultural farm as their first choice of forest products' collection. On a contrary, the FGDs revealed the true practice of the community members. Responses among the household heads were summarized as follows;



Source: Field survey data, 2020

Figure 11: Places where forest products are collected

Interestingly, as it is mostly the case, the FGDs clearly revealed the true information about places where forest products are collected by community members. According to the FGD participants, most of the forest products were collected from the reserved forest. Participants further expressed that, most of the NTFPs are found in the reserved forest and more matured to yield high income and consumption values.

Moreover, FGD participants, which included most of the influential and key decision makers across the communities revealed that they prefer collecting forest products from matured forest. For example, products such as the bitter cola (fruit of Garcinia kola), bitterroot (often root of Garcinia kola) and worlor (Beilschmiedia Mannii) are traditional or indigenous species that exist in matured forest. Bitter Kola and bitterroot are mostly collected by the males while worlor and zylopia are collected by the females.

3.7 COSTS AND BENEFITS (SOCIAL, ECONOMIC, AND BIOPHYSICAL) OF FOREST LANDSCAPE RESTORATION OPPORTUNITIES IN THE LANDSCAPE(S);

The cost benefit analysis was carried out to determine the most appropriate restoration option that will be recommended for implementation across the East Nimba forest landscape. Costs were provided by diverse community members in the Focus Group Discussions with high amount of estimated certainty of direct and indirect costs and benefits. Various parameters were considered in the calculation of the cost benefits of the restoration options; Social cost, social benefit, Biophysical cost, biophysical benefits, economic costs and benefits. These parameters are described below;

Social cost: The Social Cost is the cost related to the implementation of the proposed intervention, but is not explicitly borne by the implements instead it is the cost to the society due to the implementation of the preferred option.

Cost Benefit Analysis (CBA)						
Restoration option	**Social Cost/Ha USD**	**Biophysical Cost/Ha USD**	**Economic Cost/Ha USD**	**Social Benefit/Ha USD**	**Biophysical Benefit/Ha USD**	**Economic Benefit/Ha USD**
Agroforestry (Cocoa)	6,265	3,761	12,024	16,540	5,615	17,690
Oil Palm	7,588	4,648	16,205	15,888	7,825	17,525
Rubber	5,075	4,490	11,215	14,325	6,873	15,935

Source: Field survey data, 2020

Social benefit: Social benefit is the total benefit to society from implementing or consuming produce of the preferred intervention options.

Biophysical cost: This is the environmentally negative effects that will be created as a result of the preferred interventions

Biophysical benefit: This is the environmentally positive effects that will be created as a result of the preferred interventions

Economic cost: The economic cost is based on the cost of the alternative chosen and the benefit that the best alternative would have provided in a year if chosen.

Economic benefit: **Economic benefits *are often used to determine what may be gained from the preferred intervention per yea[18]r.***

In the FGDs' participants were guided to generated the various costs and benefits for their preferred restoration options. Their various monetary values were further analyzed and averaged to establish a holistic East Nimba forest landscape community's opinion for the planting of one-hectare of each of the preferred restoration option. Below are the cost benefit analysis and the

Net Benefit of the cost benefit analysis;

Table 9: Cost Benefit Analysis

[18] Verdone, M. (2015). *A Cost-Benefit Framework for Analyzing Forest Landscape Restoration Decisions.* Gland, Switzerland: IUCN.

Table 10: Net benefits of the Cost Benefit Analysis

Net Benefits of CBA of FLR Options				
FLR Intervention option	**Total cost (USD)**	**Total Benefit (USD)**	**Net Benefit (USD)**	**Benefit-Cost Ratio**
Agroforestry Cocoa	22,051	39,845	17,795	2
Oil Palm	28,440	41,238	12,798	1
Rubber	20,780	37,133	16,353	2

Source: Field survey data, 2020

From the analysis above, the restoration option with the highest net benefit ratio should be considered. Hence, cocoa and rubber species as restoration options revealed the equal net benefit ratio of 2. This means that the investment in cocoa and rubber will yield the most appropriate social, biophysical and economic benefits for the communities across the East Nimba Forest landscape.

3.8 CATALOGING THE SOCIALLY AND ECONOMICALLY IMPORTANT BIODIVERSITY (GENES, SPECIES, ECOSYSTEMS) WITHIN THE LANDSCAPE(S).

In this study, no scientific recording of trees and plants species was done. However, discussions across the FGDs, coupled with observations, some species were recorded. In addition, desk review revealed series of important species that exist in the East Nimba Forest. Generally, the topography of the East Nimba forest landscape is undulated ranging from hills to mountains. The soils are mostly lithosol type of soil with high iron content in most places. The climate is humid and have two main seasons, the wet and dry seasons that had existed on a 6 monthly basis ten years ago. This has changed over the last ten years; no constant duration for the wet and dry seasons due to the climate change effects. The Nimba forest in Liberia constitute a rich biodiversity in their own right (contiguous with other forest in Guinea and Ivory Coast covering the entire Nimba Ridge) with at least 173 species recorded that are either biome- or range-restricted, or globally threatened (BirdLife World Birds Database)[19]. Review of diverse literatures revealed that the East Nimba National Reserve (ENNR) contains original and diverse species of the most remarkable animal and plant populations, not only in West Africa, but also in the entire African continent; notably threatened species such as the *Micropotamogale* of Mount Nimba (*Micropotamogale lamottei*), the viviparous toad of Mount Nimba (*Nimbaphrynoides occidentalis*) and chimpanzees *(Pantroglodytes verus)* that use stones as tools. These were confirmed in the FGDs across the communities and community members revealed local names for most of the species based on their medicinal and cultural values.

The reserve contains an array of rare and exceptional animal and plant populations of conservation relevance not only in West Africa but the continent as a whole; among which are the

[19] Environment Protection Agency (EPA) Liberia 2010

Nimba Otter Shrew (*Micropotamogale lamottei*).The Liberian species of the viviparous Nimba Toad (*Nimbaphrynoides occidentalis liberiensis)* only found in Liberia side of Mount Nimba and the common chimpanzee (Pan troglodytes versus)(Endangered) that exhibit the ability to use tool and nest building behavior; As well as the Beuttikofer's Shrew (*Crocidura beuttikoferi*) and the Nimba Flycatcher (*Malaenornis annamarulae*)[20]. Some of these species are of great importance to the local communities for food, medicinal herbs, construction and other cultural/traditional purposes. A few of these tree species are the African spice tree (Xylopia aethiopica), Ganagana (Cassia fikifiki), Yellow wood (Terminalia sppivorensis and T. superba), Dahoma (Piptadeniastrum Africana), Abura (Hellea ciliate and H. stipulosa), Worlor (Beilschmelia mannii) and Raphia pine (Raphia palma-pinus). Tree species mainly cultivated for commercial purpose in the East Nimba Forest landscape are; cocoa, coffee, oil palm rubber and kola. Other wildlife species common in this area include most of the wildlife in Liberia such as Chimpanzee, Pangolin, Monkey, Grass cutter, Black deer just to name a few. Common domesticated animals are chicken, pig, goat, sheep, duck fowl

4.0 CONCLUSIONS AND RECOMMENDATIONS

This section presents the conclusions and key recommendations derived from the assessments across the sampled communities.

4.1 Conclusions

The East Nimba Nature Reserve (ENNR) is one of the hot spot forests in Liberia and located on the North- eastern part of Liberia with a total area of 13, 500 hectares. This forest Reserve is characterized by a composition of natural ecosystems evolving from several ecological and geo-physical processes that have resulted in the creation of many habitat types of national and international conservation interest. However, studies and aging observations over the years have shown that the natural values of the forest have been threatened by human activities. In a bit to address these threats, in 2019, the MRU, in collaboration with the FDA-Liberia with funding from IUCN agreed to implement forest restoration activities across the transboundary forest landscapes in the MRU states. One of the landscapes selected was the East Nimba forest landscape. However, prior to the intervention, series of baseline assessments were agreed upon to help establish the existing sociocultural and environmental characteristics of communities and the landscape at large. Hence, the socioeconomic assessment was geared towards understanding the general social, cultural and economic characteristics of the communities across the East Nimba forest landscape in Liberia. Data were collected using quantitative and qualitative approaches, coupled with direct observations to critically unveil actualities for relevant conclusions. Key conclusions were made based on the thematic areas of assessment;

Generally, the total population of the communities assessed was estimated as 10,330 residents with approximately 59% female population. These communities portrayed very similar social, cultural and economic characters. Among the four communities sampled, only camp #4 has some restrictions in

[20] PROSPER 2014

terms of access to land for agricultural purposes; they have not been allowed to cultivate perennial crops on the land allocated to them. However, all the communities were revealed as permanent settlements with a long-term history of establishment between 1815 and 1978.

Most of the household heads interviewed aged above the national youth age bracket of 15-35 years. This indicates that households were headed by matured adult residents and had the knowledge and experience about their household's socioeconomic situations and how they influence forest landscape restoration.

The majority of the residents interviewed attained some form of education, ranging from primary to professional training. This result indicates that these communities have residents with some form of academic and scientific awareness of the relevance of forest landscape. These ideas may be built upon to strengthen their capacity for effective and sustainable forest management.

More than half of the residents interviewed were married to at least one spouse. Given that marital status of being married was revealed as an indication of responsibility and pre-requisite for the establishment of large farm, one would conclude that large area of forest is cleared on an annual basis to support the households. Average household size was calculated as 7 persons, which exceeds the national average household size for rural communities in Liberia (5.3 persons). These households might have high influence on the forest resources with varying forest resources extraction approaches that may degrade the landscape.

Less than half of the residents interviewed had not benefited from any projects across the landscape. It was revealed that most of the development interventions have focused on only few people who are directly involved in the projects' activities. This understanding can guide any restoration intervention in term of community involvement and participation for sustainability. Generally, the communities expressed awareness in forest landscape values, but limited awareness in sustainable forest landscape restoration practices. This is an opportunity for restoration intervention to strengthen the capacity of community members in sustainable forest management.

Across all the communities, major livelihood activities mentioned was manual farming through slash and burn methods, coupled with consistent shifting cultivation. Other livelihood activities mentioned were; open cast diamond mining, petty trading, collection of NTFPs, timber production etc. This clearly indicates the trend of forest landscape degradation. All of these livelihood activities are strongly associated with natural resources' extraction. It was revealed that most of the products generated from the forest were used for consumption and very few for sale to augment household economic needs.

The dominant tribe revealed was the mano ethnic group and most practiced religion was Christianity. Interestingly, average income of the respondents was below the average expenditures. Main reason proffered was the high level of responsibilities on the households that led them to borrowed money to satisfy their demands. Further analysis indicates that the average expenditure (LD 318,375 or US$1,633) exceeds the average income (LD 101,814 or US$522) by 68%. However, when their

income was calculated per day (US$1.4/day), it exceeds the World Bank Poverty line rate analysis for Liberia, of $1.25/day[21].
Access to social facilities was revealed as one of the challenges faced across the communities. Very few facilities such as health centers and schools were revealed. This may be a very important area for interventions that reflect the need of the communities.

Diverse priorities were mentioned by the residents to satisfy their social needs in the event forest landscape restoration. Key among them were, the establishment of restoration portions that do not affect the 'poro' and 'bondo' secret society sacred sites and intervention activities that regard the existing social structures in the communities (secret societies, social organizations etc), coupled with gender responsive economic empowerment of the communities.

Finally, agroforestry was analyzed as the most cost benefit restoration intervention for communities with established land rights. One of the sampled communities with limited land access for long term plantation investment (Camp #4) suggested economic empowerment and awareness raising as their preferred restoration option.

4.2 Recommendations

Communities' empowerment and capacity building: In addition to continuous behavior change communication (BCC), despite the communities' basic levels of education, there is need for the establishment of educational programs to economically empower community members. Communities should be empowered/capacitated to carry out various skilled activities to promote a common vision. Farming centers will be supported to ensure that biodiversity conservation and climate change curriculums are upgraded in line with the goals and strategy of the East Nimba Landscape development through ROAM.

Sustainable rural forest landscape management and land use planning: Communities should be encouraged to develop the notion of sustainable land use planning and demarcate permanent forest estates that will be set up as Community Forests according to the process defined in the National Forest Acts of Libreria. The main achievement expected is that the communities agree to not expand agriculture in the demarcated forest but rather retain certain rights and benefits for sustainable extractions coupled with enhanced regeneration and enrichment planting. Biodiversity and carbon potential for those communities will be assessed for REDD+ benefits to stakeholders. Capacity building should target communities, agriculture and forestry field agents and cover agricultural techniques, cooperation set up and market or saving organization.

Stakeholders' sensitization through behavior change communication: This is to get communities to take ownership of the ROAM activities and value the need to reduce deforestation, forest degradation and biodiversity loss in their forest. Focus will include education of natural

[21] The World Bank has announced that about 54 percent of the population of ***Liberia*** is living below the ***poverty line***. This means they live on less than $US2. 00 a day, 2016

resource users on sustainable practices especially integrated land use planning, sustainable agriculture, women and youth mobilization, inclusion and alternative livelihoods.

Productive agriculture, coupled with livelihood enhancement: This support should be done with the assumption that improving agriculture/agroforestry techniques and alternative livelihoods in forest communities will decrease the pressure by farmers to clear remaining natural forests for agriculture. This should be done by intensifying agricultural production through the introduction of sustainable agricultural packages, improved seeds, conservation farming and the development of alternative livelihood enterprises to stem deforestation/agricultural encroachment. Exploring income generating activities compatible with sustainable forest management will also be promoted.

Annex 2: Household survey questionnaire

ROAM HOUSEHOLD QUESTIONNAIRE

Country 1 = Liberia 2= Guinea 3= Sierra Leone (circle)

Site _____ Village: _____ Group: _____ Name head of the Group: _____ Number I HH group

Questions	Reponses	
Age of household head (or year of birth)		
Level of education	0= no education 1= primary school; 2= secondary school ; 3= university ; 4= professional training	
Marital status	0= single ; 1= married ; 2= divorced ; 3= widowed	
Size of household (give the number of peoples that actually live in the house)	**Males :** _____ 0-5 years : _____ 5-18 years : _____ 18-50 years : _____ > 50 years : _____	**Females :** _____ 0-5 years : _____ 5-18 years : _____ 18-50 years : _____ > 50 years : _____
Are you notable in chieftaincy for conflict resolution?	0= no ; 1=yes	Have you benefited from a project in the last 2 years to improve: Agriculture : 0= no ; 1=yes Livestock : 0= no ; 1=yes Forestry : 0= no ; 1=yes Agroforestry : 0= no ; 1=yes
Are you member of legalized village association	0= no ; 1=yes	
Are you member of religious association	0= no ; 1=yes	
Have you been in contact with the state services (forestry, agriculture, livestock ...) during the last 12 months?	0= no ; 1=yes	Did you attend an awareness meeting on good land use? 0= no ; 1=yes if yes which year ? _____ Did you participate in an awareness meeting on good forest resources?? 0= no; 1=yes if yes which year? _____

Have you had land boundary conflicts with the neighbours of the village?	0= no ; 1=yes	
Did you clear any forest for agriculture in 2018?	0= no ; 1=yes estimate length _____m and width _____m	
If yes give the reason for clearing this space		
If yes what is the distance from your house?	_____ km or _____ hours for walking	
If not in what year did you last clear a virgin forest for agriculture??		
Have you ever heard of REDD+?	0= no ; 1=yes, if yes since which year ? _____	
Utilisation of agriculture inputs in your farms	fertilizer 0= no ; 1=yes : Pesticides : 0= no ; 1=yes ; Engine for plot 0= no ; 1=yes	
Use of chainsaw to prepare the fields	0= no ; 1=yes	
How many years do you leave a plot before returning to cultivate the same place?	_____ years why ?	
Estimate of expenditure for one year (in local currency) **Note:** put 0 in case the person does not make the expense	health : _____ ; School for children : _____ ; Petroleum : _____ ; electricity ; _____ ; fuelwood _____ : purchase physical goods _____ ; mobility (travel) _____ ; clothes _____ ; organisation of ceremonies _____ ; agriculture activities _____ ; hunting activity ; planting trees _____ _____	
Cash Income Estimate (refer to the list of products in Tool 4, the head of household selected an item where he or she can give accurate +/- information on the income earned in 2013)	**Agriculture Products** Name of product _____ Estimation of cash income : _____ **NTFP** Name of product _____ Estimation of cash income : _____ **Livestock products** Name of product _____ Estimation of cash income : _____ **Other** Name of product _____	Rank the place where you collect the forest product for your HH (1st 2nd 3rd ….) In agriculture farming (_____) In the fallow (_____) Home garden (_____) In cocoa and coffee farming (_____) In forest reserve or national park (_____) In forest concession (_____) In community forest (_____)

	Estimation of cash income : _____	In mining concession (_____) In other (precise_____) (_____)
Consumption and selling of product (score / 20)	**Agriculture Products :** Consumption in HH ___/20 Sell ___20 **Forest product/hunting** Consumption in HH ___/20 Sell ___20 **Livestock/fishing** Consumption in HH ___/20 Sell ___20	

5.2 FOCUS GROUP DISCUSSION (FGDs) GUIDE

What is the total population living in the intervention landscapes? How has it changed over time?

What areas are occupied by the villages and village activities-Estimated area in Acres?

What are the estimated human migration flows in the project landscapes- give percentage outflow and inflow and why?

What value chains exist in the landscapes? Including main fruit products and which have the highest export volume or value?

What are the revenues from natural resources commonly used by local communities within the intervention landscapes? What do they commonly use the revenue for?

Which economic activities attract more foreign investment or involvement in the project landscapes?

What land use options exist at the landscape scale?

What are the market access conditions? What is the level of accessibility of the villages? Road conditions and travel effort?

What traditional or indigenous species that exist and access by gender?

What institutions and organizations work in the landscape? What is their level of interest in forest landscape restoration (tree-based agricultural system)? What is their social or economic influence for restoration?

What are the roles of women, men and youth in agricultural systems?

How are the costs and benefits of economic activities and social responsibilities for restoration distributed between men and women?

What influence does culture have on the restoration or degradation activities? (Opportunity or barrier?)

Annex 3: Participants Attendance Sheets

Interview and Focus Group Discussions

Section 2: Meeting Participants

No.	Name	Sex (M/F)	Origin (Country/ Community)	Organization /Institution	Title / Position	Phone Number	Email	Signature
1	Rebecca mulbah	F	Camp 4		Communer	0770627 17		Rimulbah
2	Helen K. Gortu	F	C-4			0776271824		
3	Eunice Dixon	F	"			0777552822		
4	Julinor	F	"			0 97783 3024		
5	CLARENCE Gadeau	M	"		District contractor	0777318292		
6	Blessed Harris	M	"			0778759879		
7	Clement philips	M	"			0778903508		
8	Mansion Tokpah	M	"			0886187 26		
9	Tarpeh Dent		"			0777 [illegible] 52		
10								

Section 2: Meeting Participants

No.	Name	Sex (M/F)	Origin (Country/ Community)	Organization /Institution	Title / Position	Phone Number	Email	Signature
1	Roland S. Dolo	M	Zolowee	LCF	Chair	0775556179		
2	Oranoh Korto	M	"	PTA	Chair	0770343232		
3	A. C. Blasay	F	"	Youth	member	0775717241		
4	Francis Gungor	M	"	LCF	Town Chief	0776900486		
5	Jestina Beglar	F	"	Youth	member	0776058448		Jestina
6	Alphonso Tozo	M	"	CHA	Youth	0778101395		
7	Patricia Wanto	F	"	ion Farmerun	Chairlady	0776153247		P.W
8	Ma Massah	F	"		Elder			
9								
10								

D.	Name	Sex (M/F)	Community /Institution	Designation/ Position	Phone Number	Signature
	Nico M. Tuo	M	Zortapa	Town Chief	0776108749	N. M Tuo
	Joe Vaisee	M	"	Elder	0777220387	[illegible]
	Wellington Y. Tuo	M	"	ENNR CMC	0775838214	[illegible]
	Jeresco Dorway	M	"	Elder	0775520462	[illegible]
	R. B. Harway	F	"	Youth	—	[illegible]
	Betty Paye	F	"	Teacher	0776015939	B. Paye
	Evelyn Yeamuah	F	"	Youth	—	Eve. [illegible] Yeam
	Victoria Glee	F	"	Farmer	—	V. N B

Section 2: Meeting Participants

No.	Name	Sex (M/F)	Origin (Country/ Community)	Organization /Institution	Title / Position	Phone Number	Email	Signature
1	Yormie Karsiah, jr	M	Dullay-Lib		Youth	0776334592	y.karsiahjr@gm	
2	Slethe Gbuteh	M	"		Town Chief	0779859463		S. V. G.
3	U. Yormie Karsiah, sr	M	"		Elder	07968880		
4	Alex Luogon	M	"		Council	0777236 2492		
5	Eduard Gbato	M	"		Chief Elder			E G
6	Etta Flehn	F	"		Elder	0777166315		
7	Johanna Vokor	F	"		Woman Zoe	—		J. V
8	Evon Gbato	F	"		Woman Chair	—		E. G
9	Benetha Page	F	"		Youth	—		B. P
10						—		

Annex 4:

Annex 4: Inception meeting report on the ENNR Landscape

July 10—14, 2019

Introduction

The Roam Activity 1.2 study was conducted in four communities located around the East Nimba Nature Reserve (ENNR). The four survey communities are Zortapa, Camp #4 (known also as Unification Town), Zolowee and Duly (Dulay). The reserve is shared by two administrative districts in Nimba County; they are the Gbehlay-Geh District and Yarmein District.

The topography of the ENNR site of the reserve is a rough terrain ranging from hilly to mountainous. The soils are characterized lithosol with high iron content in most places. The site is mainly drained by the Cavally River in the northeast of the reserve; this river forms the boundary between Liberia and Cote d'Ivoire. Another important water body in the ENNR landscape is the Karn Creek in the northwest of the reserve. This creek is heavily observed as polluted apparently due to industrial iron ore mining activity. Industrial iron ore mining by ArcelorMittal is currently ongoing in the northwest of the reserve. According to an Agricultural Value Chain report (PROSPER 2014), there are two community forests existing adjacent to the ENNR. One is the Zor Community Forest (13,569 ha) near Dulay in the Northeast of the Reserve. The other is the Gba Community Forest (10,939 ha) near Zolowee in the southwest of the reserve. There are many natural trees species in the ENNR landscape. Some of them are of great importance to the local communities for food, medicinal construction and other cultural/traditional purposes. A few of these tree species are the African spice tree *(Xylopia aethiopica*), Ganagana (*Cassia fikifiki)*, Yellow wood (*Terminalia sppivorensis and T. superba),* Dahoma (*Piptadeniastrum Africana), Abura (Hellea ciliate and H. stipulosa), Worlor* (*Beilschmelia mannii*) and Raphia pine (*Raphia palma-pinus*). Tree species mainly cultivated for commercial purpose are cocoa, coffee, oil palm rubber and cola. Some wildlife species common in this area include most of the wildlife in Liberia such as Chimpanzee, Pangolin, Monkey, Grass cutter, Black deer just to name a few. Common domesticated animals are chicken, pig, goat, sheep, duck fowl.

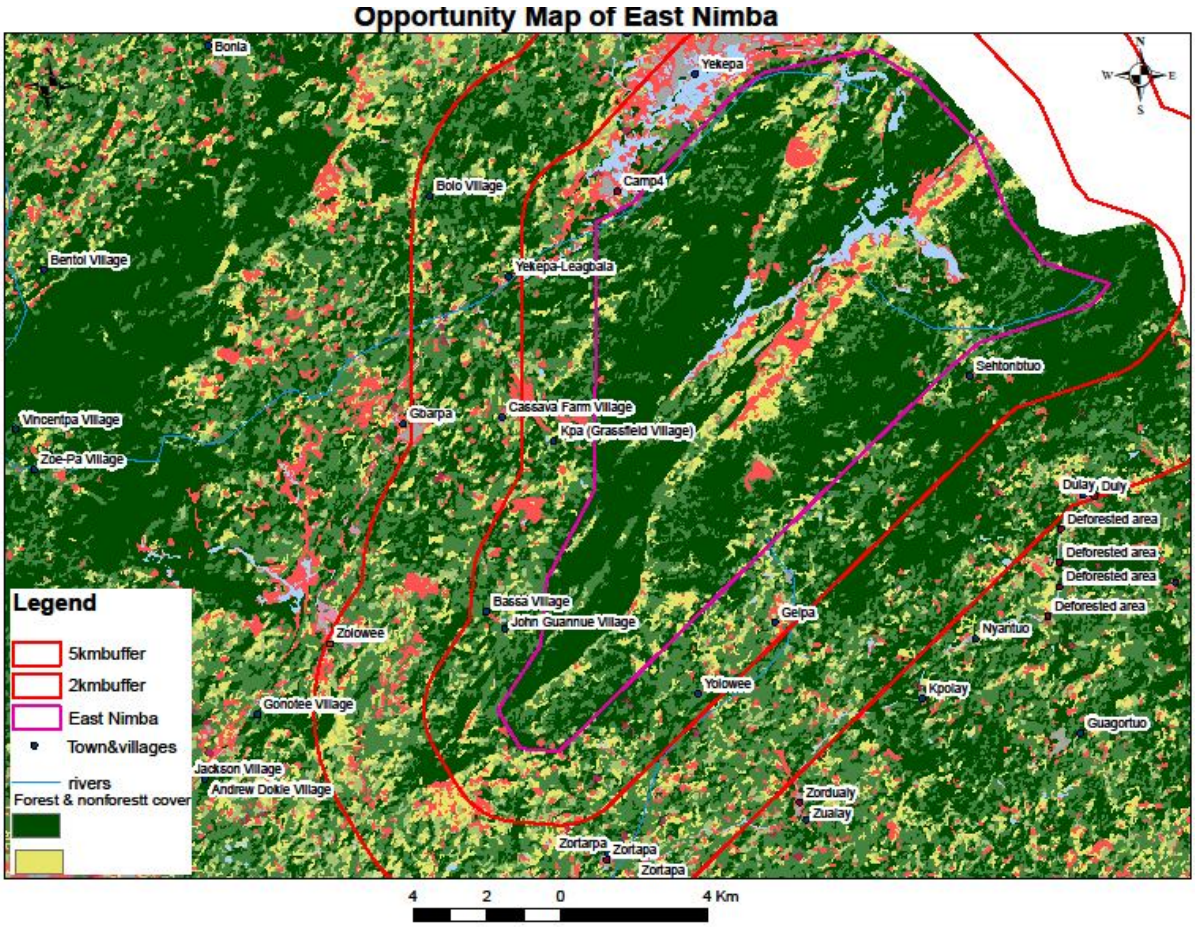
A separate meeting was held in each of the four target communities from July 10-14, 2019. Participants included land users (i.e. farmers, hunters, miners and fishermen), elders and youths comprises males and females. The Town Chief, of each town who requested the participants to the meeting also participated.

Generally, the study noted that the people of the four communities are of the same cultural background and have similar cultural practices as they relate to land use and cultural/traditional practices and other livelihood activities, this was reported and observes in the four communities studied.

Land use

The major land-use activity in the area is farming which is in two parts: upland and lowland farming. Upland farming involves shifting cultivation (where the common crops planted are rice, corn, cassava and vegetables) and cash crop farming (where the common crops planted are cocoa, oilpalm, rubber and cola). Lowland farming involves the cultivation of rice in both raining and dry season and

vegetables as well as corn in the dry season). Other land use activities reported and observed were industrial iron ore mining, power-chain sawing, alluvial gold mining, fishing and backyard gardening. Of all the above mentioned land use activities, farming is the greatest driver of deforestation and forest degradation. This is followed by mining (both alluvial mining and industrial iron ore mining as being carried out by ArcelorMittal in the northwest and southwest of the reserve.



A separate meeting was held with a group of people selected by the town chief of each of the four targeted communities (Zortapa, Camp #4, Zolowee and Dulay) in the ENNR landscape. The field staff of the FDA (Forestry Development Authority) ROAM Team, Mr. Gonkarnue Tiatun who facilitated coordination of the study and the Town Chief of every town were present in every town meeting. The meetings were intended to discuss future landscape restoration opportunities with these target communities in the ENNR landscape and to negotiate restoration issues with them. Participants in each meeting acknowledged that the forest of their landscape is being rapidly depleted as a consequence of farming and mining activities. They expressed interest in any future action that would help to restore their landscape. The meetings were held from July 10 – 14, 2019 (which fell in the peak of the rainy season). Community members represented in each meeting included members of FDA Local Community Committee (LCC), farmers, hunters, youths, elders, town chief as well as males and females. In the Zortapa and Dulay meetings, field staff of RCCE (Rural Integrated Center for Community Empowerment) was also present.

Survey Communities

The below sections summarize the landscape restoration discussions held in each of the four target towns.

Zortapa

Zortapa, founded in 1960, is located outside the ENNR about 2km south of the reserve. Its population is about 1053 people comprising of 533 females and 520 males. About 219 households and 160 houses were reported. The community has mixed tribes and is dominated by Mano ethnic group. The long staying/permanence residents are in the majority compare to seasonal migrants who visit for few weeks or months for business transaction.

Livelihood activities

Farming

The people of Zortapa are basically farmers mainly focusing on upland and lowland farming. Main crops produced in subsistence farming are rice, peanut, plantain and vegetables (including pepper, okra, bitterball and eggplant). Most of the vegetables are market and some used for family consumption. The most common crop planted on both upland and lowland is rice but the upland farming is common according to respondents. Upland rice is intercropped with cassava, plantain, corn and vegetables. Lowland/swamp farming is not common in this community and practiced by only few residents. Cash crop farming is common and crops of interest on interest level are cocoa (Theobroma cacao) first, rubber (Hevea brasiliensis) second, oil palm (Elaeis guineenisis) third and coffee (Coffea spp) fourth.

Animal husbandry

Livestock is also raised in all the towns/villages in the landscape. The most domesticated animals are goat, sheep, pig, chicken and duck fowl. Except pigs, these animals are free-ranged domesticated, moving everywhere for feeding; the pigs are confined in a pig pans.

Hunting

Hunting of wildlife is reportedly done on subsistence basis but some hunters do sell portion of carcass to generate income that contributes to sustaining their families. Single barrel guns and traps (snares) are the main weapons used. Wildlife hunted as reported are ground hug (grass cutter), ground squirrel and red deer); these are wildlife species often involved in human-wildlife conflicts, raiding the crops of farmers.

Fishing

Fishing is done on a subsistent basis and carried out in rivers and creeks in the community with the use of one finger net and hook.

Timber product harvesting

Local people also harvest forest products such as timber and NTFPs (non-timber forest products). Timber is harvest by use of power-chain saw. Among others, tree species commonly logged are Framire' (Terminalia spp), Dahoma (Piptadeniastrum africanum), Kusia (Nauclea diderrichii) and Abura (Hallea spp). Some community members in Zortapa are also reportedly involved in the

collection of NTFPs. Some NTFPs are sometimes collected are bush pepper (from Piper guineense), African spice (from Xylopia aethiopica), bitter kola (from Garcinia kola), walnut (from Coula edulis), rattan (from Calamus spp), pine wine (a breverage from Raphia Palma-pinus) and worlor (fruit of Beilschmiedia mannii); roots, leaves, and backs of other forest plants are also collected for various purposes, especially for food and medicinal purposes.

d) Mining

The two mining activities in the ENNR landscape are industrial and artisanal mining. Industrial mining of iron ore is carried by ArcelorMittal. According to the respondents, few people do artisanal mining of diamond in the area using 'dig-hole-cover-hole' method as done in the Gola landscape.

Current interventions

As reported by respondents, the following institutions have done and some continue to conduct interventions in Zortapa:

PROSPER (The People, Rules and Organization Supporting the Protection of Ecosystem Resources) provided training in fire management, forest species inventory, business management, community awareness on forest management.

CI (Conservation international) provided training in monitoring and protection of forest species (forest animal and tree species) and co-management of the ENNR.

FFI (Fauna and Flora International) provided training in the operation of GPS, computer and camera trapping in forest.

ARD (Tetra Tech Associates Rural Development) provided training in post-harvest and storage, woman conservation forum and eco-stove building.

RICCE (Rural Integrated Center for Community Empowerment) provided training to local farmers in vegetable farming using three methods including: a) Conventional method—Brush-burn, plant and mulch, b) traditional method (controlled)---brush, burn, and randomly plant, and c) conservation method --- brush-slash-plant and mulch.

Best Practice

The best practices reported and/or observed in Zortapa are:

- Cash crop farming which is mostly stable and retains the vegetation cover of the farming site for many years.
- Training for local farmers in conservation farming methods including: a) Conventional method—Brush-burn, plant and mulch, b) traditional method (controlled)---brush, burn, and randomly plant, and c) conservation method --- brush-slash-plant and mulch.

- Training in post-harvest and storage of crops, woman conservation forum and eco-stove building; this is good because people's capacity is built or enhanced to maximize the value of their farm products and to actively participate in conservation initiatives in their communities.

- Training in monitoring and protection of forest species (forest animal and tree species); this is also good because it motivates local people to get involve in co-management of the ENNR.

- Training in fire management, forest species inventory, business management, community awareness on forest management; this also builds local people's capacity and motivate them to actively participate in co-management of the ENNR.

- Raising animals to substitute bushmeat; this activity has the propensity to detract hunters' interest in hunting of wildlife and also provide sustainable income for their families.

Landscape restoration vision for Zortapa

Zortapa sustained great forest degradation since the 1990s due to artisanal mining activities and severe deforestation in the post-war era mainly due to shifting cultivation. During the recent study, deforestation was observed along the motor roads connecting the town to other settlements in the ENNR landscape. Thus the landscape restoration vision for the Zortapa community should be the development of cash crop farms/plantations in all farmland sites and improvement of watershed cover with local forest tree species that can provide economic benefits for the Zortapa people and to provide ecosystem services in the community.

Landscape Restoration Negotiation and Agreement with Zortapa people

The participants, on behalf of the Zortapa people, expressed their desire to see the trend of deforestation and forest degradation reversed and wished to acquire the technical knowledge to do so. Furthermore, they acknowledged that shifting cultivation is a major driving force to deforestation and wished for alternative means of survival that will allow them to stop clearing the forest for food production. Together with their Town Chief, landscape restoration intervention was negotiated with the participants. They were asked if they would be willing to sign an agreement for a restoration program for their community in the future. They positively responded but under the condition that the agreement will be in the interest of the Zortapa people. They would like to have access to the written agreement far ahead of the signing date to ensure that the Zortapa people accept the terms in the agreement. However, they agreed verbally to enter into any agreement /memorandum of understanding for the restoration of their deforested/degraded landscape in the future, once such agreement is in their interest for sustainable livelihood development and improvement in their environment.

Camp #4

This town, also known as Unification Town, is located outside outside the ENNR less that one kilometer in the northwest. It was established in 1964 and originally named Camp #4. The name 'Unification Town was given it by Late President William VS Tubman when he attended Unification Day celebration there later the same year and gave the name. As reported by a health facility staff in

the area, the recent population is about 2260 people comprising of 1100 females and 1160 males with 293 households. This community also have mixed tribes dominated by the Lorma ethnic group. According to the respondents, the people are stable in the camp but do not own land because the facility was established by LAMCO to host none employees of the company. The occupants are allowed to grow rice and vegetables in the community but not to plant cash crops on the land. Farming activities destroyed the reforestation plantation established near the town by FDA between 1974 and 1989. An exotic tree species called *Gmelina arborea* was the dominant tree species planted in the area. Trees in the plantation are being converted to charcoal by residence of the camp.

Residents in the town earn their living by the following activities as reported and observed:

Farming

Farming is the number one livelihood activity in which farmers focus on the production of rice and vegetables. Rice cultivation is mostly done on the upland and intercropped with vegetables, plantain, eddoes, maize and sometimes banana. They sometimes continue cultivating the site with other seasonal crops after the rice is harvested. Some people are also involved in swamprice farming where rice is harvested at least two times a year. Some people alternatively grow rice and vegetables in the swamp with vegetables planted in the dry season. Most swamprice farmers use chemical (herbicide) to kill weed instead of brushing the field/plot. Few people also practice backyard gardening where vegetables are the main crops planted; other crops planted in their backyard gardens are corn, pineapple and cassava.

Business

Petty trading is the second livelihood activity of interest. Marketed commodities include imported goods and local agricultural products. Charcoal produced mostly from the FDA reforestation plantation are also marketed.

Animal husbandry

Domesticated livestock reported and/or observed include pigs (raised in pig pan) as well as chicken and duck, all free-ranged raised.

Hunting

Hunting of wildlife is not a common practice in this area because of restriction placed on it by the FDA as a measure to protect the ENNR. It is reportedly done on subsistent basis but some hunters sell a portion of the killed animal to sustaining their family. Hunting, if done, is carried out in the unprotected forest surrounding the community using shotgun and/or snare (wire trap).

Fishing

Fishing is done in the Karn and Yaa Rivers. The Karn River is not polluted as impact of the iron ore mining as with the Yaa River whose banks lack forest cover. Fishing is done with country net, although some people use mosquito net also.

Collection of forest products

As reported, few people are involved in power-chain sawing done on commercial basis. However, this was not observed by the survey team. Some community members in Camp # 4 are involved in the collection of NTFPs such as bush pepper, bitter kola, rattan, bitter root, walnut, worlor and pine wine. People also collect leaves, roots and tree barks mainly for medicinal purposes.

Current Interventions

The following interventions were reported:

- Conservation International (CI) provided training in safeguarding wildlife and other species in the forest and provided the community with pigs
- Elit Agribusiness Project (community based organization) provided community support project in road rehabilitation, animals husbandry, nutrition and health

Best practice

Best practices reported and noted are:

- Training in safeguarding wildlife and other species in the forest
- Animal husbandry to provide protein for as substitute to bushmeat
- Swamp cultivation which can discourage shifting farming
- Willingness of local people to cooperate with FDA on restriction to hunting in the ENNR (But FDA has not made her promises good).

Landscape restoration vision for Camp #4

Deforestation is so severe in the Camp #4 community to the extent that the FDA reforestation plantation in the area is being rapidly wiped out. Although farming activities were ongoing in the area prior to the 1990, it became intensive and uncontrollable in the post-war era. Deforestation in the area is not due only to farming. Industrial mining activities also removed forest cover on mountain tops and in the vicinities near the mining area. During the recent study, deforestation was observed everywhere even up to the ArcellorMittal mining concession area. The vision for landscape restoration for the Camp #4 community should be the development of cash crop farms/plantations in all farmland sites as well as restoration of sites where mining activities are no more active. The banks of all water bodies in the area should be planted with forest tree species that have the potential to produce non-timber forest products.

Landscape Restoration Negotiation and Agreement with Camp #4 people

The participants (including males and females consisting of the Township Commissioner, the Counsel, elders, youths, farmers and hunters) on behalf of the Camp #4 people, expressed their desire to reforest the deforested sites and improve the degraded land. They acknowledged that shifting cultivation and iron ore mining are major land-use activities causing deforestation and land degradation in their community. Together with their Town Commissioner and Counsel, both of who participated in the meeting, landscape restoration was intensively discussed and negotiated. They were asked if they would be ready to sign an agreement for a restoration program for their community in the future. The response was positive but added that the only industrial mining entity in the area, ArcelorMittal, should be involved in the agreement. Another condition given by the participants for signing the agreement was that the agreement should indicate the interest of the Camp #4 and Yekepa communities. For now, However, they agreed verbally to enter into any agreement /memorandum of understanding for the restoration of their deforested/degraded landscape in the future, once such agreement is in their interest for improved and sustainable livelihood development and improved economic development.

Zolowee

Zolowee is located outside of the ENNR in the southwest about 5km away. As reported by respondents, the town was established in 1815 and the current population is about 6000 people comprising 4000 females and 2000 males. There are 1200 households occupying 450 houses. The community has mixed tribes dominated by Mano ethnic group while the long-staying residents are in majority compared to seasonal migrants.
This community is experiencing continuous deforestation and degradation due to farming and mining activities which took root in the area since the 1960s.

Livelihood Activities

Like neighboring communities, Zolowee is mainly an agriculture community. Farming is the number one livelihood activity though some members of the community are involved in alluvial/artisanal mining activities. As reported by respondents, the expanding deforestation is attributed to farming (i.e. shifting agriculture) while most of the land degradation is attributed to mining (both artisanal and industrial).

Farming

The farming systems are similar to those of Zortapa (i.e. both upland and lowland farming). Upland farming involves rice cultivation and cash crop farming. In terms of interest ranking, the people consider cocoa first, oil palm second, coffee third and rubber fourth. The cash crops are purely produced for commercial purpose. Swamp/lowland cultivation involves mainly rice but crops such as eddoes, sweet potatoes and vegetables are also planted in lowland during the dry season. These are mainly for family consumption.

Mining

Diamond mining is the second livelihood activity to farming, although few people are involved in this activity. As reported, the method applied *is 'dig-hole-cover-hole'*. Respondents said there is community law that governs mining in this town. That is, miners are not allowed to mine without permission from the mining chairman in the community.

Animal husbandry

The residents of Zolowee are also engaged in animal husbandry though on low level. Animals domesticated include goat, sheep, chicken and duck fowl, all raised on the free-ranged level. Pig is also raised but confined in pig pan for proper management and community health reasons. As mentioned by respondents, health practitioners in the community advised pig owners to confine the animal in an enclosure to prevent the spread of diseases in the community).

Hunting

Few people are involved in hunting. Respondents mentioned that hunting is currently done on subsistent level although some pieces of bushmeat are sold to generate income for the family. Shotguns and traps/snares are used for hunting.

Fishing

Fishing is reportedly done at subsistence basis but some fisherman may sell some of their catches to generate income for the family. The fishing methods include the use of nets, and line (hooks).

Collection of forest products

Harvesting of forest products (timber and non-timber products) is another means of income generation in Zolowee. The sawn timber produced by power-chain sawing is transported on head to motor-road side for sale. Few people are involved in private chain-saw logging in the community with Terminalia spp the most harvested tree species. Some residents of the town are also engaged in the collection harvested of NTFPs (non-timber forest products) such as rattan, bush pepper, African (country) spices, malagueta pepper, tree barks and roots. The methods used for collecting some of these NTFPs are not conservation friendly. For example, it was reported in the meeting that the African spices trees are being depleted in their forest because the trees are cut down to collect the mature fruits for sale.

Current Interventions

The FIFES provided training for Forest Guards for forest protection, vegetable production and VSLA.

VOSELA provided $100,000LD as support to group of people who were affected by Arcellormittal mining concession areas; about 22 persons benefited from this donation.

The following institutions carried out interventions in Zolowee:

- CODA (local NGO) provided support for community voluntary group in forest conservation.
- Green Advocate (GA) provided training in managing community forest.
- Conservation International (CI) provided training in pig production, provided training in conservation farming and created awareness for conservation of forest

Best practice

Best practices noted in Zolowee are:

- Farming of cash crops such as Cocoa, coffee, oil palm, rubber and cola because these crop are planted to cover deforested areas of the land which is beneficial to both the forest and the community.
- Lowland farming is a good practice because community farmers grow their rice in the lowland and harvest three times a year, which they think contributes to minimizing deforested and degraded areas since most farmers will remove their focus from upland rice farming which destroys forested land.
- Abiding by FDA restriction on hunting (i.e. no hunting of protected animals and no entry into the ENNR).

Landscape restoration vision for Zolowee

Zolowee community is severely deforested and has sustained great forest degradation for a protracted period of time.The landscape restoration vision for the Zolowee community will be the development of cash crop farms/plantations in all deforested sites, enrichment planting in degraded forest areas with commercial timber as well as NTFP tree species and improvement of watershed cover with NTFP tree species that can bring economic benefits to the local people and improve the aquatic ecosystem in the community.

Landscape Restoration Negotiation and Agreement with Zolowee people

The participants, on behalf of the Zortapa people, also expressed their desire to see the trend of deforestation and forest degradation reversed and wished to acquire the technical knowledge to do so.As in previous communities surveyed, they acknowledged that their activities (shifting cultivation and artisanal mining) are contributors to deforestation and forest degradation in their community. Opportunity for landscape interventions was discussed with the participants (male and female, youths and elders, farmers and hunters) including the Town Chief.They were asked if they would be ready to sign an agreement for a restoration program in their community in the future. They positively responded but under the condition that such an agreement would be in the interest of the Zolowee people.They would like to have access to the written agreement at far ahead of the signing to ensure that the Zortapa people accept the terms in the agreement. However, they agreed verbally to enter into any agreement /memorandum of understanding for the restoration of their

deforested/degraded landscape in the future, once such agreement is in their interest for sustainable livelihood development and improved economic development in their community.

Dulay (Duly)

Dulay is located in the northeast of ENNR. This community has mixed tribes dominated by the Geo ethnic group. The first establishment (location unknown to the respondents) was affected by LAMCO mining in 1972 which caused the company to relocate the town to the present site in 1978.

Farming

The farming practices are similar to those in Zortapa (i.e. upland and lowland farming) and the crops planted are similar also.

Hunting

Hunting practices are also similar to those in Zortapa. Wildlife species often hunter are those that raid farm crops (e.g. porcupine, squirrel, Red deer and grasscutter.

Fishing

Fishing here is done in the Cavally River and creeks in the Dulay community using traditional net, finger-sized net and hook (referred to as line fishing). Catches are for both family consumption and sale.

Business

Business is a major livelihood activity in Duly. Items marketed include imported materials (including toiletry, clothes, canned food and biscuits among others), local farm products, domesticated animals and sawn timber. Cross-border trade in Cot d'Ivoire is regular as Dulay is a border town near the Ivorian border.

Harvesting of forest products

Power-chain sawing is also a lucrative livelihood activity in Dulay. The products (sawn timber) was observed displayed along roadsides in close proximity to the down. Tree species commonly harvested are Samba, Iroko, Framire', Cotton tree, Kusia, Dahoma and Niangon. Non-timber forest products (NTFPs) collected from the forest are malagueta pepper, Africa (country) spice, rattan as well as barks, leaves and roots of plants for medicinal purposes.

Animal husbandry

Animals raised in the town on free-ranged level are goat, sheep, guinea fowl, chicken and duck fowl among others. Pig is also raised but contained in fence mainly for health reasons (see the animal husbandry section under Zolowee).

Current Interventions

The following organizations have done and continue to do interventions in the Dulay community:

- RICCE conducted training in swamp farming and provided materials for swamprice production.
- CI is providing support in piggery, forest patrol, swamprice development, vegetable production and Village Saving and Loan.
- FIFES is providing support for forest conservation by hiring forest guards, conducted socio-economic survey in the ENNR comunities, conducted biomonitoring and provided training in integrated capacity building along with CFMBs (Community Forest Management Bodies).
- PARLEY conducted awareness raising and advocacy for reserving and managing clan reserved forest.
- SOLIDARIDAD is conducting training in cocoa development.

Best Practice

The local residents in Dulay are aware that farming and forest product harvesting activities are damaging the forests in their community. However, respondents say they are engaged in the following activities that, if sustained, can restore their land cover:

Cash crop farming (cocoa, oil palm and rubber)

Lowland farming
Obeying the 'No entry rule' into the ENNR.

Community Recommendations

Base on the above best practices and in order to contribute to co-management of the ENNR, the respondents recommended as follow:

- Employment for the local people
- Support in the area of cash crop farming
- Support for skills training
- Support for Zor Community Forest
- Let the head manager of the Zor Community Forest reside in Dulay.

Landscape restoration negotiation and agreement

Zortapa

In a meeting that included ten (10) citizens of Zotapa selected by the Town chief. Land use planning was interestingly discussed with the people. The participants on behave of the town guaranteed that the people are prepared to be engaged in site restoration initiatives in the future. They agreed verbally to enter into any agreement of understanding for the restoration of their deforested and degraded areas depending the terms will be in our interest.