

REPUBLIC OF LIBERIA



NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN-II 2017-2025

MARCH 2017

FOREWORD

Biological diversity affects every facet of our lives. The socio-economic and political development of a country depends on its natural resources, and how these resources are sustainably utilized for the benefit of the populace. Biological Diversity is largely viewed as core in providing variety of services for human wellbeing and for the improvement of society. However, human activities in the country over the past six decades have significantly reshaped the diversity of genes, species, habitat and ecosystems to the extent that we have lost many species, while most of the ecosystems have been degraded due to loss of approximately 60% of our forest. The 2004 NBSAP records that roughly only 7% of an estimated 13 million species have been identified thus far; meaning that more research is required to discover additional ones, whilst at the same time, more actions are required to address the causes of biodiversity loss across our various ecosystems.

Liberia has been regarded as one of the Biodiversity hotspots in the world, and one which contains the highest remaining portion (42%) of the Upper Guinea Massif including plants with high endemism. The country boasts of over 2000 vascular plant species, 600 bird species, 75 reptile species, 150 mammal species, etc., which demand adequate safeguard/ measures. Thus to enhance the conservation and sustainable utilization of biological resources, Liberia needs a sound, comprehensive and holistic blueprint (strategy) which will chart the way to sustainable management/governance of these resources.

Liberia ratified the Convention on Biological Diversity (CBD) on November 8, 2000, and in 2002 commenced the writing of a strategy & action plan that underscores the importance the country attaches to its intrinsic values of biological resources. Since 2004 when the document was launched, it has served as a national blueprint utilized by sector institutions responsible for biodiversity management in the country.

The revised NBSAP has been prepared consistent with Strategic Goals of the CBD and its Aichi Targets, as well as Liberia's national goals and objectives for biodiversity management. The Strategy takes into account key issues identified by stakeholders critical for biodiversity conservation and provides strategic direction to enhance biodiversity management. I look forward to successful implementation of the Strategy, with support and collaboration of all stakeholders.

Honourable AnyaaVohiri
Executive Director
Environmental Protection Agency of Liberia

PREFACE

Liberia is recognized globally as a top conservation priority in the West African region, as it has significantly high levels of species endemism and accounts for 42% of West Africa's remaining Upper Guinean Forest, a humid coastal rainforest belt and a global Biodiversity Hotspot that stretches across the other West African countries of Cote d'Ivoire, Ghana, Sierra Leone and Togo. Liberia's forest ecosystems harbour the highest populations of elephants in the region and are a home of over 225 timber tree species, 2000 flowering plant species, 140 mammal species, 600 bird species, 75 amphibian and reptile species and over 1000 species of identified insects which must be conserved, utilized equitably and managed sustainably. There remains a countless number of animals, plants and other organisms of Liberia's resource rich and diversified ecosystems which science has yet to discover.

However, in the last 3 decades, more than any other time in Liberia's history, poorly regulated human activities have significantly degraded most of the ecosystems of note, resulting in an unprecedented loss of biodiversity. Taking one ecosystem for an example, it is approximated that over 60% of the country's forested landscapes is degraded and this must have resulted in the extinction of hundreds of thousands of animals, plants and other organisms. Sustained action towards a responsible and credible governance and sustainable management and use of Liberia's critical natural resource base is the single most important challenge the country faces and meeting this challenge must begin with addressing the causes of the loss of biodiversity of the various ecosystems.

As a testimony of her seriousness of purpose to meet the challenge in point, the Liberian Government signed the Convention on Biological Diversity (CBD) in the year 2000 and in 2002, prepared the first draft of a National Biodiversity Strategy & Action Plan (NBSAP) that underscored the significance attached to the intrinsic and extrinsic values of biological resources. The document was launched in 2004 and it continues to serve as a national blueprint for the institutions in Liberia charged with the responsibility to govern, use and manage biological diversity. National Biodiversity Strategy & Action Plans (NBSAPs) usually require updating as mandated by the Conference of the Parties to the Convention on Biological Diversity, Article Six (6). Thus, consistent with Article Six and the Strategic Plan for 2011-2020, Parties have undertaken the task to revise or update their strategies.

This document, the Revised National Biodiversity Strategy & Action Plan (NBSAP), presents Liberia's strategic goals and objectives for the sustainable management and utilization of her treasured and threatened biological resources under the Global Strategic Plan 2011- 2020 and is in consonance with the Environmental Pillar of the Agenda for Transformation – Liberia's national development strategy up to 2030. The Government of the Republic of Liberia recognizes and understands the threats posed by the loss of biodiversity and climate change to the country's natural resources and the urgent need to take concrete actions to address them. The Government of Liberia is committed to conserving and protecting these resources and pledges an unflinching support for this NBSAP and other credible schemes designed to govern and sustainably manage and utilize biological resources of the country as an integral part of the national development agenda for the benefit of the present and future generations.

Honourable Anyaa Vohiri
Executive Director
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The Policy Council, Board of Directors, National Biodiversity Steering Committee, the Management of the Environmental Protection Agency (EPA) and the Office of the EPA's Executive Director, Madam AnyaaVohiri, gratefully acknowledge the United Nations Environment Programme (UNEP), the Global Environmental Facility (GEF) and the Secretariat to the Convention on Biological Diversity (SCBD) for financial and technical assistance to revise the first the NBSAP. Support also came from sectoral institutions, including international non-governmental organizations (INGOs), local non-governmental organizations (LNGOs), academic institutions and Civil Society institutions (CSIs). We appreciate their participation and contribution to the revision process.

Special thanks go to members of the Technical Expert Committee: Dr.Samuel N. Koffa (Independent consultant), Richard S. Sambolah of FACE (Farmers Associated to Conserve the Environment), Edwin Kamara of SCNL(Society for the Conservation of Nature of Liberia), Mr.BorwenSayon of CI (Conservation International) and Sampson Chea of the Environmental Protection Agency of Liberia (EPA) who tirelessly contributed to the draft Strategy, as well as a number of individuals, organizations and institutions whose names cannot be mentioned because of space limitations, contributed immensely by meticulously reviewing the document and making constructive comments. Finally, we express sincere thanks and appreciation to Jonathan Davies (deceased) and J.S.Datuama Cammue of the EPA for organizing the series of workshops held in support of the revising process and for the enduring commitment and outstanding facilitation skills which contributed to the success of this exercise.

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EXECUTIVE SUMMARY

One of the four existential threats humankind faces today is the loss of biological diversity. The others are climate change, food insecurity and poverty. Biodiversity, most simply stated, is life on Earth, the wealth of ecosystems, species and ecological processes that make up our living planet. It is humankind's living natural resource base, our biological capital in the global bank. Managing biodiversity sustainably is critical to the survival of humanity and thus needs to be given the utmost serious consideration by all actors.

As is true globally, an unexampled rate of extinction of marine and terrestrial animal and plant species is plaguing Liberia's biological resource base. It now approaches a crisis proportion that requires urgent and concrete actions for mitigation. This crisis is impelled, almost invariably, by the direct and indirect threats of agro-industrial plantations of rubber, recently oil palm that are replacing the natural forests, giant logging concessions and related contracts, mining, unsustainable and destructive extraction and collection of firewood, charcoal production, shifting cultivation, uncontrolled hunting and fishing practices, ineffective community-based forest management and strategy, invasive alien plant species, , the lack of a national land use policy and strategy, climate change, poverty, the extreme lack of knowledge about ecosystem values, the lack of recognition and employment of local knowledge systems in natural resource governance and management and the lack of a national energy policy and strategy.

The United Nations Convention on Biodiversity is the instrument for ensuring the conservation of biodiversity, sustainable utilization of its resources, and the fair and equitable sharing of benefits accruing from the use of these resources. Chapter II and Article 7 of the Constitution of the Republic of Liberia, the National Environment Policy, and sectoral programmes, plans and policies are in agreement with the purpose of the Convention and Liberia has revised her National Biodiversity Strategy & Action Plan in keen adherence to the Strategic Plan for Biological Diversity 2011-2020 which was adopted in Nagoya, Japan, in 2010. At such the Revised NBSAP largely mirrors and details the vision and strategy for the Aichi Biodiversity Targets and a ten-year action plan (2015-2025) for conservation and sustainable management of biodiversity in Liberia.

Preparation of the plan commenced in 2012 by the National Biodiversity Coordinating Section of the Division of Multilateral Environmental Agreements at the EPA, the lead Agency for environmental sustainability in Liberia. The document is a result of a Country Study that takes into account the political and socio-economic contexts that influence biodiversity management. It provides a summary of key issues, constraints and opportunities identified during the stocktaking and inventory phases of the Study. It further defines the strategic objectives, actions, outputs and indicators needed to achieve the overarching goals of communicating informed decisions about the implementation of the Convention nationally. The strategy identifies three key components to ensure effective implementation, one of which is Financial and Resource Mobilization Plan (FRMP). The FRMP provides a framework for sources of funds to implement programs and activities proposed in the Strategy, as well as the indicative budget required to implement the Revised NBSAP. The other implementation plans include Capacity and Technology Needs Assessment and Communication Strategy, which address, respectively, what capacity is required to implement the Strategy, and how effectively the Revised Strategy needs to be communicated to ensure participation of all stakeholders.

ACRONYMS AND ABBREVIATIONS

AfT	Agenda for Transformation
AML	ArcelorMittal Liberia
BHL	Biodiversity Heritage Library
CARI	Central Agricultural Research Institute
CBD	Convention on Biological Diversity
CBOs	Community-based Organizations
CEPA	Communication, Education and Public Awareness
CFMAs	Community Forestry Management Agreements
CHM	Clearing House Mechanism
CI	Conservation International
CITES	Convention on International Trade in Endangered Species
CMS	Convention on the Conservation of Migratory Species of Wild Animals
COP	Conference of the Parties
CS	Communication Strategy
CSI	Civil Society Institution
CWIQ	Core Welfare Indicator Questionnaire
ECF	Environment Conservation Fund
ECOWAS	Economic Council of West African States
EPA	Environmental Protection Agency
FACE	Farmers Associated to Conserve the Environment
FAO	Food and Agriculture Organization of the United Nations
FDA	Forestry Development Authority
FGDs	Focus Group Discussion
FMCs	Forest Management Contracts
FUPs	Forest Use Permits
GBIF	Global Biodiversity Information Facility
GDP	Gross Domestic Product
GEF	Global Environment Facility
GoL	Government of Liberia
GSM	General Service Mobile
IAPs	Invasive Alien Plants
IPBES	Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services
IPPC	International Plant Protection Convention
ITCZ	Intertropical Convergence Zone
ITTO	International Tropical Timber Organization
IUCN	International Union for the Conservation of Nature
LC	Land Commission
LCC	Liberia Chamber of Commerce
LEITI	Liberia Extractive Industries Transparency Initiative
LiCC	Liberia National Bar Association
LIGIS	Liberian Institute of Statistics and Geo-Information Services
LMA	Liberia Marketing Association
LMDA	Liberia Medical and Dental Association
LNBA	Liberia National Bar Association

LNGOs Local Non-governmental Organizations
 LPMC Liberia Produce Marketing Corporation
 LRCPF Land Rights and Community Forestry Program
 LRDC Liberia Reconstruction and Development Center
 MDG Millennium Development Goal
 MEAs Multilateral Environmental Agreements
 MIA Ministry of Internal Affairs
 MLME Ministry of Lands, Mines and Energy
 MoA Ministry of Agriculture
 MOCI Ministry of Commerce and Industry
 MOE Ministry of Education
 MPEA Ministry of Planning and Economic Affairs
 NACUL National Charcoal Union of Liberia
 NBSAP National Biodiversity Strategy and Action Plan
 NEP National Employment Policy
 NFRL National Forest Reform Law
 NGOs Non-governmental Organizations
 NTFPs Non-timber Forest Products
 PAs Protected Areas
 PROSPER People, Rules and Organizations Supporting the Protection of Ecosystem Resources
 PUL Press Union of Liberia
 SCBD Secretariat to the Convention on Biological Diversity
 SCNL Society for the Conservation of Nature of Liberia
 SLM Sustainable Land Management
 TEEB The Economics of Ecosystems and Biodiversity
 TSCs Timber Trade Contracts
 UBN Unmet Basic Needs
 UGF Upper Guinean Forest
 UNDP United Nations Development Program
 UNEP United Nations Environment Program
 USAID United States Agency for International Development
 WARDA West Africa Rice Development Authority
 WHC World Heritage Convention
 WTTC World Travel and Tourism Council

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SECTION ONE

INTRODUCTION

1.1 The Importance of Liberia's Biodiversity

The Convention on Biological Diversity (CBD) defines biodiversity as “the variability among living organisms and the ecological complexes of which they are a part, including the diversity within species, between species and of ecosystems”. The interaction- and inter-dependence among the various components of biodiversity make the Earth habitable for all species, including humans. Biodiversity provides goods such as food, medicine, building material, fiber, fuel, paper product, industrial materials that are for direct use. A host of vital services are also provided by Biodiversity, which include Regulating global processes, such as atmosphere and climate soil and water conservation; nutrient cycling; pollination and seed dispersal; control of agricultural pests; genetic library; other services include inspiration and information; scientific and educational; tourism and recreation; cultural, spiritual, and aesthetic.

Besides the extrinsic value of biodiversity described above, the intrinsic value of biodiversity must be appreciated. Every species has value and role to play in nature by supporting the web of life. In this regard, conservation of biodiversity must be done in a responsible manner having regard for all biodiversity.

Liberia's vast terrestrial and aquatic biological resources are distributed throughout the landscape of the country, which comprises flat rolling coastal plains running into interior plateaus, and then mountains in the north-eastern, northern and north-western parts of the country(<http://www.fao.org/ag/AGP/AGPC/doc/Counprof/Liberia/liberia>). **Map 1** shows the landscape of the country.

Biologically, Liberia is exceptionally diverse with high rates of endemism and one of the 14 centres of plant endemism globally. The country lies in the heart of the Upper Guinea Rainforest in Western Africa. Its ecosystems are typically the ecosystems of this forest region and are associated with the topography and various types of landscapes of the country.

Map 1: Landscape map of Liberia

Source: Larbi (2010)



1.1.1 Biodiversity and ecosystems services:

Ecosystem services are the transformation of a set of natural assets (air, animals, plants, soils and water) into things that we as humans value. These services or benefits are obtained from both natural and managed ecosystems from which humankind continues to enjoy provisional, regulative and cultural services. As a result of the contribution to the different forms of life that constitute biodiversity, biodiversity does influence the rate and stability of ecosystem service provision. Fuelwood, timber, freshwater and regulative services such as water purification, disease control, suppression of pathogens and temperature amelioration are among the goods and services that biodiversity provides.

1.1.2 Biodiversity and food security:

Biodiversity contributes to food security by ensuring availability and access to safe and nutritious food. Agriculture is dependent on biodiversity as it is at the origin of all crops and domesticated livestock and the variety among them. Food production and nutrition depend on essential ecosystem functions such as nutrient cycling, decomposition of organic matter, soil formation and rehabilitation, pest and disease regulation, and pollination that benefit crop and livestock production.

1.1.3 Biodiversity and climate change:

The diversity of genes and species in an ecosystem, and the ecological processes they are a part of, determines a forest's stability against pressures such as rapid climate change and extreme weather events such as drought and catastrophic floods. The flow of genes and species within and between different forests – which allows species and genes not adapted to these pressures to migrate out, and more adapted genes and species to migrate in – is essential in maintaining this stability. It is evident from these realities to acknowledge and appreciate the contribution of biodiversity to forest health and sustainability. Biodiversity exerts a significant impact on climate change, among others, by sustaining forests so that they continue to capture and store greenhouse gases, carbon in particular.

1.1.4 Biodiversity, livelihoods and disaster risk reduction:

In the support it provides to a host of ecosystems (e.g. agricultural and forest ecosystems), biodiversity significantly contributes to livelihoods and disaster risk reduction. In Liberia, as is true for other sub-Saharan African countries, agricultural and forest industries provide employment as well as meet the subsistence and income generating needs of millions of people. During the 14-year conflict in Liberia, people took refuge in the forest where they fed on wild fruits, root crops and bush meat for months. While no one wishes to see this cataclysmic event repeated, it is important to acknowledge this life-saving role of Liberia's forests during the war without which hunger must have taken tens of thousands more of precious human lives. Without the forest, life would have been more disastrous for war-fled Liberians. Finally, there have been examples in Liberia where forests served as a shelter against storm and landslide in communities around steep sloping mining areas in Nimba County. There are hundreds of examples around the country where forests have been useful in disaster risk reduction which time and space could not allow us to discuss in this document.

1.1.5 Species diversity and endemism:

Biologically, Liberia is exceptionally diverse with high rates of endemism and one of the 14 centers of plant endemism globally. The country lies in the heart of the Upper Guinea Rainforest (UGF) in Western Africa (Halton 2013). In fact in 1999, the West African Conservation Priority Setting Exercise for the Upper Guinean Forest ecoregion (UGF) brought together over 150 experts from West Africa of various backgrounds in Almina, Ghana. These experts identified Liberia as the top priority country for biodiversity conservation in the UGF (Sutter 2001). Table 1 provides examples of the various species of animals, plants and other organisms that are so far identified in Liberia's natural ecosystems. The table shows that 100 species are endemic and 89 are threatened. While these figures are quite conservative in their capture of what the reality is, they speak unequivocally to the threat plaguing Liberia's biological resource today, the likes of which it has never ever seen. The country's forests now harbour the highest populations of elephants in West Africa (Suter 2002) and are home of over 2,000 flowering plants, including about 225 timber species and approximately 140 mammal species, 615 bird species, 75 known reptiles and amphibians and over 1000 described insect species (Lomax 2008, UNEP 2004, FDA 2000).

Table 1: Examples of the classes of threatened species of animals, plants and other organisms in Liberia

Class	Total Species	Total Endemic	Total Threatened
Amphibians	38	4	1
Plants	2,200	103	46
Mammals	193	n/a	17
Birds	590	1	22
Reptiles	67	2	2
Mollusks	n/a	n/a	1
Other Vertebrates	n/a	n/a	1
Ants	1,000	N/A	89
TOTAL		110	89

Sources: World Conservation Monitoring Centre, IUCN, FAO (NBSAP)

For birds in particular, Liberia is also known as a flyway for migratory birds and a home for many resident birds. Some bird species are threatened (See Table 1 above). For example, the Liberian Greenbull (*Phallastrephus leucoleps*) is reported to be critically endangered within the Cavala Forest (near Zwedru), a restricted habitat. Also the Rufus fishing-owl (*Sotopelia ussheri*) is reportedly endangered. Based on this information, BirdLife International, in collaboration with the Liberian Government, has designated seven (2) Important Bird Areas (IBAs) in the country. They are (i) Lake Piso Multiple Use Reserve in the northwest, (ii) Proposed Gola Forest protected area in the northwest, (iii) Proposed Wonegisi Protected Area in the northwest, (iv) Monserrado Wetlands in the south, (v) Marshall Wetlands in the south, (vi) East Nimba Nature Reserve in the north and Sapo (vii) National Park in the southeast.

Of the total of 615 species of birds recorded in Liberia, 125 are Palearctic Migrants. Amongst these are 21 species of global conservation concern, only three of which are not resident. Fourteen of these are also species of restricted-range; almost the whole of Liberia falls within the

Upper Guinea forests Endemic Bird Area (EBA 0840). Liberia also lies entirely within the Guinea-Congo Forests biome (A05) and 184 species characteristic of the biome have been recorded. BirdLife International is currently working in the country, most likely to report whatever changes that may occur in the populations of birds, among others.

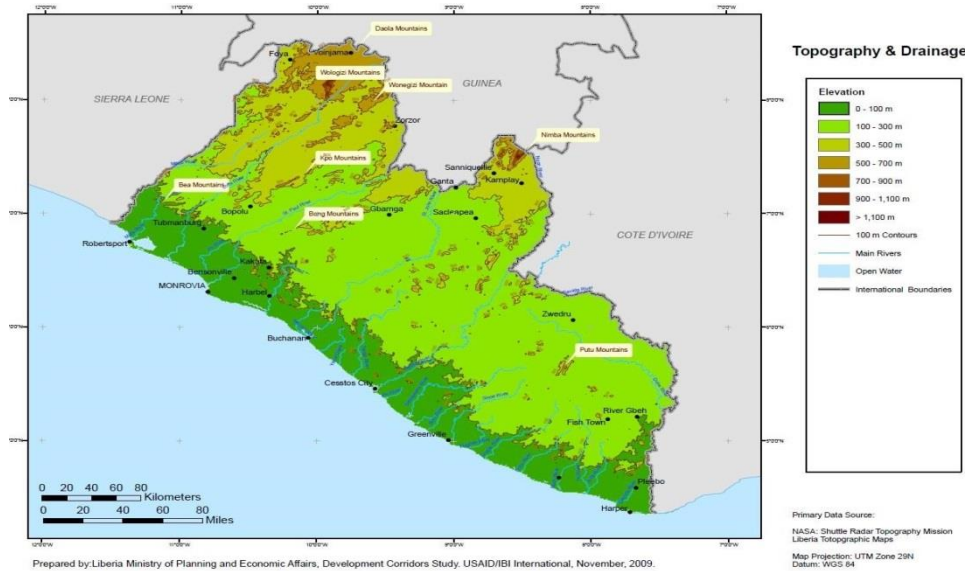
The Western Chimpanzee, *Pan troglodytes*, has a wide but discontinuous distribution in Equatorial Africa, in about 21 countries extending from Senegal in the west to Tanzania in the east. Four distinct subspecies of this common chimpanzee have been recognized which include *Pantroglyodytes*, *Pan troglodytesverus*, *Pan troglodytes vellerosus* and *Pan troglodytes schweinfurthi*. Subspecies *P.troglodytesverus* and *P. troglodytes vellerosus* are the two that occur in Liberia. The Wild Chimpanzees Foundation (WCF), in Collaboration with the FDA, carried out a survey in the Grebo forests of Liberia from 2012 – 2013 which reported that the abundance of chimpanzee in 2012 was 412 and in 2013 it was 341. The survey also found that 139 – 836 individuals have a conservation value of 46.21%.

SECTION TWO NATIONAL CONTEXT

The Republic of Liberia, a relatively small country of approximately 111,369km², is located entirely within the humid Upper Guinean Forest Ecosystem in West Africa on coast of the Atlantic Ocean. In terms of land area, Liberia is the fifth smallest country on the African Continent. The extreme southeast of the county is closer to the equator than any other coastal part of West Africa. It is closer to the South American Continent than any other African State, being about 1,600km from Brazil (Wiles 2005). The country is located at latitudes 4°21'N and 8°33' north of the equator and longitudes 11°28'W and 7°32'W. Within its borders, 15,050km² consist of water, and the remaining 96,319km² are land.

The perimeter of Liberia is 2,551km (UNDP 2006), and it shares a border with three countries. Côte d'Ivoire is to the east with a shared border length of 598 km; Sierra Leone is to the west with a shared border of 370km; and Guinea is to the north with a shared border of 540 km (Wiles 2005). In the south Liberia is bordered by the North Atlantic Ocean, with a 350-mile (560km) coastline stretching to Cape Palmas in the southeast on the border with Côte d'Ivoire, and northwest beyond Robertsport to the Mano River on the border with Sierra Leone. Liberia's Exclusive Economic Zone (EEZ) is 229,700km², extending 370.4km (200 nautical mi) seaward from shore. The width of the continental shelf is generally limited by the 100 m isobaths, being wider off central Liberia (Wiles 2005). Four physiographic regions, corresponding largely to increasing elevation, are apparent in Liberia. All the physiographic regions are roughly parallel the coast (Gatter 1997). **Map 2** shows the topographic features and drainage of Liberia.

Map 2: Topography and Drainage Systems of Liberia



2.1. Geographical Features

Liberia is roughly divided into five geographical zones and these are listed and briefly described as follows:

2.1.1 The Atlantic Ocean. The Atlantic Ocean surface waters of Liberia lie between the Canary Current area to the northwest and the Benguela Current area to the east and are uniformly warm (26–28°C) and of low salinity because of heavy rainfall and high river discharge. Seasonal oscillation of the thermocline and nutrients occur according to the oscillation of the equatorial undercurrent (Brandolini and Tigani 2006). The area of the continental shelf adjacent to Liberia is between 17,715 to 18,400km², and the shelf ranges in width from 16 to 56km (Ssentongo 1988). In the northwest the slope starts at 300m depth but it starts at 100–120m depth in the southeast and beyond this depth the sea floor has canyons and rocky outbreaks which limit trawling.

2.1.2 The coastal plain: The coastal plain lies at sea level to about 30m in elevation (average elevation about 15m above mean sea level) varies from 16-40 km in width. It is about 560km long and is formed by a powerful pounding surf with sand bars and long beaches that consist of a nearly unbroken sand strip, salt and freshwater lagoons, and a few promontories like Cape Mount (329m elevation, at Robertsport, Grand Cape Mount County), Cape Mesurado (91m, at Monrovia, Montserrado County), and Cape Palmas (31m, at Harper, Maryland County) (Gatter 1997; EPA 2007). Because of the steepness of the shoreline, about 90% of the coast consists of a narrow, 20-30m wide, sandy beach; the beach widens to 60-80m from about King William's Point to Grand Cess in eastern Liberia. Only about 10% (60km) of the coastline has rocky outcrops. Immediately behind the beach in 80% of the shoreline is forest, forest-like formations, or thickets. Tidal influence extends inland in wetlands and rivers to about 10km (20km in the Junk River) (Gatter 1997).

Although no offshore islands or natural harbors exist along the coast, rocky reefs and cliffs occur locally. Rivers generally flow slowly over the coastal plain in large meanders, widening near their estuaries. Wave action, tides, and a strong long-shore drift produce sand bars along the shore that divide lagoons from the sea and form across the mouths of rivers. The drift is towards the northwest from October to December and towards the southeast for much of the rest of the year. Several large wetlands, lakes, and lagoon complexes occur along the coast (Gatter 1997).

2.1.3 Mountain ranges and plateaus: Mountain ranges and plateaus lie north of the belt of rolling hills. Nearly half of the interior of Liberia lies between 200-330m in elevation in this region. Major mountain ranges, consisting of long ridges aligned along a southwest-northeast axis, are the Mano River Mountain, Gibi Range, and Putu Range, whose summits reach 700m. Summits in the Bong range reach 500m in elevation. Other ranges include the Bea and Tienpo. The greatest width of this zone is about 128km between the Lofa and St. Paul rivers in the northwest.

2.1.4 Northern highlands: Two disjoint areas form the northern highlands. The Wologizi Range is in northwestern of Liberia in Lofa County, which is variously reported as reaching 1335-1380m in elevation and Mt. Wutivi, which is reportedly the highest point in Liberia (UNDP 2006). The other highland area is the Nimba Mountain range, in northeastern Nimba County in northern Liberia,, which reportedly reaches maximum heights of 1,305 or 1,385m on the Liberian side of the border (Gatter 1997; EPA 2007); the range is shared by Cote d'Ivoire, Guinea, and Liberia. Both the Wologizi and Nimba mountain ranges were once covered with forest and both contain rich iron ore deposits.

2.1.5 Rolling hills: The belt of rolling hills lies at about 200-330m elevation (average about 92m). It parallels the coastal plain and has numerous hills (e.g., Bomi Hills, Mount Barclay, Mount Gibi), valleys, and waterways. Rivers flow rapidly in this region over bedrock bottoms and have numerous rapids within their channels. In Grand Cape Mount County and the eastern part of the country, this zone is forested. Most private agricultural concessions are located in the belt of rolling hills. Here, agriculture and forestry are favored by the prevailing topographical and climatic conditions.

2.2. Climate and Hydrology

Liberia's equatorial position puts the sun almost overhead at noon throughout the year giving rise to intensive insolation in all parts of the country, and a resulting high temperature with little monthly variations. Notwithstanding the temperature would have been much higher had it not been for the effect of the degree of cloud cover, air, humidity, and rainfall, which are influenced by the luxurious vegetation cover of the country (NBSAP 2004). The Atlantic Ocean also has an ameliorating effect on the temperatures along the coast with maximum annual and daily variations.

The location of Liberia gives birth to two separate climate regimes. The first is the equatorial climate regime, where rainfall occurs throughout the year and is restricted to the southernmost part of Liberia. The second is a tropical regime dominated by the interaction of the Inter-tropical Convergence Zone (ITCZ) and the West African Monsoon. Liberia's coastal location allows the southwesterly flow of the monsoon to prevail most of the year, maintaining a thin layer of moist marine air near the surface, although the Harmattan Wind typically intrudes for brief periods

during the winter in coastal areas (duration is typically less than two weeks). This interaction of the ITCZ with the monsoon flow produces the characteristic summer wet season/winter dry season of a tropical climate.

The moisture-laden West African Monsoon winds from the southwest strike the Liberian coast head on, increasing coastal rainfall despite the gradually increasing elevation inland. The average annual rainfall in the coastal belt is >4000mm with individual months receiving more than 1000mm of rainfall (McSweeney et al. 2008). Isohyets are essentially parallel to the coast in the central and eastern provinces. A similar pattern occurs in Sierra Leone to the west. In western Liberia, the isohyets penetrate much deeper into the interior as the northeast-southwest alignment of the high mountain ranges channels the monsoon flow and prolongs the rainy season. Where the monsoon winds meet high coastal promontories (e.g., Cape Mount, Monrovia), the annual rainfall is much higher than average for the coastal region. The high rainfall of the Nimba Mountain ranges is also due to its unique topography. Relative humidity is generally high over all of Liberia owing to its coastal location. Along the immediate coast, humidity levels rarely drop <80% and averages >90%. Much wider variation in humidity occurs in the interior, particularly during the dry season as the Harmattan may drop humidity levels to <20% (Gatter, 1997).

Temperature in Liberia is determined by its tropical location, where the sun is almost overhead all year (Gatter, 1997). Generally, the country experiences high temperatures all the time that show little variation. The temperature over the whole country ranges from 27-32°C during the day and from 21-24°C at night (MPEA, 1983). Average annual temperatures along the coast range from 24-30°C (MPEA, 1983). The temperature rises slightly in the dry season and decreases in July and August. Towards the interior of the country the average maximum rises and the average minimum decreases. For example, temperatures during the hottest month of the dry season at Tappita, Nimba County, which is about 120km from the coast, are 1.2°C higher than at Monrovia, and the coolest month of the rainy season is 2.0°C less than the average temperature on the coast at Monrovia, Montserrado County. Average annual temperatures are highest in the central belt of Liberia with temperatures in the interior averaging between 27-32°C (MPEA, 1983). At the Nimba and Wologizi mountain ranges in the interior, the height above sea level (ca. 700-1400 m) results in a lowering of the maximum temperature.

Temperatures in the country are strongly influenced by season. Temperatures during the rainy season are relatively low because of near complete cloud cover, and little diurnal variation in temperature occurs. Temperatures along the coast at this time of year are generally higher than inland as the southwesterly flow pushes the clouds inland, providing coastal regions with more solar radiation. In contrast, temperatures in the dry season, when cloud cover is minimal or nonexistent, are higher, and the diurnal range is much greater. Nights during the dry season can be cool, particularly when the Harmattan blows (Gatter 1997). For the period of 1970-1999, temperatures typically ranged from 24 to 25°C during the wet season and 24 to 27°C during the dry season (McSweeney et al. 2008). These temperature ranges are consistent with those reported by Coolidge (1930) of 24 to 26°C and 24 to 29°C during the wet and dry seasons respectively.

2.3 Political Administrative Jurisdictions

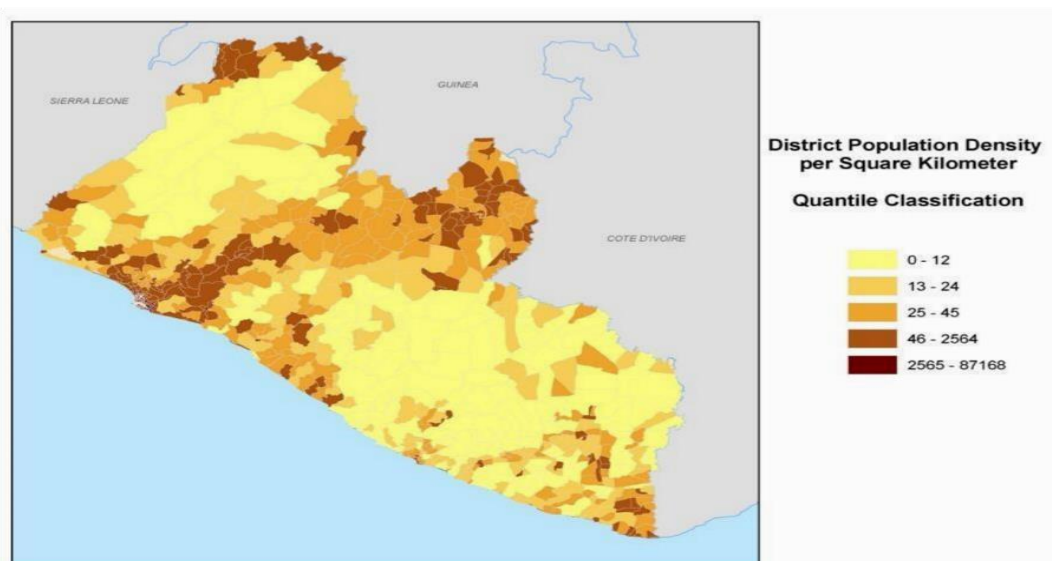
Liberia is divided into a hierarchical arrangement of political jurisdictions consisting of 15 counties (each with a designated county seat), 136 districts arrayed within counties, and numerous clans arrayed within districts. Individual counties comprise from 4-18 districts and varying numbers of clans. The six largest counties are (i) Nimba County(11,551km²); (ii) Lofa County (9,982km²);(iii) Gbarpolu County (9,953km²);(iv) Sinoe County (9,764km²);(v) Bong County (8,754.0km²); and (vi) Grand Bassa County (7,813.7km²). Other counties range in area from 1,880km² (Montserrado County) to 5,663km² (River Cess County) (LISGIS 2010).

2.4 Population Characteristics, Trends, and Poverty

Population characteristics: The estimated population of Liberia is 3.440 million people (36 individuals/km²), a 65% increase since 1984 (LISGIS 2010). Liberia's population growth rate in 2008 was estimated to be 5.3% and is expected to decline to 2.1% by 2025. Net migration is positive as a result of in-migration from surrounding countries that have also experienced political unrest. The major coastal cities, which also include major population centers, are: Monrovia, the capital and largest city in the country (Greater Monrovia District, population 970,824; LISGIS 2010); Robertsport; Buchanan; Greenville; and Harper. An estimated 58% of the population of Liberia lives along the coast (EPA 2007).

The highest concentration of population occurs in and around coastally located Monrovia, the capital and largest city in the country, including Montserrado and nearby counties (LISGIS 2010). Montserrado County has 595 individuals/km², and nearby Margibi County has 78 individuals/ km², Bomi County, 44 individuals/ km², Bong County, 38 individuals/ km², and Grand Bassa County, 28 individuals/ km², which includes the seaport Buchanan. Other counties with moderate to high relative densities include Maryland County (59 individuals/ km²) which includes the coastal city of Harper in the extreme southeast, bordering Côte d'Ivoire; north-central Nimba County (40 individuals/km²), bordering Guinea and Côte d'Ivoire; Lofa County (72 individuals/km²) in the west, bordering Sierra Leone; and Grand Cape Mount County (27 individuals/km²) in the northwest, which includes the coastal city of Robertsport and borders Sierra Leone and Guinea. The remaining 6 counties have densities ≤ 15 individuals/km² (**Map 3**). Half of Liberia's population lives in and around Monrovia.

Map 3: District population density, individuals/km²



Some uncertainty still remains in the aggregate population at the county level because of the displacement that occurred during war years (CFSNS 2006). Many people were displaced at least twice during the war; although many have returned, in some areas more than 10% of the population has not been re-settled. Their reasons for leaving, and for returning, are varied as is acceptance of them by the settled community. In some cases, returnees found others had replaced them on the land.

Life expectancy has increased substantially since the mid-1990s and infant and childhood mortality has declined as well. This is reflected in the age structure which also shows that essentially equal gender distribution of the population. One result is that over 40% of the population is “dependent,” defined as under 5 and over 65 years old. On average, household size is 5.6 persons, with the proportion of female headed households varying from 5% in Bomi County to 21% in Lofa County, the area most heavily and continually affected by violence during the conflict (MPEA 2008). The effects of the conflict are evident as well in the spatial distribution of disabled people as a percentage of the population. **Map 4** shows the spatial distribution of Liberia’s population distribution across its 15 counties.

Liberia’s population has a number of notable features including 1) A high rate of fertility; 2) an extremely high ratio of youth; 3) a high degree of urbanization; and 4) relatively high literacy and education levels among the youth. The table below shows the population trend over the past five decades. According to the 2008 census, the population of Liberia was close to 3.5 million. While overall population density is still relatively low, population growth rates are high. The population grew at an average rate of 3.3% annually between 1962 and 1974 and 3.4% during 1974 and 1984. Between 1984 and 2008, average growth was 2.1%, reflecting the population exodus and losses during the civil war. Figure 4 shows spatial distribution of the country’s population across its 15 counties.

Map 4: Spatial distribution of population in each of the 15 counties in Liberia in 2008



Population Trends: Liberia’s population has a number of notable features including (i) A high rate of fertility; (ii) An extremely high ratio of youth; (iii) A high degree of urbanization; and (iv) Relatively high literacy and education levels among the youth. Table 2 shows population trends

over the past five decades. According to the 2008 census, the population of Liberia was close to 3.5 million. While overall population density is still relatively low, population growth rates are high. The population grew at an average rate of 3.3% annually between 1962 and 1974 and 3.4% during 1974 and 1984. Between 1984 and 2008, average growth was 2.1%, reflecting the population exodus and losses during the civil war.

Table 2. The Population trends of Liberia, 1962–2008 (census statistics)

	1962	1974	1984	2008
Population	1,016,443	1,503,368	2,101,628	3,489,072
Population change	-	486,925	598,260	1,387,444
Average annual increase	-	40,577	59,826	57,810
Percentage increase (total)	-	48	40	66
Average annual rate of growth	-	3.3	3.4	2.1
Sex ratio (male to female)	-	-	102.0	102.3

Fertility levels, while below the levels of the 1980s, are still very high. There is some evidence that the fertility rate has declined from 7.1 in 1984 to 5.8 in 2008. During that time, infant mortality was reduced almost by half, from 144 deaths per 1,000 live births in 1984 to 78 deaths per 1,000 live births in 2008. Because of these trends, Liberia's population is very young with 42% below the age of 15. The result is a lot of pressure on the provision of health care, education, housing, food, transportation and employment. Even if fertility levels decrease, the existing dynamic means that the dependency ratio will remain high for years to come and Liberia is unlikely to see a demographic dividend in the next several decades.

During the civil war, Liberia saw a large internal migration from rural to urban areas; its urbanization is now much higher than other low-income countries. As of 2008, 48.7% of households lived in urban areas and 51.3% lived in rural areas. Despite the high urban density (especially Monrovia), people are reluctant to return to rural areas where there is more poverty and fewer economic opportunities. While fertility averages 4.9 children per mother in urban areas, the rural area average is 6.5 per mother. Infant mortality is higher in rural areas (84/1000) compared to urban areas (68/1000) and both maternal and under age 5 mortality rates are higher in rural areas. Literacy is also lower among the rural population. Table 3 reflects some selected demographic features of the population in a given county.

Table 3: Selected Demographic Features of Liberia's Population by County

	Fertility (children/ Woman)	Population Growth Rate (aver. 1984,2008)	Mortality			Literacy Rate (adults)	Total Population
			Infant (per 1000 births)	Maternal (per 100,000 births)	Under-5 (per 1000 children)		
Bomi	6.6	0.9	109	967	171	45.8	82,036
Bong	5.9	1.0	76	909	115	39.1	328,919
Gbarpolu	6.7	2.3	74	586	117	40.7	83,758
Grand Bassa	6.1	1.4	101	854	160	35.6	224,839
Grand Cape Mount	6.1	2.0	100	1,679	154	40.5	129,055
Grand Gedeh	6.3	2.9	65	744	81	42.8	126,146
Grand Kru	7.9	0.4	92	923	132	50.6	57,106
Lofa	6.2	1.3	93	1,114	136	40.4	270,114
Margibi	5.5	1.1	78	633	117	54.2	199,689
Maryland	6.5	2.8	72	1,934	81	58.9	136,404
Montserrado	4.8	3.5	70	615	98	72.6	1,144,856
Nimba	6.2	1.7	64	1,052	95	56.3	468,088
River Cess	6.4	2.3	72	681	108	38.0	65,862
River Gee	7.8	2.2	62	435	86	53.8	67,318
Sinoe	6.9	2.1	70	1,274	99	49.7	104,932
Liberia	5.8	2.1	78	890	119	55.9	3,476,608
Urban	4.9		68	686	95	70.4	1,633,824
Rural	6.5		84	1,057	125	57.9	1,842,889

(LISGIS 2008 Population & Housing Census)

Dimensions of poverty: Many approaches are used in measuring poverty among people. One such approach is the income and consumption expenditure approach—this approach defines a threshold at which those individuals or households living below it are considered poor. A

threshold of USD 1 a day indicates that 64% of the Liberian population lives on less than USD 1 a day. This varies from 68% in rural areas to 55% in urban areas. The 2008 census employed two additional ways to determine poverty. The first concept is the Unmet Basic Needs (UBN) Index, which gauges the extent to which households and individuals strive to satisfy their basic needs. The goods and services included in this index are quality of housing, ownership of assets, access to health services, safe water, solid waste management system, literacy and unemployment status of the household head among others. The UBN approach shows that poverty is widespread in Liberia. According to the census, River Cess County had the highest proportion of households with unmet basic needs (82%), followed by Grand Kru County (78%) and Gbarpolu and River Gee (75% each). These counties are geographically isolated with poor road conditions; lack basic social services; and are less intense in concession and other vibrant economic activities. See Table4 for the distribution of the country's poor population in each county.

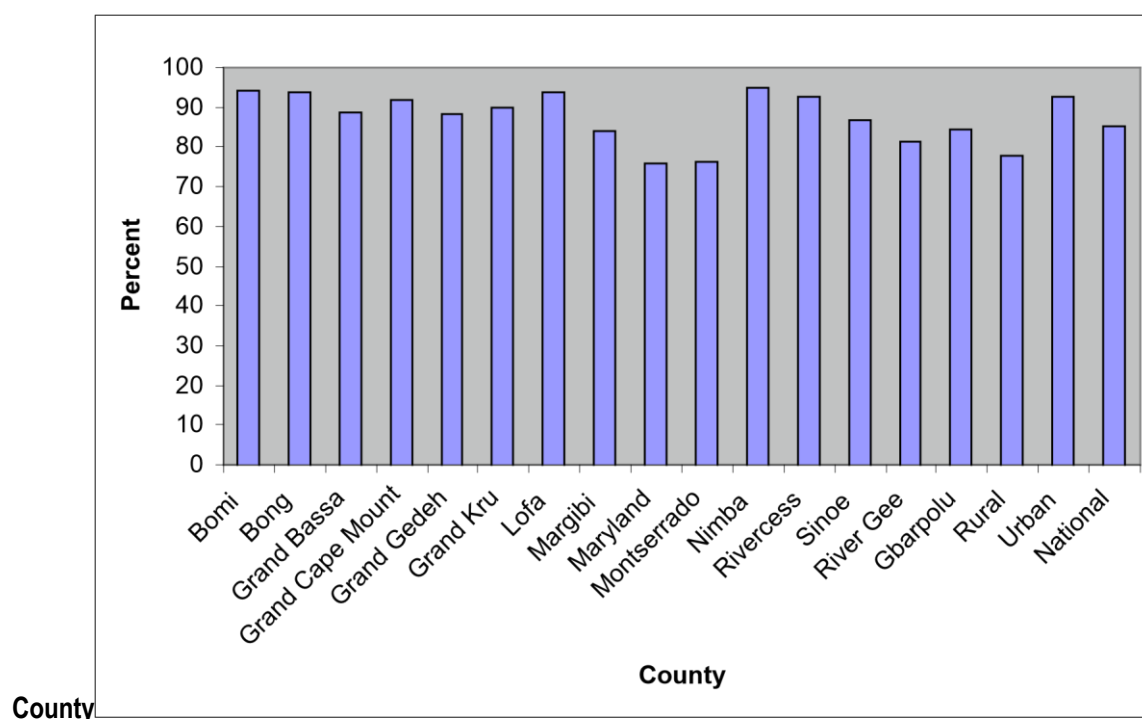
Table 4: Distribution of Liberia's poor population per County

County	UBN	Population	NumberPoor of
Bomi	69.6	82,032	57,094
Bong	71.8	328,107	235,540
Grand Bassa	74.0	213,480	157,975
Grand Cape Mount	72.2	124,540	89,933
Grand Gedeh	71.7	123,372	88,504
Grand Kru	78.4	57,402	45,003
Lofa	73.0	273,031	199,415
Margibi	60.7	207,437	125,862
Maryland	63.7	134,778	85,854
County	UBN	Population	Number of Poor
Montserrado	45.4	1,093,150	495,743
Nimba	65.7	452,110	297,037
River Cess	82.3	69,905	57,523
Sinoe	73.7	101,306	74,637
River Gee	74.7	63,843	47,659
Gbarpolu	75.0	81,385	61,018
Rural	74.6	1,602,408	1,194,996
Urban	47.7	1,819,347	868,511
National	61.5	3,405,877	2,095,892

Source: LISGIS, 2008

Another proxy used in poverty analysis is “essential asset” and “non-essential asset” deficiency. Nonessential asset deficiency entails the absence of items such as a vehicle, television or mobile phone or radio, while essential deficiency means the absence of a mattress, or basic furniture. According to 2008 census figures, essential assets deficiency in Liberia was about 85% on average. Nonessential assets deficiency was about 96%. Nimba, Bong, Grand Cape Mount, Bomi and River ccess counties were found to have the highest essential assets deficiency, all with a ratio of more than 90% deficiency. Of the remaining counties, only Montserrado and Maryland counties had a less than 80% deficiency. **Chart 1** shows the percentages of households plagued by the deficiency of essential assets in each county.

Chart 1: Percentages of households with essential assets deficiency by



Source: LISGIS, 2008

Other dimensions of poverty

Lack of access to infrastructure represents another dimension of poverty. Electricity deficiency for both lighting and cooking stands at about 95% in Liberia. Pipe-borne water as main source of drinking water is low and water deficiency is about 61%. The incidence of improper waste disposal is very high with 87% of households having no access to flush toilets on a regular basis. Unemployment and under-employment is another proxy for poverty. According to the 2008 census, of the 2,834,733 Liberians of working age, 37.5% (1,062,924) were employed, 10.6% (299,889) were unemployed and 51.9% were inactive. Those considered inactive are most often in school or attending to household duties.

The relatively moderate rate of official unemployment masks a much larger problem of high job informality and vulnerable employment. According to the 2010 Liberia Labor Force Survey, 68% of employed Liberians work in the informal sector without regular wages and benefits. Over half of the employed population is self-employed or provides non-wage labor within their

households. In rural areas, a significant portion of the labor force is in traditional small-scale agriculture and family work rather than cash crop production. More than half of those employed are uneducated, which leads to low productivity and low wages. Overall, Liberia faces the dual challenge of improving the quality and productivity of work for those with vulnerable employment and of creating work for young people who will enter the labor force in the coming years.

Lack of access to education is also a facet of poverty. Many Liberians' education was interrupted by war. Among the population older than age 15, only 19% have attained some level of primary education, while 15% have attained some level of secondary education. However, the number of students completing primary and secondary education has increased over the years; as a result, youth today are significantly more educated than previously. According to the 2008 census, 69% of the population between the ages of 15 and 24 are literate. This is fairly high among African countries. However, large disparities continue to exist between urban and rural areas and among the different regions of Liberia. While urban dwellers have an average literacy rate of 70%, about 58% of their rural counterparts are literate. At the county level, literacy rates range from a low of 36% in Grand Bassa to a high of 73% in Montserrado.

A good quality education remains another concern. As of the 2007/2008 National School Census Report, only 41% of the teachers in Liberia were trained. However, teacher training institutions are currently operating and increasing the number of teachers with formal training. Years of conflict also disrupted the health care delivery system, with poor access to health care being yet another dimension of poverty. While the health sector is transitioning from emergency to development—data from the Ministry of Health and Social Welfare (2009) showed a significant increase in the number of health facilities in Liberia, including those managed by the state, NGOs and private individuals and organizations—a large percentage of the population, especially the rural and urban poor, still has limited access to health and social welfare. The result is poor health outcomes, in particular a high incidence of malaria, accounting for 69% of the total most prevalent diseases cases in 2009; high maternal mortality; and high child mortality. The government has sought to establish a package of free basic health care of acceptable quality, the Basic Package of Health Services (BPHS), and make it available in 70% of the health facilities by 2010. However, lack of access to health care services remains a concern. (Source: Agenda for Transformation 2011).

. Demographic Projections

A recent analysis of population trends in Liberia, commissioned as part of the Vision 2030 process, created projections of population variables to facilitate strategy development and planning. The key determinant of population levels and trends is inevitably how fast fertility is reduced. Assuming that fertility levels fall from current levels of 5.2 in 2008 to 2.4 (low scenario), 3.5 (medium scenario), or 4.2 (high scenario) by 2038, the population of Liberia is likely to grow anywhere from 53% to 90% in total. Table 5 projects 3 fertility levels for the country from 2008-2038.

Table 5: Total Population—Under Three Different Fertility Scenarios, 2008–2038

Year	Low	Medium	High
2008	3,492,563	3,492,563	3,492,563
2018	4,217,685	4,382,387	4,405,151
2028	4,853,604	5,312,861	5,428,245
2038	5,347,245	6,264,192	6,600,037

Source: Retrospective Analysis of the Liberian People, *Ministry of Planning and Economic Affairs* (2011).

An important contributor to reducing fertility is the rate of female employment—since women’s fertility levels drop in response to high levels of employment. Under current projections, the demographic dividend is not likely to occur in Liberia until about 2050. At that time, the working-age population will have grown to at least 4 million. If Liberians enjoy high employment rates and women have fewer children, there will be a significant shift in the age structure of the population. If employment levels are low (particularly for women), fertility moderation may not materialize, which will lead to higher population growth and greater demand on resources. Table 6 projects the working-age population under 3 fertility scenarios from 2008-2038.

Table 6: Working-age Population under Three Different Fertility Scenarios, 2008– 2038

Year	Low	Medium	High
2008	1,916,979	1,916,979	1,916,979
2018	2,518,497	2,518,497	2,518,497
2028	3,136,426	3,195,731	3,200,704
2038	3,653,670	3,924,601	3,981,286

Source: Retrospective Analysis of the Liberian People, *Ministry of Planning and Economic Affairs* (2011).

Closely tied to employment and fertility rates is education. Thus, the provision of universal primary education offers a solid foundation to improve household decision-making and job opportunities in a way that promotes socioeconomic development and reduces fertility levels. Recognizing the importance of education of boys and girls, the GOL is already committed to boosting primary school enrolment through its “free and compulsory primary school” policy.

Table 7 shows a projection of education sector requirements based on assumptions of medium fertility and 100% enrolment by 2015 (MDG target of universal primary education), while Table 8 shows projected health sector indicators under medium fertility scenarios in the period of 2008-2038

Table7: Educational Sector Indicators under Medium Fertility Scenario, 2008–2038

Indicator	2008	2018	2038
Children of primary school age	564,734	670,010	828,199
Primary teachers required	7,969	14,889	18,404
Children of Secondary school age	469,415	571,525	767,391
Secondary school teachers required	2,691	6,553	8,799

Source: Retrospective Analysis of the Liberian People, *Ministry of Planning and Economic Affairs* (2011).

Table 8: Health Sector Indicators under Medium Fertility Scenario, 2008–2038

Needs	Projection	2008	2013	2018	2023	2028
Physicians required	Current situation	113	128	142	157	173
	WHO level ¹	699	787	881	976	1073
Nurses required	Current situation	1399	1573	1756	1941	2129
	WHO level ²	4989	5624	6295	6974	7663
Health Centers required (Private & Public)		467	525	586	648	711
Hospitals required		31	35	39	43	47
Additional Annual Health Expenditure in US million dollars		101.3	113.9	127.1	140.5	142.3
Population at high risk in millions		1.4	1.6	1.8	1.9	2.1

¹ Estimation of Physicians required, based on WHO Doctor Patient Ratio of 1:5000

Estimation of Nurses required, based on WHO Nurse Patient Ratio of 1:700

Source: Retrospective Analysis of the Liberian People, *Ministry of Planning and Economic Affairs* (2011).

As noted, Liberia's current fertility rates are high and available resources to meet the population's basic needs are inadequate. Moreover, there is little evidence that the current high dependency ratio will dramatically change in the next several decades, due to the inherent population momentum to earlier periods of high fertility. High population growth will stretch demand for basic social services for years to come. In order to counteract these trends, Liberia needs to increase the provision of basic social services and stimulate job growth, while simultaneously reducing fertility levels through education and economic opportunities for girls and young women. Liberia will also need to increase economic opportunities in its rural areas to counter high rural-to-urban migration.

Liberia has a primarily agrarian economy, with the majority of the population dependent on some form of subsistence agricultural production for their livelihood. It is estimated that almost 70 percent of the labor force in Liberia is engaged in agriculture, just about 20 percent in services and less than 10 percent in industry.⁷ Chief exports in 2010 were rubber, timber, iron, diamonds, cocoa, and coffee. Of Liberia's USD 207 million in export earnings in 2010, 61 percent came

from rubber. Liberia's largest export partners in that year were South Africa (27%), the United States (18%), Spain (8%) and Denmark (6%). In addition to rubber exports, the country's main revenues come from its maritime registry program.

Rubber is currently Liberia's most important export commodity, and the five largest companies in Liberia operate in this sector. It is estimated that more than 20,000 people are employed by commercial rubber farms and up to 60,000 smallholder households are involved in the growing of rubber trees. Since 2008, the world market price for rubber and the quantity of Liberia's rubber exports has declined substantially. While rubber has other uses besides automobile tires, rubber demand is strongly linked to the health of the global automobile industry, which has been hit hard by the economic crisis.¹³ Companies in the rubber sector in Liberia have reportedly been affected by the 60 percent decline in prices and have cancelled contracts with suppliers, leading to cutbacks in the employment of contract workers. Estimates at one Liberian plantation indicate that up to 2,000 full-time and contractual workers have been laid off. The majority of those laid off were contractual workers.

2.5. The Economy

Liberia has a free enterprise economy, and is largely dependent on extractive industries primarily rubber, timber, gold, diamond and agricultural crops. The country is currently considered a low-income nation. By mid-2004, Liberia's GDP stood at 207million USD with an inflation of between 14 to 15% (NHDR 2006). It has a per capita income of USD199.30 which is far below the poverty line estimated at approximately US\$ 360.00. About 41% of the population has access to health services and life expectancy at birth is only 47.7 years. The adult literacy rate is estimated at 37%. Over two-thirds (76.2%) of the Liberian people are living below the international poverty level of less than US\$ 1.00 per day. Between 2006 and 2012 the GDP composition remained unchanged, and was 76.9% for agriculture, 5.4% for industry and 17.7 for services. Despite the sectoral share of agriculture to GDP, quite too often national development efforts is most focused on the social and economic sectors ignoring the environmental sphere. There is need for adequate re-investments in the natural resource base upon which the entire economy depends.

Table 9: Sectoral Share to GDP % (1987-2005)

Year	Agri.Forestry	Mining	Manuf.	Tertiary	
1987	10.8	7.5	45.9	4.8	18.4
1988	27.8	5.4	8.4	8.1	49.5
1989	33.6	5.2	8.4	7.4	46.5
1997	61.6	15.3	10.2	5.5	15.1
1998	62.9	16.6	2.9	4.7	15.8
1999	33.2	4.9	61.8	13.5	2.4
2000	60.2	13.2	2.2	5.0	20.2
2001	59.2	13.1	2.0	5.2	21.3
2002	58.7	12.8	1.9	5.3	22.6
2003	58.0	12.6	1.8	5.5	23.6
2004	54.2	20.5	0.06	5.2	25.5
2005	54.9	19.4	0.05	6.0	26.3

Source: National Human Development Report 2006

Currently, Liberia has an estimated Gross National Income per capita of USD 265 and some 64% of the population earning less than the poverty line of one dollar per day. To improve the situation, the government has organized the annual budget around the priorities of the PRSP, and social sector expenditures are expected to grow as the PRS is implemented. As such, the government has increased the broad alignment of expenditure with PRS objectives by category in the last three fiscal years from 64% in FY 2008/09 to 73% in FY 2010/11. The government primary focus through its Poverty Reduction Strategy (PRS) is governance, rule of law, and peace building and the restoration and expansion of infrastructure and social service delivery to increase the development possibilities of its people. Nevertheless, the economy continues to depend on natural capitals such as iron ores, diamonds, gold, forest, animals/ wide life, waters, oil, etc. To have a secured and sustained flow of revenue, it must be protected and managed properly. In the absence of environmental safe guards, we place huge burdens on our national budget.

Liberia recorded its eighth consecutive year of post-war economic growth in 2011. This economic growth was supported by the first iron-ore exports since the end of the war, higher rubber exports due to booming international prices, and increased timber production. Real GDP is estimated to have grown by 6.9% in 2011, and is projected to be 8.8% in 2012 and 7.2% in 2013 largely driven by the first full year of iron-ore exports in 2012 and continued FDI. Consumer price inflation is expected to be 8.5% in 2011, mostly reflecting the pass-through of international food and fuel prices and also limited domestic market supply due to poor farm-to-market road infrastructure. Inflation is expected to be moderate at 5.6% in 2012 and 5.7% in 2013.

The agriculture, fisheries, and forestry sector represented about 72% of GDP in 2011, but this is projected to decrease in the coming years as iron-ore exports increase. Rubber production has been supported by high international prices over the last year and log production increased considerably in 2011 due to new companies engaging in logging operations. The opening of an additional port in Greenville after 2012 will support forestry exports. Recent foreign investments in palmoil production by Golden Veroleum and Sime Darby should gradually increase their output after 2012. Rubber, timber, palmoil, and food production will continue to support growth in the medium term.

Liberia's Poverty Reduction Strategy (PRS) 2008-2011 builds on the Government's "First 150-Day Action Plan" and its interim PRS (iPRS), and has been formulated through broad-based consultation with Liberian citizenry in cities, towns, and villages throughout the country, members of the business community, civil society groups, the legislature, and international partner organizations. The Government sees this three-year PRS not as an end in itself, but as a step in a process towards long-term development that will continue long beyond 2011, when it will develop the next phase of its PRS.

The Government of Liberia has developed a Long term National Vision 2030 and PRS II. The PRS II (2012 – 2017) is a medium term development agenda which is spread across four (4) Pillars, including Peace, Security and Rule of Law; Economic Transformation; Human Development and Governance; and Public Institutions. It is envisioned that management of the natural environment is significantly improved to ensure that it contributes to a sustained

economic development, peace building and growth in all sectors and at all levels. This signals appreciable improvement in the human development index at an increasing rate; and ensuring development proceed in an environmentally ethical manner.

Labor and Employment

Unemployment and biodiversity depletion are intrinsically linked. This nexus was missing in the NBSAP 2004. Once the population pushed into down poverty, due partly to lack of secured jobs and or the prospects of jobs in the near future, they will turn to their immediate environment for livelihood and survival. In 2010, the ILO supported Liberia in conducting a national Labour Force Survey. The survey report has recently been released by the Liberian Institute of Statistics and Geo-Information Services (LIGIS). This has been a joint effort by the government and a handful of development partners and it is a great achievement for the country. The report provides precious insights that will be used in future development planning and implementation in order to better address labor and decent work issues.

Additionally, a National Employment Policy (NEP) has been developed which aims to support private sector growth and economic development with due regard for international labor standards and has established NEP implementation, monitoring, and evaluation responsibilities at the Ministry of Labor. The level of unemployment has been measured, based on the ‘relaxed’ international definition of unemployment. The ‘strict’ definition of unemployment requires that a person should not have done any work in the reference period, should be available for work, and should be looking for work. This last condition has been ‘relaxed’, and not made a condition for being counted as unemployed.

Since most people in developing countries cannot afford to remain unemployed and not do any work at all, the level of unemployment is not a good indicator of the state of the labor market. Using the ‘relaxed’ definition, the overall adult unemployment was rate is put at 3.7 percent. Unemployment remains a challenge as Liberia seeks to provide secure work for its people. Since wage employment is low nationally, consumption is used to measure poverty levels. According to the 2007 Core Welfare Indicator Questionnaire (CWIQ), the percentage of people living in extreme poverty (living on a dollar a day) was 63.8%. Subsequently, the government’s poverty reduction objectives are to reduce absolute and extreme poverty by 4% through alignment of core PRS initiatives to the MDGs, which provide clear internationally accepted indicators for poverty alleviation and development realization.

Food Security and Human Well-being

In Liberia most rural households are food insecure, meaning that they lack access at all times of the year to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Nationally, 80% of the rural population was either moderately vulnerable (41%) or highly vulnerable (40%) to food insecurity (GoL 2007). Different rural livelihood profiles provide differing degrees of food security; the most food insecure groups were those involved in palm oil production and selling followed by hunters and contract laborers.

2.6: Types of Ecosystems in Liberia

Essentially, there are four major types of ecosystems in Liberia are (i) aquatic;(ii) marine and coastal, (ii) terrestrial and drylands and savannah. The characteristics of these ecosystems are typical of the landscape of the country. The various types of ecosystems in the country are briefly discussed in the following sections.

2.6.1: Aquatic Ecosystems

The sub-types of aquatic ecosystem in Liberia are mainly coastal/marine and the freshwaters ecosystems. Because of the great importance of coastal and marine ecosystem to the fishing industry, which contributes greatly to Liberia's national economy, it has been classified as a major ecosystem for the country. Some other examples of aquatic ecosystems are the Inland wet lands (rivers, creeks, lakes, ponds etc.). Marshlands, some of which are characterized by temporary wetness during the year, are also wetland environment. These are found in most lowland landscapes throughout the country.

2.6.2 Coastal and Marine Ecosystems (CMEs): Liberia has a coastline of about 560 km (350 miles) and about 58% of the country's population live along the coast. With an area of continental shelf of about 14, 894 square kilometres and territorial seas of up to about 159,200 square kilometres, this coastline annually produces about 7616 metric tonnes of fish and about 126 metric tonnes of molluscs and crustaceans. The coastal belt consists of swamp related vegetation, which includes mangrove forests and savannah woodland related vegetation that extend up to 25 km inland. Figure 6 is a bird eye view of the Atlantic Ocean and Lake Piso Multipurpose Use Reserve. This reserve is the only CMEs protected area currently existing in Liberia.

Aquaculture and fisheries: Marine and inland fisheries and aquaculture are the two main components of the Liberian fishery system. Marine fishery accounts for most of the fish catch of the country. The continental shelf provides habitat for various species of fish and crustaceans such as tuna, mackerel, shrimp and lobsters. The continental shelf covers 70,000 sq. miles, but it is of irregular shape. Artisanal fisheries cover about 20,000 km² of fishing grounds. This sector accounts for a workforce of 10,000 people, including full time, part-time, sport fishermen and fishmongers. The pelagic and some demersal fish species that are being exploited are *Sardinella maderensis* and *Sardinella aurita*, Chub or Spanish mackerel (*Scomberja ponicus*), Bonga (*Ethmalosa fimbriata*) and Anchovy (*Engraulis encrasicolus*). Species of the Carangidae and Thunidae Families are also recorded. Other important demersal fish group exploited by marine artisanal fishers belongs to the Sparidae, Pomadasidae, Scienidae and Serranidae Families. Large quantities of crustaceans, particularly shrimps and lobsters, are also exploited.

The Bureau of National Fisheries (2013) reported that a National Fishery Policy was being developed under the FAO supported regional fishery capacity building project. The identification of Marine Protected Areas is now a high agenda issue of the Government of Liberia. An Artisanal Fishing Craft Registry has been set up, and regulations developed. Currently, 6000

artisanal crafts have been registered. Artisanal fishery provides livelihoods for approximately 33,000 full-time fishers and fish processors in the coastal counties and there are an estimated 3,473 canoes operating in the waters of Liberia with only 8% motorized.

The industrial fishery is a high capital investment venture that uses fishing trawlers and cold storage facilities. There are now 14 fishing companies operating in Liberia. Six companies are exclusively engaged in the importation of frozen fish from the high sea, eight are operating 27 fishing vessels with a combined gross registered tonnage of approximately 4,000 tonnes. The employment of Liberian nationals in industrial fishery is estimated at 75%, representing 28% of the total employment in the fishery sector. Foreign nationals presently dominate ownership in industrial fishery. Fish farming in Liberia is largely subsistence and about 3,561 fish farmers nationwide are engaged in some form of fish culture on a part-time basis. Four hundred and forty nine (449) fish ponds of various sizes with a total area of 17.47 hectares are operating in 159 communities around the country. Most of these ponds have been dormant since 1990 and are now being rehabilitated. A total of 704 women are participating in aquaculture (**NBSAP Inventory & Stocktaking Report 2013**).



Photo 1.1: A view of a beach of the Atlantic Ocean and Lake Piso Multipurpose Use Reserve (Credit: R. S. Sambolah)

Freshwater bodies, wetlands and lakes: Liberia possesses abundant surface water and six principal rivers (including Cavalla, Cestos, Lofa, Mano, Saint John and St Paul). Together, these river basins drain approximately 65.5% of the country. The Mano and Cavalla rivers are shared basins between Sierra Leone and Cote d'Ivoire respectively, while the Lofa, Saint John and Saint Paul drain part of Guinea. Numerous micro watersheds or sub-watersheds also exist. The major rivers flow in a northeast to southwest direction due to topographical conditions en route to the Atlantic Ocean (UNEP/NESDA, 2002). Major exceptions to these patterns are the middle reaches of the Cavalla and Dugbe Rivers in eastern Liberia, which flow parallel to the coast in their lower reaches before entering the Atlantic Ocean.

These ecosystems differ from the coastal/ marine ecosystems in that they do not contain salt, that's why they are sometimes referred to as freshwater. In Liberia, these ecosystems are habitats for various species of reptiles, amphibians, fish, mollusks, worms, protozoa and other fauna species that cannot adapt to salinity environments. Three basic kinds of freshwater ecosystems exist in the country. They are (i) Slow-flowing or still water (such as pools, ponds and lakes); (ii) Fast-flowing water (such as streams and rivers); and (III) Stagnant and inundated/saturated

inland wetlands (such as marshland, swamp, and ground water) in which the soil is flooded temporarily or drenched either temporarily or permanently throughout the year.

Most rural communities benefit directly or indirectly from freshwater ecosystems for various services including provision of drinking water, water for irrigation, water for other home uses and water for food production/processing. Freshwater ecosystems also provide services such as hydroelectric power generation, water purification and waste removal, nutrient cycling, transportation, recreation, flood control and climate regulation. Inland wetland landscapes are very important for food production, especially in communities where fertile terrestrial soils have become infertile due to overuse and mismanagement. Inland swamps are particularly used for rice cultivation, referred to as paddy farming. Threats to Liberia's inland wetlands include but not limited to poisoning of water bodies to kill fish, gold and diamond mining (some gold miners reportedly use mercury which is poisonous to animals including man himself).

More studies on inland wetlands and fresh water are urgent in Liberia, especially to determine the conservation values of the biodiversity they contain and water quality in terms of salinity (which is also a determining factor in the kinds of species found in saturated habitat). It is also important for determining the degree of salinity in estuaries or lagoons to determine their status as fresh, intermediate or brackish water. Many freshwater organisms are intolerant of salt, so such information can help which organisms habitate in different places. Additionally, such information on freshwater is important for human health since freshwater is used for drinking in many rural communities. As of 2002, a total of eight (8) wetlands had been identified for conservation actions. They are Lake Piso, Marshall, Mesurado, Lake Shepherd, Bafu Bay, Cestos-Senkwehn, Gbedin, and Kpatawee. Some of these lakes have waterfalls, Kpatawee, for example.

Identification of the types of wetland and their associated species composition was done more than twenty (20) years ago and these needs to be updated. The four (4) wetland types that have so far been identified are inland riverine, inland swamp, and coastal and coastal lacustrine. After the NBSAP 2004 process, some rapid assessments of wetlands were carried out under the RAMSAR Convention which supported the designation of five (5) RAMSAR sites in Liberia. In order to sustain and consolidate the management and governance of these areas, there is a need to upgrade the status of these wetlands and to complete the National Wetlands Policy and put it into action. The ecosystems with which these wetlands are associated include the Atlantic Ocean, beaches, lakes, mangrove forests, estuaries, salt marshes, lagoons, bays, creeks, etc., and are distributed in the nine coastal counties of Liberia (i.e. Grand Cape Mount, Bomi, Montserrado, Margibi, Grand Bassa, River Cess, Sinoe, Grand Kru and Maryland).

2.6.3. Mangrove Ecosystems: Mangroves cover discontinued blocks along the coast – from Cape Mesurado to Cape Palmas at the edges of lagoons, river banks and river estuaries and in widespread areas of swamps. These special types of forests perform several ecological and hydrological functions that include: (i) Water supply and flood control; (ii) Provision of basic food chain resources for arboreal (especially birds) life and near shore marine life through their leaves, wood, roots and detrital materials; (iii) Serve as wind breaks through prop root baffling of wave action; (iv) Improvement of water quality and clarity by filtering upland runoff and trapping waterborne sediments and debris; (v) Functioning as areas for social interaction among countless number of residents and transient amphibians, mammals and reptiles that congregate there for

water to escape the sun's heat in the dry season; (vi) Capture and storage of about 2.5 times as much carbon dioxide as humans produce each year, the so called “blue carbon”, to differentiate it from the “green carbon” absorbed above ground in trees and other plants; (vii) Maintenance of biodiversity through the provision of habitat and as a breeding ground for a countless number of aquatic animals and plants; and (viii) Provision of more than 10% of essential dissolved organic carbon (DOC) that is supplied to the global ocean from the land that regulates atmospheric carbon dioxide and climate (Dittmar et al 2006, Alongi 2002, Kathiresan& Bingham 2001,Field 1995).There are several types of mangroves found in the country including: *Avicenniagerminans*, *Rhizophoraracemosa*, *Rhizophora harrisonii* ,*Rhizophora mangle* and *Conocarpus erectus*. Mangroves in Liberia were known only for fuelwood production and poles for hut construction. Figures 8 and 9 show mangrove stands that are largely populated by *R. racemosa* and *R. mangle*.



Photo 1.2 *Rhizophoraracemosa*

Photo by Richard Sambolah (2014)



Photo 1.3 *Rhizophoraracemosa* stand and a single tree of *Avicenniagerminans*

Four (4) mangrove species have so far been identified in Liberia; they are (i) *Avicennia germinans*; (ii) *Rhizophoraracemose*; (iii) *Rhizophoraharrisonii* and (iv)*Rhizophora mangle*. A fifth species (*Conocarpus erectus*) has recently been found and reportedly but some taxonomic and related details about this new discovery remain. The most common among these species is *R. racemosa*.Probably for a century or more, mangroves were known only for fuelwood production and poles for construction purposes .However in the last ten years, mangrove communities have discovered another product of economic importance, kissmeat (a Gastropods species). Figure 10 shows a Gastropods species (kissmeat) that was collected by individuals in communities adjacent to mangrove ecosystems to meet survival and economic needs.



Photo 1.4: .Kissmeat (a Gastropods species) collected from mangrove swamps on the banks of the Maffa Creek, in the community of Kebbah, northwest Liberia. Photo by: Richard Sambolah (2014)



Hundreds of floral and faunal species dominate most of the coastal areas, including seaweeds. The coastal ecosystems also provide many economic benefits to society by supporting industries ranging from fisheries to recreation and ecotourism. Intensive fishing, shipping, land-based pollution and development, and uncontrolled harvesting of wetland resources, both faunal and floral, and the increasing human population are negatively impacting coastal areas. Of particular concern are uncontrolled waste disposals, industrial processes and wastes, agricultural activities in which agro-chemicals are used and mining contribute significantly to decreased water quality and increased potential for water-borne diseases.

2.6.4. Terrestrial Ecosystems

The terrestrial ecosystems of Liberia include forests, mountains and drylands/savannah. These and other types ecosystem are briefly discussed below.

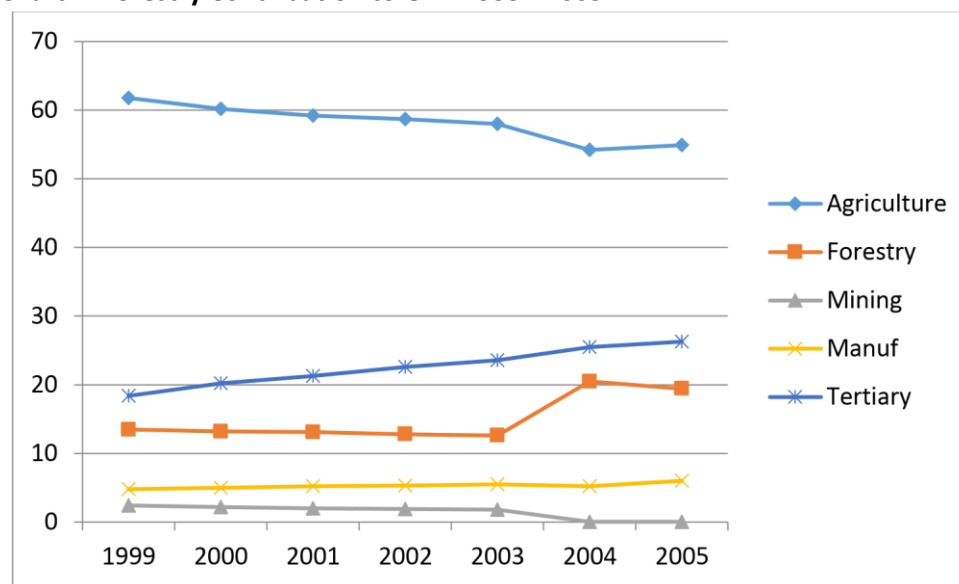
Generally the Liberia's forest ecosystems are characterized by high rainfall as well as high diversity and abundance of animal and plant species. Two types of forests are distinguished in the country: evergreen and moist semi-deciduous (Voorhoeve 1965). The evergreen forest ecosystems receive a very high rainfall and are characterized by dense vegetation which comprises tall trees at different heights and are mostly found in the southeast of Liberia. The moist semi-deciduous forest ecosystems also receive high rainfall but not as high as the evergreen forest ecosystem, and are found in the northwest of the country. The evergreen and moist semi-deciduous forest ecosystems constitute the two main forest blocks in the country and probably the largest forest blocks in the Upper Guinea Forest of West Africa.

The forests comprising the evergreen and moist semi-deciduous forest ecosystems are further divided into four classes: (i) Primary dense forest; (ii) climax secondary forest; (iii) secondary forest (which has not reached climax stage); and (iv) mixed vegetation (NBSAP2004). A 1960 inventory puts the extractive potential of mature timber in standing trees at 80,000,000 cubic meters, and recommended a 25-year felling cycle for concession areas. Consequently, the annual allowable cut (AAC) was estimated at 3.2 million cubic meters. Since this volume of wood was estimated, no new determination has been made as to its rate of accuracy. This is clearly where attention is required now. In 2004, the contribution of forestry to GDP as indicated in Figure 7 was 20.5%. It dropped to 19.4 % in 2005 and this, entirely, is in terms of the volume of wood extracted and exported as logs. Currently there are three protected areas created in the terrestrial ecosystems in Liberia. They include Sapo National Park I southeastern Liberia (the oldest protected area in Liberia), Nimba Nature Reserve in Northern Liberia and Gola Peace park in northwestern Liberia. The creation of two other protected area under terrestrial ecosystems will be in the Wonegis is Forest in northwestern Liberia and in the Grebo Forest in southeastern Liberia. The extent and rate of forest cover removal do not match replacement. Up to about 480,000 acres (192,000 hectares) of forestland is lost annually due to logging, shifting cultivation and other activities such as agro-industrial tree crop plantations (oil palm, rubber), while government has replanted less than 27,000 acres (10,927 hectares) since the inception of its reforestation program in 1971.

Expansion of oil palm concession areas in the rolling hills relief zone of the country is depleting vast forested areas in the country. In the last 10 years, a forest area of about (48,000 acres

express this figure in) hectares forest has been depleted. Cassava and coconut are cultivated mainly in the coastal plains.

Chart 2: Forestry Contribution to GDP 1999 - 2005



Source: EPA (2004)

Currently, no intervention has been recorded towards regeneration of the forest (since the late 80s). The accurate expanse of what remains of Liberia's forests is not exactly known. It must be said here that of the diverse terrestrial ecosystems in Liberia, the forest domain is the largest in terms of spread, species and ecosystem diversity. Liberia's forests are among the world's most exceptionally diverse forest ecosystems now harbouring many of those species that fled the scourge of deforestation and are at the verge of extinction in other countries in the Upper Guinean Forest ecoregion (UGF), a humid coastal rainforest belt stretching across several West African countries (including Liberia).

At the close of the millennium, Liberia harboured the largest remaining proportion of the UGF, with 42%, followed by the Ivory Coast (28%), Ghana (16%), Sierra Leone (5%) and Togo (1%) (Sayer et al 1992). It is worth mentioning that in 1959, 90% of Liberia's terrestrial landscape was covered with rigorous, robust and thriving tropical lowland forest ecosystem (Kryn & Fobes 1959). In 1963, the first consignment of export logs was shipped out of Liberia (FAO 1975). By 2009, in about 50 years later, Liberia forest cover shrunk to 31.6% (FAO 2009). There appears to be 2 permanent categories into which Liberia's forests are classified with respect to use. These are protected area systems and national forests. Areas designated for commercial logging or as proposed protected areas are almost always an integral part of a national forest. In other words, national forests are transitory in use as they can be given to concessions for logging or proclaimed as protected or proposed protected areas. Liberia had taken the decision for nearly two decades now to set aside 30% of its forested ecosystems entirely for conservation purposes; but given the transitory nature of Liberian forests, meeting the 30% target has been increasingly difficult. Protected areas fall into the 30% category. According to the U.N. FAO, 44.9% (about 4,329,000 ha) of Liberia is forested. Of this 4.0%

(175,000) is classified as primary forest, the most bio-diverse and carbon-dense form of forest. Liberia had 8,000 ha of planted forest. Currently, the total forested landscape covered by protected areas is 384,080 hectares, which is about 8.9% of the total forested area of the country. For proposed protected areas, the estimate is 746,417 hectares or about 17.2% of the total forested area of the country. If the proposed protected areas are declared as protected area, a total of 1,130,497 hectares or 26.1% of the forested area of Liberia would be under protection. **Table 1.10** shows protected and proposed protected areas in Liberia. In terms of change in forest cover: between 1990 and 2010, Liberia lost an average of 30,000 ha or 0.61% per year. In total, between 1990 and 2010, Liberia lost 12.2% of its forest cover or around 600,000 ha. and Protected Areas: Liberia has some 881 known species of amphibians, birds, mammals and reptiles according to figures from the World Conservation Monitoring Centre. Of these, 0.8% are endemic, meaning they exist in no other country, and 4.2% are threatened. Liberia is home to at least 2200 species of vascular plants, of which 4.7% are endemic. 1.3% of Liberia is protected under IUCN categories I-V.

There are eleven (11) national forests currently under partial protection. These forests are set aside as production forests, from where concession areas are carved out. Conservation activities such as wildlife management are permitted, but no farming, hunting and human settlements (except logging camps and similar activities) are permitted in the national forests. These forests are situated in the northwest and southeast of the country (Table 11).

Table 10: The protected and proposed protected areas in Liberia

Protected Areas	Area (Hectares)	Year Gazetted
East Nimba Nature Reserve	13,569	2003
Gola Forest National Park	88,130	2016
Lake Piso Multiple Use Reserve	97,975	2011
Sapo National Park	184,406	1983
Total:	384,080	
Proposed Protected Areas		
Grebo Forest National Park	97,136	Gazetement scheduled for 2016
Wonegizi Nature Reserve	37,979	
Foya Proposed Protected Area	164,628	Gazetement scheduled for 2017
Grand Kru River Gee PPA	135,100	
Cestos/Senkwen Proposed PA	80,348	
Gbi PPA	88,409	Part of Proposed Protected Area Network scheduled for gazetement by 2017
Kpo Mountains (near Zelekai)	83,709	
Bong Mountains (Yoma)	24,813	
Margibi Mangroves "Marshall Islands"	23,813	
West Nimba PPA	10,482	
Total:	746,417	

Source: FDA

Liberia's forests contain 585 million metric tons of carbon in living forest biomass. Biodiversity

Table 11: The national forests that serve as set-asides for production and protection

S/N	NATIONAL FOREST	AREA ACRES	IN	AREA HECTARES	IN
1.	Krahn-Bassa	1,270,000		513,962	
2.	Grebo	643,603		260,462	
3.	Gola	510,168		206,995	
4.	Kpelle	432,000		174,828	
5.	Yoma	6,456		2,649	
6.	Lorma	176,000		71,226	
7.	South Lorma	107,503		43,506	
8.	Gbi	81,370		32,930	
9.	Gio	165,480		66,969	
10.	East Nimba	71,650		28,966	
11.	West Nimba	32,000		12,950	
	TOTAL	3,496,230		1,415,443	

Source: EPA, 2004

2.6.5The Mountain Ecosystems: Mountains ecosystems are actually associated with the terrestrial ecosystems because they are found on highlands. They provide an array of habitats where a large number of animals and plants can be found. Like other ecosystems such as those described above, the mountain ecosystems host plant and animal species that can adapt to the influence of elevation and climate of the area. Mountain ecosystems are home to a wide variety of animal and plants species. The ecological richness and beautiful sceneries of Liberia's mountainous landscapes make for attractive tourist destinations. Unfortunately, the tourism sector of Liberia is still underdeveloped and so is unable to utilize the opportunities which these mountain ecosystems provide. The 10 mountains and mountain ranges of Liberia are listed in Table 12 below. It must be noted here, though, that four of these mountains and mountain ranges – Bong Range, Gibi Mountain, Kpo Range, Bomi Mountain, have been exploited for iron ore.

Meanwhile, Arcelor Mittal, a multinational mining giant, has gathered more information about the various species of birds of which the mountains of the Nimba Range serve as habitat. Previously, the total species list for the Nimba Range stood at 413. Because of the research on birds that AML had supported, the current list of birds of the Nimba Range is now 615 (AML 2010).

Table 12: The Important Mountains and Mountain Ranges of Liberia

Mountain	Status in 2004	Status in 2013	Location
Nimba Mountain	Second highest in Liberia; Exploited for iron ore; source of St. John, Cestos& Cavalla Rivers	Exploited for iron ore	Nimba County, Northern Liberia
Wologisi Mountain	Unexploited	Explored for iron ore	Lofa County, Northern Liberia
Bong Range	Exploited for iron ore	Exploited for iron ore	Margibi County, Southern Liberia
Gibi Mountain	Unexploited	Unexploited	Margibi County, Southern Liberia
Putu Mountain	Unexploited	Explored for iron ore	Grand Gedeh County, Northern Liberia
Bomi Mountain	Exploited for iron ore	Exploited for iron ore	Bomi County, Northwestern Liberia
Wutivi Mountain	Highest in Liberia Unexploited	Unexploited	Lofa County, Liberia
Mano Mountain	Exploited for iron ore	Exploited for iron ore	Grand Cape Mount County, Western Liberia
Bea Mountain	Unexploited	Explored for iron ore	Grand Cape Mount County
Kpo Range	Unexploited	Unexploited	Gbarpolu, Northwestern Liberia
Wenegissi	Unexploited	Unexploited	Lofa County

Source: Field Survey (2013)

2.6.6 Drylands and Savannah Ecosystems: Dryland ecosystems in Liberia mainly consist of savanna ecosystems. The Liberian savanna ecosystems are highly specialized places for certain plants and animals and are perfect habitat for birds of prey. Generally, many bird species in the country love the savanna ecosystems and most savanna sites are designated Important Bird Areas (IBA). A lot of grazing and browsing animals (e.g. duiker/antelopes), insectivores (e.g. iguana) and various species of birds inhabit the grasslands. They support a large number of predators and grazers. Many grass species are typical of the dry and humid ecosystems of Liberia. Grasses found in the grass-thicket plant communities include *Andropogoncanaliculatus*, *Andropogoncanagayanus*, *Brachiariafulvibarbis*, *Hyparrheniasmithiana*,

Schizachyrium sanguineum, and *Vetiveria fulvibarbis*. Areas with loose soil and moisture derived from run-off and drainage have tall grasses such as *A. gayanus*, *Cymbopogon giganteus*, *Hyperthelia dissoluta*, *Panicum maximum*, *Pennisetum purpureum* and *Rottboellia exalta* "<http://www.fao.org/ag/AGP/AGPC/doc/Counprof/Liberia/liberia.htm>"
[_http://www.fao.org/ag/AGP/AGPC/doc/Counprof/Liberia/liberia.htm_](http://www.fao.org/ag/AGP/AGPC/doc/Counprof/Liberia/liberia.htm) Native species of oil palm trees (*Elaeis guineensis*).

Two main types of savanna ecosystems are found in the country; they are (i) Open savanna and (ii) Savanna woodland. The open savanna ecosystems are waterlogged seasonally (i.e. in the rainy season only). They are completely dry and humid lands during the dry season. The fire-resistant tree species, *Neocaryamacrophylla* is the dominant tree species in these ecosystems followed by the Oil palm (*Elaeis guineensis*). The savanna woodland ecosystems are found in the northern highland, particularly in Lofa and Nimba Counties, and contain patches of forest with Elephant grass (*Pennisetum purpureum*) as the dominant species but other grasses (e.g. *Andropogon gayanus*) can also be found. These ecosystems are characterized by a forest-grassland mosaic structure where patches of forest are developed within the grassland.

The major threat to all Liberian savanna ecosystems is fire. These grasslands are intentionally set on fire each year during the dry season. The local people's reason for burning the savanna fields is to 'clean up the area'. Also farming forest patches in savanna ecosystems destroy important biodiversity species and their habitats. Farming and burning of invaded grass result to another type of savanna called 'derived savannah', an expanding zone along the forest fringes where savannah is gradually replacing forest as a result of human interference (Rose-Innes, 1977). The vegetation in a derived savannah is a mixture of trees with closed or partially closed canopy and a thick ground cover of tall grasses and forbs. Examples of woody perennials found here are species of *Aziziaspp*, *Briedeliaspp*, *Danielliaspp*, *Lanneaspp*, *Lophira alata*, *Parkia bicolor*, *Butyrospermum spp*, *Pterocarpus spp* and *Terminalia spp*. Most of the tall grasses found in the derived savannah are also found in the Guinea savannah. Significant grass species are *Andropogon gayanus*, *Beckeropsis unisetata*, *Brachiaria jubata*, *Chasmodon spp*, *Ctenium newtonii*, *Cymbopogon giganteus*, *Digitaria diagonalis*, *Hyparrhenia spp*, *Panicum maximum*, *Pennisetum purpureum*, *Setaria spp* and *Tristachya superba*.

2.6.7 Other Ecosystems

(a) Island ecosystems with aquatic and terrestrial characteristics: Liberia's island ecosystems are relatively small in size. They however do have key characteristics that distinguish them from other ecosystems because of their dual nature: terrestrial-aquatic characteristics. They are actually terrestrial in nature but surrounded by aquatic environment. Those that are well-known because of their historical significance are Providence and Bushrod Islands in Montserrado and Wetlands and Massa (Massatin) Island in Lake Piso. There are other islands in the country that have not been identified.

An island in the country that much is written about in Liberia's history is Providence Island, actually a very small island, where the American Colonization Society landed the first batch of slaves in 1816. Another island of touristic importance is Marshall, located at the site of the Marshall Wetlands that are of international importance. Other islands reported by local people but not popularly known are Dead Island in Maryland County, Dubli Island in Bong County and

Tindual Island in Gbarpolu County. Because most of these island ecosystems have received little or no research attention, very little or nothing is known about their size, location, the types of plants and animals inhabiting them and a host of other important information that could inform their status as far as threats to their existence, among others.

(b) Agricultural ecosystems with aquatic and terrestrial characteristics : These agricultural ecosystems could have entirely been considered as a part of terrestrial ecosystems but this is not possible because of their dual ecosystem characteristics. In these particular types of agricultural ecosystems, both terrestrial upland crop and cattle production on one hand and aquaculture fishery production on the other, are possible. The topographic features of Liberia's landscape directly or otherwise influences soil characteristics and this has implications on the quality of soils hence on agricultural productivity. Most agricultural activities take place in the northern and central parts of the country, especially in areas with rolling hills and northern highlands. Here rice and vegetables grow well. Oil palm development is taking place in the region between the coastal plain and the rolling hills.

(c) Pastoral ecosystems: There are fifteen or more pastoral ecosystems in Liberia. They are used to raise large ruminants (cattle) and small ruminants (goats and sheep). Permanent pastures account for two (2) million hectares in terms of land use for 1998 (FAO, 2001). The government of Liberia has established four (4) major pasturelands intended to enhance and maximize livestock production.

2.7 CONSERVATION

2.7.1 Ex-Situ and In-Situ Conservation: A number of activities had been undertaken in a bid to conserve the fauna and flora population of Liberia outside of their natural habitat. For faunal ex-situ conservation, there have been a number of initiatives. The William V.S. Tubman Totota Zoo and Lakpaze near Monrovia were good examples but they no longer exist. However, some botanical gardens are currently being managed by the Firestone Plantations Company, the Central Agriculture Research Centre and the Chinese Technological Demonstration Center in central Liberia. The Firestone Rubber Research Program manages rubber varieties with the aim of manipulating them genetically to aid clone derivatives. The Central Agriculture Research Centre Botanical Garden is an ongoing work whose ultimate goal is to distribute varieties of crop species to farming initiatives nationwide in order to contribute to food security. The Chinese Technological Centre is providing skills and exposure to appropriate technologies to mid-level national and local technicians, farmers, etc. to support their work to the extent where they can manage their own ventures.

Currently the Liberia Biomedical Research Center, established in 1974 in Margibi County, has been carrying out research using chimpanzees for the development of vaccines and immunotherapy for hepatitis A, B and C virus and onchocerciasis "river blindness". The Center now runs three (3) regional research sites in Bong, Lofa and Maryland Counties with specific focus on the development of onchocerciasis, and maintains In-Situ program on six (6) small islands in the Du and Farmington rivers.

Agrobiodiversity: Agrobiodiversity is the part of biodiversity that is directly relevant for agricultural production, including the genetic diversity within and between crops and animals used for agricultural. This critical component of biodiversity closely interacts with crops such as pests, diseases, soil organisms, pollinating insects and so on. Agrobiodiversity is synonymous with agricultural biodiversity in literature. Throughout Liberia, Agrobiodiversity is remains a strange term in any discussion about biodiversity in Liberia. Agrobiodiversity has been recognized by CBD as essential for global food production, livelihood security and sustainable agricultural development. The plant, animal and microbial organisms important to food and agriculture must be conserved and used sustainably if, as is required for universal food security, sustainable food production is to be achieved across the whole range of agro-ecosystems and production systems. This has been has been recognized not only by FAO but also by the Parties to the Convention on Biological Diversity (CBD) through the Agricultural Biodiversity Programme (Almekinders 2001).

Biodiversity in agricultural systems: The agro-ecosystem of Liberia contains four major zones – (i) The coastal plains; (ii) Hilly zone ;(iii) Mountain and plateau zone; and (iv) The northern highland zone. The agriculture biodiversity of the nation encompasses rich flora and fauna population which is characterized by domesticated plant and animal species, soil micro – organisms, pollinators, pests, wild relatives of domesticated crops and animals as well as plant and animal genetic materials including varieties, hybrids and different types of germplasm. In 2004 the major crops grown were rice, cassava, maize, oil palm, cocoa, coffee, rubber and sugar cane. The Asian rice species (*Oryza sativa*) and the African species (*Oryza glaberrima*) are the two rice species grown. *Oryza glaberrima* is nowadays rare. Twenty-two aquatic varieties (19 exotic and 3 indigenous) and thirty-two terrestrial (25 exotic and 7 indigenous) are available. Nearly all the exotic varieties were brought from the West African Rice Development Association (WARDA). About 90% of the locally produced rice is grown in the upland in lithosols which account for 75% of Liberia’s total landscape (Larbi 2010).The four major groups of soils in Liberia and the most productive type among them are discussed under “Traditional agriculture production system”(Section 4.4.2).

Livestock production in Liberia has always been the least prioritized as compared to crops. The industry plays a minimal role in Liberian agriculture. The Ministry of Agriculture reported in 2013 that animal rearing in Liberia is still not well institutionalized. Most of the livestock and poultry enumerated during the period under reviewwere produced in the backyards of the traditional farmers. The modern segment comprises a number of firms, prominent among which are the Firestone Plantations Company, Cavalla Rubber Corporation, Liberia Agricultural Company, Cocopa Rubber Corporation, Weala Rubber Corporation, which employ huge labor. Currently, the modern sector is expanded to include both rubber and oil palm monocultures. Weala is merged with German Camp to have what is now Sallala Rubber Corporation. Others include Sime Darby, GoldernVeroleum, Equatorial Biofuels and the Sifca Group.

Low investment in agriculture: Liberia is agrarian nation with 90% of the crop area under rain-fed agriculture system making it highly vulnerable to climate induced changes; nearly 70% of the labor force employed in the sector and contributes 20% of GDP. Also, two-third of Liberia’s population depends on such subsistence agriculture for livelihood activities (Ministry of Planning and Economic Affairs 2008 Annual Report).The importance of the agriculture sector is

evident in the PRS (national development blue print for post conflict Liberia for 2008-2011). While priorities include peace and security, economic revitalization, rehabilitation of infrastructure and delivery of basic social services, heavy concentration was focused on the agriculture sector. Despite the importance of the agriculture system for poverty alleviation and the principal sector that needs immediate adaptation to climate change, under investment remains the major handicap to growth and modernization of the sector. Example: from 2008-2011, Liberia implemented a full fledged Poverty Reduction Strategy in which investment in agriculture did not surpass 3% of the National Budget. The Maputo Declaration of the African Union on agriculture and food security mandates African countries to increase expenditure to 10% for agriculture development (Assembly/AU/Decl.7 (II), page 1). The Constitution of Liberia under the principles of individual freedom and social justice require citizens' participation in the management of natural resources to ensure the general welfare of every member which include food security. The Agriculture policy also complements this by requiring government to undertake adequate investment in the sector to ensure food security, national economic viability, peace and security (**Liberia Agriculture Policy 2005**). However, agriculture remains at the margin of the national budget in term of expenditure with 2% expended on the sector(National budget during the implementation of the PRS -2008-2011) despite the sector contributing 20% to GDP growth during the same period. Table 13 shows government budget to the agriculture sector.

Table13: National budget contribution to the agriculture sector (2008-2011) in Liberia

Year	AMOUNT IN \$	Agriculture	Percent
2008/2009	276,767,955	5,572,000	2.0
2009/2010	347,035,687	7,100,000	2.0
2010/2011	381,160,912	9,658,274	2.5

SOURCE: Ministries of Finance

SECTION THREE

THREATS TO BIODIVERSITY

Threats are those human-induced and dynamic influences that cause some degree of deterioration or destruction of biodiversity in a given site and are synonymous with “barriers”, “drivers”, “impacts” or “pressures” Human-caused increases in the magnitude or frequency of natural catastrophic events, however, are considered as threats. Threats are classified as direct and indirect. Direct threats are further categorized as external and internal (Margoluis&Salafsky 2001). External direct threats are, on one hand, factors or conditions that have direct impact on biodiversity and are caused by outsiders, such as logging and agro-industrial crop plantations by multinational companies. Internal direct threats, on the other hand, are factors that directly impact biodiversity and are caused by the stakeholders living at the site of conservation interest, such as uncontrolled hunting of large mammals (Salafsky et al 2008, Margoluis&Salafsky 2001), introduction of invasive alien animal and plant species and shifting cultivation. Under certain circumstances, some threats could be both external and internal at the same time. External direct threats.

Threats are those human-induced and dynamic influences that cause some degree of deterioration or destruction of biodiversity in a given site (Margoluis&Salafsky 2001) and are synonymous with “barriers”, “drivers”, “impacts” or “pressures” (Salafsky et al 2008, Salafsky et al 2003, Kremen et al 1994, NcNeely et al 1990). Losses of animal and plant species or habitats due to natural processes, such as fires from lightning and hurricanes, are not considered threats to biodiversity. Human-caused increases in the magnitude or frequency of natural catastrophic events, however, are considered as threats. Threats are classified as direct and indirect. Direct threats are further categorized as external and internal (Margoluis&Salafsky 2001).

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3.1. Direct Threats

3.1.1 Agro-industrial crop plantations: Firestone Rubber Plantation Company in Harbel, Margibi County, established in 1926, is the first industrial rubber plantation in Liberia. Since then the other large-scale rubber plantations that followed include Cavalla Rubber Corporation in Maryland County, the Guthrich Rubber Plantations in Bomi County, the Salala Rubber Corporation in Bong County, Sinoe Rubber Corporation in Sinoe County and the Liberian

Agriculture Company in Grand Bassa County. Most of these monoculture plantations are established on landscapes which were once forested. In this decade, more than any other in Liberian history, an unprecedented upsurge of oil palm plantations occurs. These are huge monoculture plantations of exotic oil palm whose seeds are used to produce palm oil.

Production of palm oil in Liberia involves two different modules: (i) The traditional and (ii) The industrial. In the traditional, palm trees are part of a productive landscape and natural palm groves are the result of long-term resource management, where forests have been cleared for farming, but leaving a number of well-spaced palm trees that allow both types of production to coexist. In other cases, palm trees have been planted as community or family palm stands or as a part of an agroforestry system. The industrial system is based on monoculture plantations of exotics, where the land produces only palm fruits for industry. This system drains the land extensively as much as it carries out widespread use of agrochemicals, both impacting local water resources.

The current key stakeholders of the oil palm industry in Liberia and the size of each of their plantations are: (i) Sime Darby – a Malaysian company that signed a 63-year contract with the Liberian government in 2009. The company has been granted a concession of 220,000 hectares in Bomi, Gbarpolu, Grand Cape Mount and Bong Counties, where it also will establish rubber plantations; (ii) Equatorial Palm Oil – a United Kingdom-based company whose concession area is 169,000 hectares in Grand Bassa, River Cess and Sinoe Counties; and (iii) Golden Agri Resources (Golden Veroleum) – a Singapore-listed company belonging to the Indonesia Sinar Mas Group. Golden Veroleum plans to cultivate over 240,000 hectares of oil palm in southeastern Liberia, specifically in Sinoe, Grand Kru, and Maryland Counties (including 40,000 hectares throughout-growers) (Carrere 2010). In total, the 3 foreign companies would have 629,000 hectares of land under palm plantations, which is a huge amount of land in a small country like Liberia whose total land area expands just over 11 million hectares. Table 14 lists the recent oil palm plantation giants in Liberia.

Soils and plant biomass are the two largest biologically active stores of carbon; together, they contain about 2.7 times more carbon than the atmosphere (Schlesinger 1997). Converting these natural habitats to oil palm plantations releases carbon due to microbial decomposition of organic carbon stored in plant biomass and soils). Further, monoculture plantations such as oil palm, reduces species diversity (Fargione et al 2008).

Table 14: The major oil palm plantations in various parts of Liberia and their duration, sizes and origin

N0.	Company	Land area	Duration	Date	Counties	Origin of company
1.	Sime Darby	220,000ha.	63yrs	2009	Bong, Bomi Cape Mount, Gbarpolu	Malaysia
2.	Equatorial Oil Palm	169,ha.	n/a	2009	Bassa, River Cess, Sinoe	United Kingdom
3.	Golden Agri-resources	280,000ha	60 yrs.	2010	Sinoe, Maryland, Grand Kru,	Singapore-listed (Indonesia Sinar Mas Group)
Total land area in hectares 629,000						

Source: National Bureau of Concession 2014 & Fifth National Report field Report

3.1.2 Logging concessions and related contracts: The government of Liberia, through the Forestry Development Authority (FDA), issues five types of licenses for the management and use of forest lands. These are : (i) Forest Management Contracts (FMCs) –longer and larger contracts awarded for forest land areas 50,000-400,000 hectares that do not include private land and are generally for a period of 25 years; (ii) Timber Sale Contracts (TSCs) – logging contracts issued for forest land areas smaller than or equal to 5000 hectares that do not include private land and are meant for a period of 3 years; (iii) Forest Use Permits (FUPs) – small-scale licenses for logging, research, non-timber forest products (NTFPs) extraction and use or other uses with no details on duration, size or ownership type; (iv) Community Forestry Management Agreements (CFMAs) – licenses issued to communities for purposes of community-based forest management areas smaller than 50,000 hectares, and are regulated by the Community Rights Law with respect to forest lands (CRL) and its regulations; and (v) Private Use Permits (PUPs)-licenses issued to private land owners (individuals, groups, communities) to extract wood for which no specific regulation exists and where no information is available as to size, duration and guiding principles (World Bank 2012, Woods et al 2008). In addition to these concessions, there are chapters of chainsaw logging groups, pit sawyers, all over the country who are competing with these legal concessions but have no legal framework and national strategy for their existence. While there are legal and regulatory instruments to govern the activities of most of the state-recognized concessions, no credible and workable enforcement mechanisms are in place to ensure compliance. These concessions and other timber mining contracts therefore pose a serious threat to biodiversity.

3.1.3. Mining: The Liberian government, in its Poverty Reduction Strategy, views industrial and artisanal mining as activities that would spur rapid economic growth and is counting on this as a means to contribute significantly to employment, income generation and infrastructure development. There, however, is a degree of geographic overlap between mineral deposits, exploration permits and the protected area/forest reserve network. As exploration occurs within these areas, forest cover and biodiversity are significantly affected negatively. Forest destruction is locally expanding and permanent as a result of mining. Other environmental impacts of mining include siltation of rivers, ground and surface water pollution, and forests and therefore habitat fragmentation, among others. Iron ore mining concessions, past and present, cleared tropical rainforests for mines from open-cast pits and this creates unmanaged disposal sites. There are no post-environmental impact assessment on mined landscapes and so the human health, social and environmental impacts/risks of industrial and artisanal mining remain largely unknown (UNDP 2006).

There are more than 100,000 artisanal miners in Liberia, (UNEP 2004) and the number is growing. This particular class of miners faces numerous organizational and related problems (Brownell 2009). In 1999, the Ministry of Lands, Mines and Energy estimated that there were 5000 unlicensed and 1000 licensed mining and dealing operations in the country (EIU 2003). This type of mining is causing perpetual displacement of people and as such increased pressure on the remaining forests. Example, hunters have increased their assault on the dwindling wildlife to supply bush meat to mining settlements. Another significant impact is siltation which is threatening freshwater fish population in mining areas. Competitively, the dreadful impacts of mining on ecosystems and human lives are the same for both industrial and artisanal activities but are quite heightened and broaden in scope and impact for industrial mining concessions as

compared with artisanal mining. Mining is a direct internal threat as well as an external direct threat. Table 15 lists the number of mining concessions in Liberia as of 2013.

Table 15: Mining Concessions, their size and specific locations in Liberia as of 2013

S/N	Companies	Concession areas (ha)	Counties
1.	Arcelor Mittal	N/A	Nimba, Bassa, & Bong
2.	China Union Company Ltd.	61,944	Bong
3.	Western Cluster Ltd.	26,880	Bomi, Grand Cape Mt. & Gbarpolu
4.	AmLib United Minerals Inc.	N/A	Bong, Grand Gedeh & Montserrado
5.	Putu Iron Ore Mining Inc.	N/A	Grand Gedeh & Sinoe
6.	BHP Billiton	N/A	Nimba, Bong & Bassa

3.1.4 Invasive alien plants: There are many floral and fauna species that invaded Liberia over the last several decades. Invasion here means accidental and unplanned introduction of plant and animal species (NBSAP 2004). Some of the invasive plant species are water hyacinth, the Nile salad, *Leucaenaleucocephala* and *Chromolaena odorata* (locally known as Doe Leave). *C. odorata*, a perennial shrub, is a typical pioneer species of secondary forest succession with a strong heliophilic character and vigorous vegetative development. Initially, *C. odorata* spreads through seed dispersion, but after establishment it may also reproduce vegetatively from lateral branches. Regrowth occurs after slash and burn cultivation. *C. odorata* was introduced in West Africa around 1937 through a contaminated seed lot of *Gmelina arborea*, a tree species imported in Nigeria from Sri Lanka and finally shipped to Liberia for reforestation purposes. The major environmental problem with *C. odorata* is that it provides shelter and breeding grounds for harmful insects such as the variegated grasshopper (*Zonocerus varietatus*) which is transmitted from *C. odorata* to cassava fields and feeds on the leaves causing significant yield losses. During the dry season, *C. odorata* constitutes a serious fire hazard (NBSAP 2004).

Invasive alien species threaten native species as direct predators or competitors, as vectors of disease or by modifying the habitat or altering native species dynamics, out-compete and repress native species, and fundamentally change the ecosystem. The threats posed to biodiversity by IAPs is considered second only to that of habitat loss. IAPs indirectly transform the structure and species composition of the ecosystem by changing the way in which nutrients are cycled within the ecosystem (UNEP 2014).

3.1.5 Shifting cultivation: Shifting cultivation is a traditional farming system which majority of Liberia's population is engaged in. Farm size falls within the range of 1-5 hectares and food crops such as cassava and rice are the major crops grown. The staple food crops of Liberia are rice and cassava. Other crops grown for local consumption and trade include sugarcane, bananas, citrus spp, plantain, pineapple, sweet potatoes, corn and vegetables. Traditionally, domestic production of the country's main staple foods still relies on a traditionally low input/low output, shifting cultivation-mixed crop system. In the cycle of events constituting shifting cultivation, forests do not serve any forest production purposes but are only auxiliary means for the regeneration of soil fertility for agricultural production. Fallow periods in swidden farming (also known as shifting cultivation) are so short to allow the forest to regenerate up to high forests with trees of exploitable height and diameter.

The primary and principal environmental impact from domestic agricultural production comes from shifting cultivation. Besides eroding natural vegetative landscapes, shifting cultivation also threatens many endemic animals including birds, mammals, and reptiles and plants that inhabit forests. Among the animals impacted by shifting cultivation are black casqued hornbill, white-breasted guinea fowl, the eagle (*Circaetus* spp) and the Pygmy hippopotamus (*Choeropsis liberiensis*) that is endemic to Liberia and inhabits streams and rivers in primary forests. Other animals threatened by shifting cultivation include the African elephant (*Loxodonta africana*), Chimpanzee (*Pan troglodytes*), the Red colobus (*Procolobus badius*), Diana monkey (*Cercopithecus diana*), the Jenkins's duiker (*Cephalophus jenkinsi*) and the Zebra duiker (*Cephalophus zebra*) (WCMC 2000, FAO 1999). Threatened plants include premium timber tree species such as Sipo (*Entandrophragma utilis*), Tiama (*Entandrophragma angolensis*) and Tet (*Tetraberlinia maniana*) (NBSAP 2003).

Among the animals impacted by shifting cultivation are black casqued hornbill (*Ceratogymna atrata*), white breasted guinea fowl (*Agelastes meleagrides*), the eagle and the pygmy hippopotamus that is endemic to Liberia and inhabits streams and rivers in primary forests. One of the most critical driving forces for deforestation is shifting agriculture followed by forest harvest, a major driving force in Liberia. It has contributed to the rapid acceleration of forest depletion (Revised NBSAP 2014). Other animals threatened by shifting cultivation include the African elephant (*Loxodonta africana*), Chimpanzee (*Pan troglodytes*), the Red colobus (*Procolobus badius*), Diana monkey (*Cercopithecus diana*), the Jenkins's duiker (*Cephalophus jenkinsi*) and the Zebra duiker (*Cephalophus zebra*) (WCMC 2000, FAO 1999). Threatened plants include premium timber tree species such as Sipo (*Entandrophragma utilis*), Tiama (*Entandrophragma angolensis*) and Tet (*Tetraberlinia maniana*) (NBSAP 2004). A range-restricted timber tree (*triplochiton scleroxylon*) known locally as Wawa, is gradually becoming threatened through swidden agriculture and power-chain saw logging, though on the IUCN Red List as 'Least Concern' currently.

3.1.6 Uncontrolled hunting: Liberia is unusual in the high importance of bush meat, and in the lack of adequate alternative to native animal protein. The economic value of this native animal protein is enormous, rivaling pre-war timber revenues in the country, and the industry is effectively unregulated. Because of the impacts of hunting on protected animals in the wild and because the harvest is generally assumed to be unsustainable at current levels, Liberia has a bush meat crisis, and could lose an important source of animal protein, rural and urban livelihoods, and some of its protected species if the industry continues to be poorly regulated (DAI 2009). If the population of wild animals goes to zero, that will have some serious implications and repercussions on the future of Liberian forests (hence forestry), which are largely tropical rainforest ecosystems. In tropical rainforest ecosystems, there is a coevolving relationship between trees and a variety of animals, ranging from tiny thrips and midges to bats and bees. These relationships can be quite specific, with one type of insect or bird being solely responsible for pollinating the flowers of particular species or even genus of forest trees.

3.1.7 Unsustainable and destructive extraction and collection of firewood and the production of charcoal: Various estimates indicate that almost all the population of Liberia (up to 99%) is dependent on woodfuel (charcoal and firewood) to satisfy their basic needs for

cooking and heating (UNEP 2004). The production of charcoal and firewood is also an important source of employment and supplemental income for many families, accounting for as much as 40% of their total income. With the continuous absence of electricity supply in the country and the lack of other alternative sources for household energy supply, the demand for wood fuel will continue to increase. These conditions are creating additional environmental degradation as forest cover reduces overall. In addition to biodiversity loss, the production of charcoal and the use of firewood are serious threats to human health from smoke inhalation (UNEP 2004, Safe The Children 2001).

3.2. Indirect Threats

3.2.1 Lack of land use policy and strategy: Land can be put to various uses including agriculture, forestry, industries and settlements. Land being a fixed resource, there often is a stiff competition among various land use types and consequently some land use types are often converted to others (e.g., agricultural land is being converted to settlement – industries and residential, forested land is converted to agriculture, etc). All of this happens in the absence of a land use policy that goes beyond the printed pages and this has been a major cause of land conflicts. Land use planning in Liberia is associated so much problems and it is reflection of a limited institutional capacity, and the availability the appropriate legislative framework, local financial resources and political will.

In recent pass and as parts of the reform effort, Liberia established a Land Commission and her first effort was the writing of Land Rights Policy that classifies land into the four categories of : (i) Private - land owned by an individual or private entity, in which management and use decisions are based solely on formal law (e.g. statutes, regulations, executive orders, and court decisions); (ii) Customary – land owned by a community and used or managed in accordance with customary practices and norms, whether or not the community in which this land is located has been issued a deed or not; (iii) Public - land designated for future use, managed in the public interest and which is not government owned, customary or private land; and (iv) Government – land owned by government and used for the buildings, projects or activities of the government (Kaba et al 2013).

3.2.2 Ineffective community-based forest management policy and strategy: Effective policies are central to any efforts to strengthen local organizations and amplify the voices of rural communities so that they are heard and responded to. Liberia's forest management policy speaks of the importance of local communities but has yet to develop a strategy that put the policy to practice. Local communities – the equivalent of indigenous people in the Liberian context, are the actual custodians of ecosystems such as forests and the network of fresh-water bodies and are the managers of food production from both wild and farmed resources. As such they are critical actors in sustaining natural resources and managing conflicts. Current forest policies and guidelines are not responsive to and supportive of rural communities so as to have them prepared to engage with government and other stakeholders in defining solutions.

There also is no recognition of the rights of rural communities to information, transparency, accountability, participation (interactive) and recourse to justice. Effective policies and robust implementing strategies are a vital pivot in the quest for efficient, sustainable and people-

centered forest resource management that is germane to biodiversity conservation. Policy options in the forest sector have, in almost all cases, been approached in a disjointed manner. For example the FDA is an institute created by a policy to regulate Liberia's forest management schemes and practices by engaging a host of actors/concessionaires, communities and so on, to get the job done; but there is no incentive of any kind to encourage a sound and improved approach to forest management. Enabling conditions are needed as an incentive for the successful development as well as implementation of the policy.

3.2.3. The extreme lack of knowledge of ecosystem values: Currently in Liberia, forestry is equivalent to the extraction of wood (logging). As a result, the country's forests are being underutilized, abused and grossly mismanaged. The multitudes of other products, especially the rich assortment of services forests provide, are not recognized. There is urgent need to pay disproportionate attention to the priceless ecosystem services forests provide in comparison with forest products. Ecosystem governance (EG**) must therefore be an integral part of the revised NBSAP. An "ecosystem awareness" approach to biodiversity conservation must be made an integral part of NBSAP activity. The table below categorizes and provides examples of ecosystem services (See Table 16).

Table 16: Categorization of ecosystems and their services*

Category	Summarized description of key characteristics	Examples of services
Provisioning services	Provisional services cover natural resources that are primarily used for economic activities. The level of contribution towards well-being is normally determined by the magnitude and rate of goods harvested (the flow) from the natural ecosystem.	Food, micro-organisms, animal and plant products, genetic material, biochemical and pharmaceuticals, fuels/energy, fiber, non-living materials , fresh water
Regulating services	Sometimes called "supporting" services, regulating services are the actual life-supporting functions ecosystems provide for the existence of humans. These are the services that are commonly forgotten or taken for granted by societies. The level of contribution towards human well-being by these services is normally determined by the size and quality (the stock) of the natural ecosystem. But exhaustive conversion of natural ecosystems into human controlled ecosystems has jeopardized the continued existence of these regulating services.	Purification of air and water, mitigation of floods and droughts, detoxification and decomposition of wastes, renewal of soil and soil fertility, pollination of crops and natural vegetation, control of a vast majority of potential agricultural pests, maintenance of biodiversity (from which humanity has derived key elements of its agricultural, medicinal and industrial enterprise), partial stabilization of climate, and moderation of temperature extremes and the force of winds and waves.
Cultural services	Also called "enriching" services of ecosystems, cultural services are among the most overlooked services ecosystems provide, especially to many people in developing countries. Many of the religions and cultures in these countries believe that nature is a living entity and, in fact, their followers pray to various elements of nature. The beliefs and values surrounding natural forces have provided spiritual guidance for many societies for many generations. But these are being destroyed at an	Spiritual components and the relationship of people to land and water (sacred creeks, etc.), aesthetic values, social relations and values, and educational (Poro and Sande schools), language and local and knowledge systems.

	alarming rate as the ecosystems get degraded or converted into human-dominated ecosystems. The breakdown of these spiritual and cultural norms has had a devastating effect on social relations among people and their values.	
*Some of these ecosystem services (cultural, provisioning, regulating) are both very relevant to the kind of lives the poor lead or could lead, but they are also at the heart of the climate change and sustainable development debate which calls for the formulation of long-term response strategies based on the sound management of the ecosystems and sensitive to inter-generational issues, including distribution and equity.		

Sources: Greibers&Schiele (2011),Costanza et al (1997) & Daily (1997)

3.2.4 Lack of recognition and use of indigenous knowledge systems:Indigenous peoples with historical continuity of resource-use often possess a broad knowledge base of the behavior of complex ecological systems in their own localities. This knowledge has accumulated through a long series of observations transmitted from generation to generation. Such observations can be of great value and complement to modern science because they have developed a stake in conserving and, in some cases, enhancing biodiversity. They are aware that biological diversity is a crucial factor in generating the ecological services and natural resources on which they depend (Gadgil et al 1993), and this experience must be tapped into developing and implementing biodiversity conservation regimes. It, in fact, has been recognized not only that biological resources (animals, plants) are important, but that cultural resources (language and knowledge systems) are relevant as well, because it is culture that shapes the management of natural resources (Amo-Rodriguez et al 2010). Cultural and natural resources together are thus defined as a distinctive concept called bio-culture (Alcorn 1997, Toledo 2003).Of recent it has been found that bio-cultural diversity is high in many areas where ethnic groups have been established for centuries (Toledo et al 2003). It also implies that landscape planning should be conceptualized within the frame of bio-cultural diversity (Amo-Rodriguez 2010).Indigenous knowledge systems will benefit the NBSAP if recognized, captured and employed in its successful implementation.

2.2.5 The lack of a national energy policy and strategy:The over-dependence on wood fuel (firewood, charcoal) and the wastage and inefficiency with which harvesting and processing of wood for charcoal are done, pose serious environmental threats and hazards. Thus there is a strong connection between forest conservation and energy efficiency .Liberia is endowed with enormous renewable energy potential in biomass, hydroelectric power, solar and wind (MLME 2007, Milbrandt 2009). Investing in the appropriate renewable energy source may cut down the degree of dependence on fossil fuels and the fast rate at which forested lands are dwindling. Let's take biomass and hydroelectric power as examples of green energy. In Liberia, woody biomass is the primary energy source used for domestic cooking and heating. Rural inhabitants and the poor account for a large proportion of firewood and charcoal used in the country. A total of 14,800kilograms (kgs) of charcoal was produced in 1998, and that quantity increased to 255,600kgs in 1999, with nearly 90% of households using firewood and charcoal as an energy source (MLME 2002).

The latest report by the National Charcoal Union of Liberia (NACUL) in 2005, as cited by MLME (2007), puts the production of charcoal at 36,500,00kgs per annum. Nationally, Liberians are harvesting trees for charcoal production well above the level that can be sustained annually without depleting the current stock and degrading the environment. The use of woody biomass as

an energy source will increase in relation to rural population growth and poverty. Clearly, this demand will not be met in a sustainable manner and is definitely contributing to deforestation and finally desertification. Besides the issue of natural forest depletion, the production and consumption of woody biomass is inefficient. The advantages of biomass-based fuel in the climate change world, however, is that it is carbon neutral which, in short, means that it does release carbon in the atmosphere but trees do capture and store the carbon released. It is therefore assumed that the amount of carbon released when biomass is burned is equivalent to the amount captured and stored in trees. Biomass fuel is therefore carbon neutral and by efficiently tapping it as an energy source, we could make a major positive contribution to climate change amelioration in the country and the world.

Hydroelectricity is another alternative to fossil fuels and is environmentally friendly. There is a considerable potential for hydroelectric power in Liberia. Before the 14-year conflict, there were three (3) operational hydroelectric power plants in Liberia: (i)Harbel (Firestone)(4MW), (ii)Mount Coffee (Liberia Electricity Corporation)(64MW), and (iii) Yandahun (a community micro hydro in Lofa County(30MW)(MLME 2007). A number of feasibility studies carried out over the period of 1976 and 1983 identified at least 14 large-scale schemes in over six (6) main rivers. Let's discuss the Cavalla and Mano Rivers since they showed some promise. The Cavalla River has a single largest potential of 255MW but with more than half of this River in Cote d'Ivoire, bilateral cooperation is required. Similarly, Mano River, with the potential of up to 180MW, has nearly a quarter of its basin in Sierra Leone (MLME 2002). However, since four (4) of the six (6) river basins are within Liberia's borders, they could be developed .The major drawback is that all these rivers suffer low-head flow; requiring huge investment in storage or reservoir to maintain firm capacity during the dry season. About 24 other sites have been identified in Liberia for small hydroelectric schemes; up to 5MW (MLME 2007).A national energy policy and strategy that embrace green energy would contribute significantly to biomass-based extraction and use efficiency and will reduce the over-dependence on fossil fuels. Although the issue of fossil-fuel freed energy source is not significantly addressed in this NBSAP, achieving energy efficiency through an energy policy and strategy that takes the "green energy" option seriously will feature at some point in the NBSAP.

3.2.6. Poverty:The latest version of the Poverty Reduction Strategy of Liberia should be carefully examined, paying keen attention to how it addresses environmental and social issues associated with the extractive industries such as forestry and mining, and the establishment of industrial tree plantations. It is clear here that the poor are highly vulnerable and depend greatly on the good functioning and maintenance of ecosystems for their well-being. Poverty itself is a major threat to sustainability, as desperation forces people to adopt inappropriate survivalist strategies to meet current and urgent needs that also put future survival at risk by depleting ecosystems resources (De Oliveria&Ikiara 2006, Duraiappah 2002).

Poverty is one of the stumbling blocks to sustainable resource management including biodiversity, peace and security in the country. Liberia has a population of 3.7million with annual growth rate of 2.1%. 1.6 million or 44.5% resides in urban centers while 2.0 million or 55.5% live in rural areas. The proportion of the population that live in absolute poverty is put at 2.1 million or 56.3% from 76.2% in 2001/2002 to 63.8% in 2007. Rural poverty stands at 56.9% from 67% in 2007 (Housing and population census –LISGIS 2008). Seventy percent (70%) of

the rural population depend on subsistence agriculture for livelihood. Dependency ratio is put at 82.9% from age range 0-14 and 65 above (Interimreport on MDG 2012-Ministry of Planning and Economic Affairs). This means that Liberia is nowhere near meeting goal 1 of MDG which calls for halving the poverty ratio by 2015 using 1990 as base year. Large number of people living in poverty means that sustainable resource management including biodiversity will be difficult if not impossible. Table 17 presents the current rate of poverty in Liberia and its impact on the lives of people.

Table 17: Current rate and projected impact of poverty in Liberia

Indicator	2001/2002	2007	2010	Targets
Proportion of population getting below USD1.00 per day	76.2	63.8	56.3	38.1
Poverty Gap Ratio (%)		24.4	21	12.2
Share of the poorest quintile in national consumption		8.78		4.39
Source: MDGs Report 2004; CWIQ 2010, World Bank Poverty Note; DHS 2007				

Experts in the various regional meetings and interactions during the stakeholders workshops/conferences agreed that one critical sector of the economy that could turn this situation around is the agriculture sector provided if the right investment is made in the sector. The failure to reform the sector which remain grossly underfunded despite contributing 46.0% to GDP from 2005-2011. As a consequence, the sector contribution dropped from 46.0-27.1% in 2012.

It is almost impossible for Liberia to meet herself imposed target that is to halve poverty to 38.1% by 2015(Central Bank of Liberia 20011,World Bank Note, CWIQ 2010, Interim MDG report 2012). The 2012 Interim MDG Report released in 2013 by the Ministry of Planning and Economic Affairs is the evaluation of national actions since 2000 to ascertain measures taken at national level geared toward meeting the MDG. The government hopes to address the issue of poverty in a more structured fashion under the new medium term national development blue known as AFT (Agenda for Transformation) that runs from 2013-2017.

3.3. Liberia's Most Threatened Ecosystems

3.3.1. Forests: Today, the ecological integrity of Liberia's forests is under threat from a number of pressures. These include logging, settlement expansion, road construction, small-scale agricultural encroachment, hunting, chainsaw logging, and mining operations. Although much of the road-building and maintenance is done by the logging industry, its effect has been to facilitate access for the other environmental pressures such as farming, hunting and chainsaw logging. It has been reported that as much as four fifths of the forest is now within 3 kilometers of a road in the country's forested landscapes (FDA 2007). Anthropogenic pressures for farmland, timber, bushmeat, fuelwood and mineral resources are reducing the size and biotic potential of Liberia's remaining forest cover. This erosion is, in most cases, an irreparable loss of one of Liberia's invaluable resources. Most of the high forest areas that remain appear to be late secondary stands which are interspersed within a network of fallowed farms with varying ages of pioneering species in succession.

3.3.2. Freshwater and wetland ecosystems: Liberia possesses abundant surface water and six principal rivers: Cavalla, Cestos, Lofa, Mano, Saint John and St Paul. Together, these basins drain approximately 65.5% of the country. The Mano and Cavalla are shared basins between Sierra Leone and Cote d'Ivoire, respectively, while the Lofa, Saint John and Saint Paul drain part of Guinea. Numerous micro watersheds or sub-watersheds also exist. The major rivers flow in a northeast to southwest direction due to topographical conditions en route to the Atlantic Ocean (UNEP/NESDA, 2002). Major exceptions to the patterns are the middle reaches of the Cavalla and Dugbe in eastern Liberia, which flow parallel to the coast in their lower reaches before entering the Atlantic Ocean. Only eight large permanent wetlands have been identified in Liberia. They provide both subsistence and economic benefits to their many inhabitants. However, like wetlands all over the world, they have become stressed by human-induced activities. Liberia has acceded to the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat 2002, and presently has five sites designated as Wetlands of International Importance.

3.3.3. Coastal and marine ecosystems: The coastal and marine environment are subjected to a variety of pressures: erosion due to sand mining, oil pollution, waste dumps, human settlement and the discharge of municipal wastewater due to the lack of proper water and sanitation facilities. Mangroves cover a small area along the coast – from Cape Mesurado to Cape Palmas – at the edges of lagoons, river banks and river estuaries and in widespread areas of swamps (UNEP 2004).

Despite the importance of mangroves as outlined earlier, people continue to use them for firewood and charcoal. Marine life also faces the risk of losing natural habitat. The regenerative capacity of Liberia's mangrove ecosystems is fast declining and the ability to provide feeding grounds for fish, molluscs and crustaceans is dramatically decreasing as uncontrolled harvesting continues. Except for few places in the central part of the country, primary mangrove forest has been replaced by secondary ones. Much of the mangrove destruction appears to concentrate along the edges of creeks and is particularly more widespread around the larger towns and cities such as Buchanan, Greenville, Harper, Monrovia and Robertsport (UNEP 2004).

3.4. Agro-industrial, Small-scale Agricultural and Tree Crop Production Systems

3.4.1. Agro-industrial tree plantations

3.4.1.1. Oil palm plantations. There are a number of giant agro-industrial tree crop plantations across Liberia where oil palm is established as a monoculture in huge concession areas. Most of these plantations are established on areas which were once forested (See Table 18).

3.4.1.2. Rubber plantations: In pre-war time, the most common tree or cash crop grown in Liberia was rubber followed by cocoa and coffee. Tree crops grown on the family level were citrus, cocoa nuts and oil palm, among others. All these crops are still being grown in the post-war era. Currently, oil palm cultivation is growing very rapidly and is highly likely to overtake the cultivation of the other tree crops if the trend continues. Table 18 shows the number, size and

location of the major agro-industrial plantations for oil palm and rubber. Industrial oil palm and rubber companies in Liberia are waging a determined and effective war against what is left of Liberia's priceless and irreplaceable tropical rainforest ecosystems. In total, they cover more than 800,000 hectares of largely initially forested land, are spreading fast and are found in 13 of Liberia's 15 counties.

Table 18: Agro-industrial crop concessions, their size and counties in which each is located

S/N	Companies	Concession areas (ha)	Counties
1.	Firestone Liberia Inc.	48,174	Margibi
2.	Sime Darby Liberia Inc.	220,000	Bomi, Grand Cape Mt.& Gbarpolu
3.	Golden Veroleum Liberia Inc.	220,000	Maryland, Sinoe, Grand Kru, River Cess and River Gee
4.	Maryland Oil Palm Plantation	8,800	Maryland
5.	Liberia Agriculture Company	242,915	Grand Bassa
6.	LIBINC Oil Palm Inc.	13,968	Grand Bassa
7.	Liberia Forest Products Inc.	8,014	Sinoe
8.	Cavalla Rubber Corporation	8,097	Maryland
9.	Salala Rubber Corporation	40,488	Bong
10.	COCOPA	10,122	Nimba
11.	Sinoe Rubber Corporation	20,243	Sinoe
12.	Morris American Rubber Plantation	1,377	Montserrado
Total	12	842,199	13

3.4.2. Traditional agricultural production system: Shifting cultivation is a traditional farming system which majority of Liberia's population is engaged in. Farm size falls within the range of 1-5 hectares and the staple food crops such as cassava and rice are the major crops grown. Other crops grown for local consumption and trade include sugarcane, bananas, citrus spp, plantain, pineapple, sweet potatoes, corn and vegetables. The primary and principal environmental impact from domestic agricultural production comes from shifting cultivation. Besides eroding natural vegetative landscapes, shifting cultivation also threatens many endemic animal and plant species which include birds, mammals, reptiles and a number of timber tree species that inhabit forests (See Figure 11).



Photo 2.1A pictorial representation of four of the major activities that constitute shifting cultivation/traditional farming. Source: Diagnostic, Policy and Strategic Assessment in Liberia's NAP 2014 Field Survey, 2014

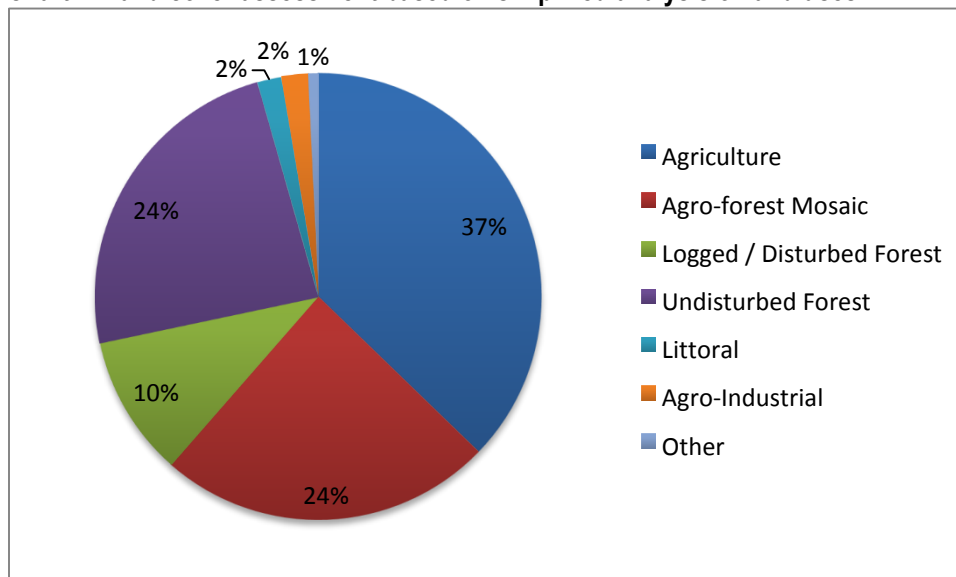
Specific animals threatened by shifting cultivation include the African elephant (*Loxodonta africana*), Chimpanzee (*Pan troglodytes*), the Red colobus (*Procolobus badius*), Diana monkey (*Cercopithecus diana*), the Jenkins' duiker (*Cephalophus jenkinsi*) and the Zebra duiker (*Cephalophus zebra*) (WCMC 2000, FAO 1999). Threatened plants include premium timber tree species such as Sipo (*Entandrophragma utilis*), Tiama (*Entandrophragma angolensis*) and Tet (*Tetraberlinia maniana*) (NBSAP 2004). The land of Liberia is arable, so a large number of people are living in areas of agricultural value. Some of these areas are protected areas and others are communal lands, generally with conflicting national and local claims of ownership.

Liberia has four (4) types of soils (Larbi 2010, CAAS-Lib.): (i) Latosols; (ii) Lithosols; (iii) Regosols; and (iv) Alluvial. Latosols have low and medium fertility, occur on hills and cover about 75% (8,352 hectares) of Liberia's total land area. It is on these types of soils where Liberia's staples – cassava and rice, are grown. Their limited amount of plant nutrients requires, without the use of fertilizers, a constant shifting of cultivation to new fields in order to maintain subsistence production levels. Tree crops perform well on these types of soils. Lithosols are the shallow and coarse soils which occur in hilly and rugged terrain, and cover about 17% (1,893,290 hectares) of the total land area of Liberia. While they support trees and other woody vegetation, lithosols have little value for agriculture, particularly for food crops.

Regosols, or sandy soils are found along the coastal plains, constitute about 5% (2,227,400 hectares) of total land area and are generally infertile. The fourth soil type is alluvial soils and is found along river banks and in swamps. Swampy soils, especially known as half bog soils, are naturally rich in humus and when drained, have the potential to provide for swamp rice and similar crops. Alluvial soils account for 3% (22,740 hectares) of Liberia's total landscape but may include wetlands of ecological significance such as those discussed under ecosystems in this document.

The land on which shifting cultivation is practiced to cultivate Liberia's staples is best for tree crops. Government needs to put more resources (e.g. cash, training, capacity building, etc.) in the cultivation of food crops in the smallest but most fertile soils - alluvial, to at least reduce the dependence on shifting cultivation as the major approach to food production to feed majority of the Liberian people. Realizing the environmental impact shifting cultivation exerts as a threat to forests, bringing resources to bear on cultivating alluvial soils is a very important decision about which government must seriously think and act quickly and timely. This will definitely reduce the damaging impact shifting cultivation is making on Liberia's forest ecosystems. Figure 12 shows results of land cover assessment based on simplified analysis of land uses.

Chart 2 :Land cover assessment based on simplified analysis of land uses



In time of crisis, as was the case with the 14-year war in Liberia, agricultural systems may be simplified or even abandoned as people turn to wild foods. Livestock died and strayed, and plantations were actually abandoned during the war. Unsustainable harvesting of rubber did take place during the war, and the rubber trees were old, thus degrading the value of the rubber resource. Weak markets of rubber and other products that are common in Liberia mean that people have no incentive to adopt improved technologies or intensify, thus systems tend toward "intensification": burning and clearing larger areas to counteract declining productivity. These trends are important for tropical forests and biodiversity because they relate to land and resource

use choices. A more productive and profitable agricultural sector is a complement to conservation (Russell & Sieber, 2005).

The years of war have affected the quality, quantity and diversity of germplasm available to farmers. Often people are forced to consume their own seed stock and fields and plantations are poorly managed. Some important food crop varieties may be lost. Invasive species such as *C. odorata* may crowd out native species in forest succession, thus reducing biodiversity. NGOs such as Africare and Environmental Foundation for Africa (EFA) are promoting swamp rice to reduce slash-and-burn practices but the agronomic and ecological dimensions of this choice seem not to be well considered by these groups.

Swamp areas may be important habitats for threatened or protected species such as crocodiles and birds. It is also important to remember that only 6% of Liberia's land is devoted to agriculture (Earthtrends 2005) so an overemphasis on preventing slash and burn may not be warranted. A more productive strategy would be to work within the upland systems on increasing diversification and productivity. Diversified tree crop plantations hold promise for both economic growth and biodiversity in areas surrounding and connecting forests. These complex systems can provide habitat for animals as well as environmental services such as protected waterways (Russell and Sieber 2005).

3.4.3. Smallholder food and tree crop production systems: Major food and cash crops grown in Liberia are rice, cassava, maize, oil palm, cocoa, coffee, rubber and sugar cane. The Asian species (*Oryza sativa*) and the African species (*Oryza glaberrima*) of rice are the two most commonly grown rice species. *Oryza glaberrima* is currently rare in Liberia. Twenty-two aquatic varieties (19 exotic and 3 indigenous) and thirty-two terrestrial (25 exotic and 7 indigenous) varieties are said to be available. Nearly all the exotic rice varieties are a product of the former West African Rice Development Association (WARDA) now known as the New African rice Research Center in the Benin Republic (NBSAP 2004, Fifth National Report Field Note 2014). During the 14-year war, agricultural systems were abandoned as people could not farm and had to turn to wild foods. Smallholder cash crop plantations of Cocoa and Coffee were the mainstay of the rural economy prior to the civil war (1990-2003). No meaningful investment has been made to resuscitate this sector except for rudimentary activities undertaken by local and international NGOs for sustainable livelihoods which had largely failed to produce the desired results. Figure 13 shows a Cocoa farm in Lofa, one of the 15 counties located in northern Liberia.



Photo 2.2 Cocoa farm in Lofa County-northern Liberia
Source: Diagnostic, Policy and Strategic assessment Liberia's NAP 2014 Field Survey, 2014)

Additionally, the conflict affected the quality, quantity and diversity of germplasm available to farmers. They were forced by the situation to consume their own seed stock. The lack of capital to invest, coupled with the lack of incentive to adopt improved agricultural technologies and the existence of “weak” markets resulted in unsustainable and environmentally damaging farming practices such as shifting cultivation. Diversified food and tree crop farms and plantations hold promise for both economic growth and biodiversity conservation in area surrounding or adjacent to forests. These complex systems can provide habitat for animals as well as environmental services such as protected waterways (Russell and Sieber 2005).

3.4.4. Traditional and community forestry: The modern approach to community forestry as a concept and a practice is quite new in Liberia. There have always been traditional communal farms in various communities in the country that are owned by clans or chiefdoms and people do cultivate rice and minor cash crops in support of the owners. There have also been few traditional community forests as well. The crops that are cultivated on communal farms belong to the clan or chiefdom and never in any case for an individual. The USAID has successfully established more than 10 functioning community forests in Grand Bassa, Nimba and Sinoe Counties. This great work began in Liberia in 2007, first with the Land Rights and Community Program (LRCFP 2010) and now the People, Rules and Organizations Supporting the Protection of Ecosystem Resources (PROSPER) program that began in 2012. The ultimate goal of these programs is to develop, introduce, operationalize and refine appropriate models for community management of forest resources for local self-governance and enterprise development in targeted communities in Liberia.

The agency responsible for governance and sustainable management of forests and forest resources in Liberia, the Forestry Development Authority (FDA), has established a Community Forestry Department that is about 10 years old. This is a positive response of government to the significance of having forest-dependent communities take sustainable forest management decisions and benefit from such decisions, with little or no interference from government. Currently, the FDA is reviewing 112 applications from communities since 2011 seeking authorized community forest status for their community forest (Aldinger 2016). Following a meticulous review of these applications, those that would meet the requirements outlined for this purpose will be awarded a community forest management agreement which will serve as a contract for 15 years and is renewable for other 15 years on the basis of the communities' performance. Working with the FDA, PROSPER has developed and field tested nine steps whose fulfillment will qualify a community for an authorized community forest status (PROSPER 2016). These community forests are highly likely to serve as corridors for the conservation of biodiversity since protected areas are not the only places of high valued biodiversity resources.

3.4.5. Agroforestry and tree plantations: Consistent with the Liberian forestry and agriculture policies, a number of perennial crops including oil palm, rubber, and others are classified as agricultural crops, and therefore are not considered under tree plantation programs. However,

Agroforestry is classified as system or technology. These tree crop plantations are classical agroforestry technologies, quite apart from agroforestry systems where agricultural crops are integrated with woody perennials in a given land area. Few examples of agroforestry do exist in some parts of Liberia where trees and agronomic crops are cultivated on the same piece of land.

Establishment of tree (woody perennials, not industrial tree crops) plantations as an approach to revegetating deforested areas has known little success in Liberia. In consequence, the establishment of plantations has not kept pace with land degradation due to deforestation. The extent and rate of forest cover removal do not match replacement. Up to about 480,000 acres (192,000 hectares) of forestland is lost annually due to logging, shifting cultivation and other activities such as agro-industrial tree crop plantations (e.g. oil palm and rubber), while government has replanted less than 27,000 acres (10,927 hectares) since the inception of its reforestation program in 1971. Expansion of oil palm concession areas in the rolling hills relief zone of the country is depleting vast forested areas in the country. In the last 10 years, a forest area of about (48,000 acres express this figure in) hectares forest has been depleted. Cassava and coconut are cultivated mainly in the coastal plains.

It is estimated that 2% (19,432 hectares) of the land area of Liberia is lost to deforestation annually, whereas only about 10,932 hectares have been since the inception of the reforestation programme in 1971 with scattered plantations in Grand Cape Mount, Grand Gedeh, Nimba, Bomi, Bong and River Cess Counties. Agroforestry systems and component technologies could keep some areas under some form of tree cover and could therefore reduce the total area that is deforested, which eventually will benefit the conservation of biodiversity.

SECTION FOUR

Strategy and Action Plan for Biodiversity Management

4.1 Strategy and Action Plan

The preparation of this NBSAP is anchored in strong national vision, principles, and priorities geared towards ensuring protection of Liberia's biodiversity heritage. The Strategy is also consistent with CBD strategic goals and the Aichi Targets.

4.2 Long-Term Vision: To have a Society that lives in Harmony with its natural environment.

4.3 Mission: 'Develop education and information programmes to raise the level of awareness of the population about the importance of biodiversity and place values on ecosystem goods and services through assessment and evaluation. To develop a framework for mainstreaming biodiversity into national accounting systems, development policies, plans and programmes'

4.4 Guiding Principles

Implementation of the Strategy will be guided by the following principles:

- ❖ Ensure the continual monitoring and evaluation of biodiversity status and trends;
- ❖ Build an Inclusive plan to incorporate widest stakeholders' participation

- ❖ Biodiversity programmes must address issues associated with governance, legal and financial modalities for equitable sharing of resources
- ❖ Ensure development initiatives with potential adverse effects on biodiversity are subjected to strategic environmental assessment
- ❖ Set balance between economic development and environmental consideration to ensure sustainability of natural resources;
- ❖ Build strong mechanism for awareness creation and education;
- ❖ Recognize, promote and uphold traditional and indigenous knowledge, practices and innovations for the sound management of natural resources;
- ❖ Biodiversity management and decision making will be people-centered approach;
- ❖ Biodiversity management and conservation will take into account economic, cultural and aesthetic values;
- ❖ Special emphasis will be placed on ecosystems and habitats management;
- ❖ Biodiversity management and conservation will take into account economic, cultural and aesthetic values; and
- ❖ Special emphasis will be placed on ecosystems and habitats management

4.5 Strategic Goals and National Targets

Five strategic goals and twenty targets consistent with CBD strategic goals and the Aichi targets have been elaborated to implement the revised NBSAP. The following are the goals and targets identified :

GOAL ONE: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1.1: By 2019, at least 60 per cent of surveyed key target groups know the meaning and importance of biodiversity and its sustainable utilization.

Target: 1.2 By 2020, biodiversity values and prioritized ecosystem services are quantified, monitored and mainstreamed to support national and sectoral policy-making, planning, budgeting and decision-making frameworks

Target 1.3: By 2020, selected incentives for biodiversity conservation and sustainable use are in place and applied, and the most harmful subsidies are identified and their phase out initiated.

Target 1.4: : By 2020, mobilization of financial resources from all sources will be increased compared to the period 2008-2012 to allow for the effective implementation of this strategy and action plan.

GOAL TWO: Reduce the direct pressures on biodiversity and promote sustainable use.

Target 2.1: By 2024, the rate of loss and degradation of natural habitats outside protected areas serving ecological corridors or containing key biodiversity areas or providing important ecosystem services is minimized by 3% through integrated land use planning.

Target 2.2: By 2023, at least 20-25% of living marine and aquatic resources are managed sustainably and guided by the ecosystem approach.

Target 2.3: By 2022, principles of sound rangeland and sustainable forest management, and good environmental practices in agriculture and forestry are applied on at least 50 per cent of all relevant areas.

Target 2.4: By 2022, pollution, including from excess nutrients, has been brought to levels that are not detrimental to biodiversity and ecosystem health and functioning.

Target 2.5: By 2018, National compendium on invasive alien species in Liberia is prepared and by 2020, priority measures are in place to control and manage their spread and impact.

Target 2.6: By 2018, ecosystems most vulnerable to climate change and their anthropogenic pressures are identified and assessed, and by 2020 appropriate adaptation measures are developed and implemented in priority areas.

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GOAL THREE: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Target 3.1: By 2020, at least 4% of existing terrestrial protected areas (national parks, nature reserves, conservation areas set aside in community forests, etc.) are conserved, effectively and equitably managed, within an ecologically representative and well-connected system, and by 2022, at least 5% of coastal and marine areas of particular importance to biodiversity and ecosystem services, are identified, assessed and measures taken for their protection.

Target 3.2: By 2018, threatened and vulnerable species lists are updated and measures effected by 2019 to improve their conservation status

Target 3.3: By 2020, Genetic diversity of cultivated plants and farmed animals is maintained and enhanced.

GOAL FOUR: Enhance the benefits to all from biodiversity and ecosystem services

Target 4.1 By 2022, ecosystems that provide essential services and contribute to health, livelihoods and well-being, are safeguarded, and restoration programmes have been initiated for degraded ecosystems covering at least 15 per cent of the priority areas..

Target 4.2: By 2018, ecosystem resilience and the contribution of biodiversity to carbon stocks will be enhanced through the protection of additional forest ecosystems which Liberia's current REDD+ project will create, in addition to the project's enhancement of the mitigation of climate change and restoration of degraded grasslands through reforestation by 2023.

Target 4.3: 3 By 2018, national legislation giving effect to the Nagoya Protocol is in force and by 2020, fully operational to ensure that benefits are fair and equitably shared from the conservation and sustainable use of biodiversity.

GOAL FIVE: Enhance implementation through participatory planning, knowledge management and capacity building

Target 5.1: 1By 2017, Liberia would have developed and adopted as a policy instrument, and has commenced implementing an effective, participatory and updated its NBSAP

Actions:

Target 5.2: By 2020, Traditional knowledge and the innovations and practices of indigenous and local communities relevant to the conservation and sustainable use of biodiversity are recognized, respected, documented and promoted.

Target 5.3: By 2025, knowledge, science base and technologies relating to biodiversity and ecosystem management are improved and made relevant to political decision makers.

Target 5.4: By 2022, mobilization of financial resources from all sources will be increased compared to the period 2008-2012 to allow for the effective implementation of this strategy and action plan.

TABLE 19: ALIGNMENT OF NBSAP WITH THE CBD STRATEGY (2011-2020) AND AICHI TARGETS

CBD STRATEGIC PLAN GOALS AND TARGETS	LIBERIA'S NBSAP STRATEGIC GOALS ,TARGETS , AND ACTION
Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society	NBSAP Goal 1: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society
Target 1: By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	Target 1.1: By 2019, at least 60 per cent of Liberians are aware of the meaning and importance of biodiversity and its sustainable utilization.. Actions: ○ Conduct national survey to gauge knowledge gaps about biodiversity and conduct public education and awareness campaigns. ○ Organize a series of national workshops to define/describe biodiversity and explore its importance in detail. ○ Develop and introduce a biodiversity training module for Liberian schools, colleges and for training in rural communities.
Target 2: By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	Target: 1.2 By 2020, biodiversity values and prioritized ecosystem services are quantified, monitored and mainstreamed to support national and sectoral policy-making, planning, budgeting and decision-making frameworks. Actions: ○ Measure and map out representative samples of prioritized ecosystems. ○ Identify and estimate various goods and services ecosystem provides. ○ Identify and assess the forest, agricultural and biodiversity and quantitative values in monetary terms. ○ Develop a sectoral policymaking, planning, budgeting and decision-making frameworks on biodiversity values.
Target 3: By 2020,at the least, incentives, including subsidies, harmful to biodiversity are eliminated , phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio-economic conditions.	Target 1.3: By 2020, selected incentives for biodiversity conservation and sustainable use are in place and applied, and the most harmful subsidies are identified and their phase out initiated. Action: ○ Define and list set of selected incentives that support the conservation and sustainable use of biodiversity. ○ Craft a legal and regulatory framework to govern harmful incentive system for conservation and sustainable use of biodiversity.

Target 4: By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits	Target 1.4: By 2020, at the latest, Government, business and stakeholders have drafted a management strategy that defines the indicators of sustainable production and use of natural resources as a first step towards keeping resources management and use within safe ecological limits. Action: ○ Convene a series of national workshops to develop management strategy to identify and assess indicators of sustainable production and use of resources. ○ Ensure mainstreaming of biodiversity conservation into relevant sectoral plans and policies.
CBD Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use	Liberia's NBSAP Goal 2: Reduce the direct pressures on biodiversity and promote sustainable use.
Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	Target 2.1: By 2024, the rate of loss and degradation of natural habitats outside protected areas serving ecological corridors or containing key biodiversity areas or providing important ecosystem services is minimized by 3% through integrated land use planning. Actions: ○ Ensure establishment of community forests and provide incentives to communities for ecosystem services ○ Carry out reforestation and afforestation projects; establish woodlots ○ Ensure SLM practices ○ Invest in the establishment and management of hydro and biogas technologies to reduce the over-dependence on woodfuel ○ Promote use of eco-stoves ○ Ensure sustainable forestry , agriculture and fishery
Target 6: By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem-based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	Target 2.2 By 2023, at least 20-25% of living marine and aquatic resources are managed sustainably and guided by the ecosystem approach Actions: ○ Establish at least 2 marine protected areas ○ Enforce fishery regulations on illegal fishing practices ○ Ensure restoration of at least 30 % of degraded wetlands ○ Ensure protection of mangrove forests of global importance through community participation ○ Finalize National Wetlands Policy
Target 7: By 2020, areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	Target 2.3:By 2022, principles of sound rangeland and sustainable forest management, and good environmental practices in agriculture and forestry are applied on at least 50 per cent of all relevant areas. Actions: ○ Carry out a desk study on the expanse of rangeland and

	their management regimes. ○ Review current legal and regulatory frameworks in forestry and agriculture and amend, where necessary, to ensure adherence to sustainable practices. ○ Ensure development and enforcement of appropriate environmental regulations relative to chemicals and modern biotechnology/biosafety
Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	Target 2.4: By 2022, pollution, including from excess nutrients, has been brought to levels that are not detrimental to biodiversity and ecosystem health and functioning. Actions: ○ Conduct a number of studies to identify the various types of pollution associated with prioritized ecosystems. ○ Conduct baseline studies to determine levels of pollution ○ Examine, upgrade and implement existing legislations on pollution and monitor enforcement. ○ Provide guidelines on use of agro chemicals
Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to <i>prevent their</i> introduction and establishment.	Target 2.5: By 2018, National compendium on invasive alien species in Liberia is prepared and by 2020, priority measures are in place to control and manage their spread and impact Actions: ○ Identify and document alien species in prioritized ecosystems and determine various means by which enter the country and sources. ○ Promote integrated management of invasive alien species ○ Undertake research into effective control of IAS ○ Put in place robust monitoring system of IAS
Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	Target 2.6: By 2018, ecosystems most vulnerable to climate change and their anthropogenic pressures are identified and assessed, and by 2020 appropriate adaptation measures are developed and implemented in priority areas. Actions: ○ Conduct studies on prioritized ecosystems vulnerable to climate and take appropriate to reduce/avoid/ threats. ○ Conduct studies in agriculture, fisheries and forestry practices on felt or potential negative impact on the natural environment
CBD Strategic Goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity	Liberia's NBSAP Goal 3: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity
Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 percent of coastal and marine areas,	Target 3.1: By 2020, at least 4% of existing terrestrial protected areas (national parks, nature reserves, conservation areas set aside in community

especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wide landscape and seascapes.	forests, etc.) are conserved, effectively and equitably managed, within an ecologically representative and well-connected system, and by 2022, at least 5% of coastal and marine areas of particular importance to biodiversity and ecosystem services, are identified, assessed and measures. Actions: ○ Conduct baseline surveys of terrestrial and aquatic(freshwater, marine) protected ecosystems to determine their current conservation status and threats they face ○ Establish additional ecologically representative protected areas ○ Update/develop management plans for the PAs ○ Conduct economic valuation of the PAS ○ Promote REDD+ program
Target 12: By 2020, the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	Target 3.2: By 2018, threatened and vulnerable species lists are updated and measures effected by 2019 to improve their conservation status Actions: ○ Assemble and review documents on threatened vulnerable species ○ Carry out ecosystem surveys to collect baseline information on the status of endangered/threatened animals and plants. ○ Upgrade the IUCN RED list on both animals and plants. ○ Ensure robust enforcement of regulations to protect endangered or threatened species
Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild varieties, including other socio-economically as well as culturally valuable species is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	Target 3.3: By 2020, Genetic diversity of cultivated plants and farmed animals is maintained and enhanced. Actions: ○ Carry out a national germplasm collection activities. ○ Establish and maintain gene banks for both agricultural crops (forestry included) and domestic animals. ○ Characterize and evaluate germplasm in genebanks ○ Strengthen Biosafety Risk Assessment for GMOs that may be introduced into the country ○ Conduct national surveys to document Traditional Knowledge on conservation of agro-biodiversity
CBD Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services	Liberia's NBSAP Goal 4: Enhance the benefits to all from biodiversity and ecosystem services
Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded , taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	Target 4.1: By 2022, ecosystems that provide essential services and contribute to health, livelihoods and well-being, are safeguarded, and restoration programmes have been initiated for degraded ecosystems covering at least 15 per cent of the priority areas. Actions: ○ Identify and map out the country's terrestrial and aquatic

	ecosystems, document the essential services they provide. ○ Determine threatened ecosystems and the extent of such threats. ○ Develop and initiate implementation of measures to restore and/or rehabilitate at least 2% of these ecosystems. ○ Identify and monitor threats to all ecosystems
Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks have been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	Target 4.2: By 2018, ecosystem resilience and the contribution of biodiversity to carbon stocks will be enhanced through the protection of additional forest ecosystems which Liberia's current REDD+ project will create, in addition to the project's enhancement of the mitigation of climate change and restoration of degraded grasslands through reforestation by 2023. Actions: ○ Promote and support community-based forest management programs ○ Support reforestation and afforestation ○ Establish woodlots in degraded landscapes ○ Put in place program to provide incentives to forest dependent communities for ecosystem services under the REDD+ Project ○
Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.	Target 4.3 By 2018, national legislation giving effect to the Nagoya Protocol is in force and by 2020, fully operational to ensure that benefits are fair and equitably shared from the conservation and sustainable use of biodiversity. Actions: ○ Accede to/ratify the Nagoya Protocol on Access and Benefit Sharing ○ Ensure enactment of the draft ABS legislations and develop implementing regulations and guidelines ○ Strengthen ABS Unit to effectively handle and process application for permits ○ Build capacity for use of ABS Clearing House
Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building	Liberia's NBSAP Goal 5: Enhance implementation through participatory planning, knowledge management and capacity building
Target 17: By 2015, each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	Target 5.1 By 2017, Liberia would have developed and adopted as a policy instrument, and has commenced implementing an effective, participatory and updated its NBSAP Actions: ○ Review the first NBSAP. ○ Collect additional information to revise and update draft NBSAP. ○ Conduct national consultations with stakeholders to validate the revised NBSAP, and seek political support for implementation.
Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are	Target 5.2: By 2020, Traditional knowledge and the innovations and practices of indigenous and local communities relevant to the conservation and sustainable use of biodiversity are recognized, respected, documented and promoted.

respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.	Actions: ○ Conduct a series of case studies on indigenous knowledge systems. ○ Document indigenous knowledge system and local languages through which it is channeled. ○ Mainstream indigenous knowledge into the planning and implementation of biodiversity conservation interventions. ○ Institutionalize the use of indigenous knowledge into the management of natural resources. ○
Target 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends , and the consequences of its loss, are improved , widely shared and transferred , and applied.	Target 5.3: By 2025, knowledge, science base and technologies relating to biodiversity and ecosystem management are improved and made relevant to political decision makers. Actions: ○ Collect, collate and analyze information about biodiversity, the reason(s) for its conservation and the significance of managing ecosystems ○ Convene a series of workshops with relevant political decision makers to discuss importance of biodiversity and ecosystem in terms of the values, functions and the consequences of their loss. ○ Promote and support research into biodiversity and ecosystem conservation
Target 20: By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan 2011-2020 from all sources and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resources needs assessments to be developed and reported by Parties.	Target 5.4: By 2020, mobilization of financial resources from all sources will be increased compared to the period 2008-2012 to allow for the effective implementation of this strategy and action plan. Actions: ○ Organize financial resource mobilization committee. ○ Establish a biodiversity conservation Trust fund. ○ Lobby national and international support for financial resources to implement the NBSAP,

SECTION FIVE IMPLEMENTATION PLAN

The Revised NBSAP will require key strategic capacities to ensure its effective and efficient implementation. The Implementation plan defines the resource needs (systemic, institutional, human, and technological) and the required strategies that should be in place to expedite effective execution of deliverables as outlined in the Revised NBSAP. The following are four components of the Implementation Plan:

1. Capacity development plan and technical capacity needs assessment detailing (systemic, institutional, human capacity);
2. Communication strategy which delivers processed education, information and awareness messages, on biodiversity conservation, sustainable use of its components, access to genetic materials and equitable sharing of benefits arising thereafter;
3. Resource mobilization strategy and financial mechanism; the strategy will analyse the financial resources required to implement the Revised NBSAP and how it can be mobilized. The financial mechanism on the other hand, is an innovative financial action plan/mechanism for generation of finances for the implementation of the programmes of the Revised NBSAP; and
4. Appropriate technology transfer plan.

5.1: Capacity Development Plan Needs Assessment for the Implementation of the Revised NBSAP

The capacity development plan operates on three levels

- Systemic level
- Institutional level
- Individual level

Systemic

At the systemic level, the main emphasis is on establishing whether there exist the requisite policies and legal regime that support an effective biodiversity governance and management regime at the community, local and national levels as a contracting party to the Convention on Biological Diversity. Therefore capacity at this level includes the development of biodiversity specific policies, laws, technical guidelines, regulations, standards and norms relevant to governance and management procedures and philosophy. Special emphasis will also have to be focused on the inclusion of traditional knowledge, codes and norms on biodiversity governance and management to correct the historical wrong of not including these principles in national policies and laws.

Existing policies and legislations:

- Environmental Policy of Liberia;
- Environmental Protection Agency Act,
- Environmental Protection and Management Law;
- 2006 Forest Policy,
- 2006 Forest Reformed Law,
- Chain of Custody Regulations 101-07,101-8,101-09,
- Wildlife Law of 2015;

- The New Mining Law of 2000;
- Integrated water policy ;
- Agricultural Policy;
- Fisheries Policy etc;
- The Protected Areas Act;

While these instruments have very good contents for biodiversity management, the uncoordinated and near lack of harmonization of sectoral policy and conflicting legal mandates as contained in sectoral legislations continue to be a major challenge to an effective policy and legal instruments to advance the governance and management of biodiversity resources in the country. As a consequence there is disconnect in the governance and management philosophy of biodiversity resources of the country among stakeholders with each group doing entirely what it likes instead of following a national blue print.

Institutional Level

Almost all institutions engaged in biodiversity management in the country have problem with capacity. Capacity development therefore is focused on organizational structure, processes, resources, management issues and the disconnect in programme and activities being implemented by stakeholders. The inadequacies of the necessary infrastructures to conduct training of personnel, scientific research, and conduct assessment of biodiversity are some of those challenges that need immediate attention. Other associated constraints identified during the assessment include but not limited to inadequate staffing, poor organizational structure resulting into low level of institutional productive capacity, lack of strategic plan with concise focus on specific biodiversity issues.

These constraints have hindered any meaningful effort for biodiversity related institutions to carry out important activities such as:

1. Biodiversity assessment and monitoring in the different ecosystems;
2. Conduct of taxonomic inventory;
3. Risk assessment and management of biotechnology;
4. Development of regulatory systems and enhancement of negotiation skills for ABS;
5. Access to information for effective biodiversity conservation etc.

Individual Level

At the individual level, the focus was on developing compendium of personnel executing specific biodiversity programmes/ activities (planning, policy and projects); the second focus was to identify the capacity gaps and the training needs. The study documented that capacity constraints at the individual level is grave and immediate action is needed. The following constitute representatives of the capacity gaps at that level:

1. Low and inadequate levels of education and training; especially, in analytical, scientific research, and technical skills,
2. Unclear job requirements and misplacement of available human resources;
3. Inadequate level of delegation of responsibility resulting to under-utilization of available skills and expertise;

4. Poor staff incentive structure resulting in low level of team spirit and productivity, poor coordination and inadequate networking among the few available experts;
5. Low level of enforcement of performance standards and merit system resulting to poor staff performance;
6. The need to prioritize capacity needs for biodiversity planning in a participatory way ;
The table below presents priority capacity need that require immediate attention; the existing ones need to be strengthened and those that do exist need to be built to ensure speedy implementation of the Revised NBSAP.

5.1.1: Priority Capacity Development Plan

The capacity Development Plan has been prepared to respond to capacity needs identified in the capacity needs assessment. The table below summarizes core prioritized needs at both institution and individual levels and actions required to address

Table 20 : Core capacity development plan at the institution & individual levels

CORE CAPACITY ISSUES	INSTITUTION & INDIVIDUAL LEVELS	CONCRETE ACTIONS NEEDED
Processes	Ensure an effective coordination of programmes and objectives from the focus Agency-EPA to the biodiversity related line ministries, agencies, local government & communities, conservations organizations Enhancement of cooperation between the subsidiary and technical bodies and including working group of line ministries, agencies and conservation organizations;	• Strengthening Biodiversity coordination unit at the Division of MEAs result focus oriented • complement traditional command and control methods of regulations, leading to internationalization of biodiversity conservation costs and efficiencies in regulatory design; • Coordination of policy making through involvement of conferences of parties of related MEAs; • Development of common indicators to assess progress in implementation; • Ensure p-participatory planning processes involving all stakeholders including community people; • Coordination of policy making through involvement of conferences of parties of related MEAs; • Trans-boundary Collaboration and coordination of conservation programmes; • Provision of training for government negotiators, customs officials, security

		- officials and judges; • Support for national environmental legislation to implement environmental treaties; • Facilitation of the development of public participation at national level • Roles and responsibilities be clearly defined and personnel held accountable for their actions; • Ensure feedback mechanism is in place
Capacity for biodiversity financing, resource mobilization and economic evaluation of biodiversity	• Provide training in biodiversity financing, including those of The Economics of Ecosystems and Biodiversity' (TEEB) • Increase the need for effective education, awareness & information and improve strategy on resource mobilization;	• Put emphasis policy priorities issues based on the targets • Increase monitor policy implementation and impacts; • Link budgets with priority programmes; • Build and use effective budget process including those of national budget, donor and partners support; • Integrate annual and multi-year planning and budgeting processes; • Develop manual on biodiversity financing & resource mobilization to train key personnel at Ministry of Financial and Development Planning, biodiversity related ministries & agencies, conservations etc.
Utilization, climate change and biodiversity etc.	Provision for training opportunity	• Provide training on ecosystem approach to address impacts of climate change; • Provide in-service training on emerging issues and data collection; • Provide training in scenarios analysis for programme to address climate change impacts using ecosystem approach;
Capacity for integration of biodiversity conservation in different sectors	• Promote biodiversity specific policy & law to drive sector programmes	• Develop biodiversity stand-alone policy & law; • Conduct dialogical forum with policy-makers

		• Promotion of compliance and enforcement mechanisms with line institutions; • Build synergies and interlinkages between conservation, natural resource management and environmental institutions at national levels; • Biodiversity conservation/ economic modeling for ecosystem services in poor markets; • Promoting linkages between multilateral environmental agreements and the Sustainable Development Goals through ecosystem services.
Capacity for integration of biodiversity conservation in different sectors and cultural settings	Promote biodiversity specific policy & law to drive conservation in culture.	• Promote cultural values in conservation • Promote linkages between traditional/cultural practices and conservation
Capacity for multi-sectoral consultation processes	Improve national coordination mechanism	• Harmonization of reporting formats and schedules for national implementation performance reporting; • Development of coordination mechanism at the national, county, districts, clan and community levels; • Establish synchronize approach for engaging conservation and civil society organizations engage in implementation biodiversity related activities
Capacity for biodiversity rehabilitation	• Provide training	• Provide training to enhance skills and know-how • Establish local platforms for discussing biodiversity conservation
Capacity for research on biodiversity components and monitoring;	• Provide training • Explore more funding opportunity	• Provide training in research techniques for organization involve with research in biodiversity; • Set up forum to bring together government agencies, universities & research institutions

		&business organizations; • Create a forum that bring together donors, development partners, the private sector to create multi-year funding raising for research partnership;
Capacity for development and maintenance of protected areas system	• Strengthening enforcement of Protected Areas system Improve training and staff development portfolio	• Improve local governance & management structure of protected areas in host communities; • Include local officials & representatives of the population groups in local governance & management decision –making of protected areas system; • Include traditional measures of enforcement of PAs; • Provide training for personnel & local people in PA management; • Conduct training for warden & senior managers for PAs

Table 21: Human Resource Deficit and Areas for Expertise Training and Development

Urgent (12-18 months)	Short term (18-24months)	Medium (24-36 months)	Long term (40-60 months)
Information/data generation and management	Remote sensing and GIS	Forest/resource inventory	Watershed management
Public awareness, education and information management	Wildlife and park management	Wildlife and range ecology	Conservation ecology
Protected area Governance and management	Extension education and rural development	Integrated Pest Management and Control	Dendrology/Plant Taxonomy
Research, planning and development	Sustainable natural resource management, policy, law and governance	Silviculture and Plantation Development	Molecular biology and biotechnology
National Wetlands Policy finalization	(a) Wetlands Laws in place. (b) Wetlands management strategy developed and enforcement started	Additional Ramsar Sites endorsed	Ramsar sites under full management scheme

Project proposal writing/extension education	Carbon management/resource economics	Conservation biology	Plant Pathology
Procurement and management	Biodiversity conservation/park management	Marine Protect Area management technic and practice	Wildlife Diseases Management and Surveillance
Agroforestry	Eco-tourism management	Natural resources related sectoral policies harmonization	Proposed 30% protected area management achieved.
Access and benefit sharing	Watershed Management	Mangrove management programme in place	
Wildlife Management	Forest Landscape restoration	REDD programme nationalization	
Bio-monitoring and data base establishment and management	Integrated Protected Area Management		

5.1.2 Technology Needs Assessment and Plan for the Implementation of the Revised NBSAP

In the context of this NBSAP, technology needs assessment identifies the human and technical capacity needs required to implement the Revised NBSAP. The objective is to facilitate the implementation of the Revised NBSAP through identifying the priority technical capacity needs.

Key technology needs for the current NBSAP are listed in below:

1. Use of geographic information system (GIS) for land use mapping
2. Use of survey tools such as ArcGIS software, satellite imageries
3. Networking and transfer of data management, monitoring and spatial analysis
4. Ecosystem Services Evaluation/analysis Tools (EcoSET)
5. Management of zoological and botanical gardens
6. Strengthening biodiversity concerns into the EIA process
7. Establishment of gene banks to conserve biodiversity
8. Management of community forest and protected areas
9. Isolation of indigenous cultivars for in-situ conservation of plant species and wildlife in various ecosystems
10. Networking and transfer of data management, monitoring and spatial analysis techniques and technology
11. Integrated Biodiversity Assessment Tool
12. Biotechnology research
13. Reforestation & afforestation techniques
14. Conservation techniques and practices
15. Management of freshwater ecosystem
16. Management of freshwater ecosystem

Table22: Technology Needs and Required Actions

Specific areas for Technology applications	Actions or Alternative
Management of community forest and protected areas	Create enabling environment to promote protected areas management, both legal and incentives to enhance livelihoods
In-situ conservation techniques of endangered and threatened plant species	Increase gene bank to four at the Central Agricultural Institute& College of Agriculture & Forestry-UL
Sustainable utilization of biodiversity	Embark on massive sensitization programme to educate the general public and policy-makers as defined by the communication strategy
Isolation of indigenous cultivars for in-situ conservation of plant species and wildlife in various ecosystems	Establishment of conservation centers for indigenous species
Management of unique land forms such as wetlands and arid zones	• Complete the development of wetland policy (convene Policy Council setting to adopt the wetland policy) ; • Print wetland policy & conduct public awareness activities; • Create buffer zones to protect areas; • Development of technical guidelines on the use of wetlands & arid zones;
Networking and transfer of data management, monitoring and spatial analysis	conduct training on data management and spatial analysis

5. 2. Financial Resources

Article 20 of the CBD requires each Party to provide financial support in accordance with its capabilities, for activities which will be undertaken to implement the Convention at national level. Parties are also required to mobilize financial resources to implement programs and activities identified at national levels to implement the Aichi Targets. One of the difficulties faced with the implementation of the first NBSAP was the lack of financial mechanism and resource mobilization strategy to mobilize the needed resources to fund the various activities outlined in the implementation plan.

To counter this difficulty, this strategy has been developed to avail sources of funding necessary for implementation of the revised NBSAP. Possible sources of funding could include: government of Liberia budget support through biodiversity related agencies; the development of innovative funding mechanisms; bilateral/multi-lateral aid for biodiversity projects ; partnerships with the private sector, local communities; and the GEF, etc.

Table 23: Financial and Resource Mobilization Mechanisms

N0.	Strategy	ACTIONS
1.	Ensure that funds essential to achieve biodiversity conservation objectives are secured and allocated in a manner that maximizes benefits.	1. Allocate funds explicitly for biodiversity conservation and sustainable use from the annual budgets of concerned line ministries and agencies and that action will be taken to ensure that institutions concern utilize those funds for that purpose 2. Establish a national Environment Conservation Fund (ECF) with the support and participation from all levels and sectors of the government 3. Determine the most suitable structure for the ECF taking into consideration the various options available such as endowment funds, sinking funds, revolving funds or a combination of these. Manage the ECF through a Board of Trustees represented by relevant government offices, private sector, NGOs and donor agencies as spelled out in the Environmental Protection Agency Act. 4. Establish guidelines for managing the fund including acceptable funding sources, criteria for project proposals and allocation of funds, system of banking, auditing and contracting including appropriate legislation and oversight 5. Ensure a large continual funding base through assistance from international donors as well as financing mechanisms at national level 6. Market the ECF to publicize the fund and give recognition to sponsors through the CHM websites, popular media and awards establish precedents for a governance structure to ensure transparency between ECF donors and beneficiaries 7. Seek financial assistance from relevant international organizations by pursuing conservation goals that they support.
2.	Put in place national system to ensure payment for ecosystem services	1. Develop, document and adopt standardized methodologies for economic valuation of Biodiversity, tailored to the requirements of individual decision-making agencies. 2. Develop mechanisms to incorporate biodiversity values into national accounting and Decision-making at different levels. 3. Ensure payment for ecosystem services from commercial users
3.	Create an integrated system of incentives and disincentives at the national and local level to encourage the conservation and sustainable use of biodiversity.	Introduce a system of direct incentives that could include: a. the provision of subsidies to encourage farmers to retain local cultivars and crop varieties, and to adopt practices such as integrated pest management, agro - forestry and multi-species cropping;

		b. the provision of subsidies to encourage land owners to manage their properties in ways that are sensitive to biodiversity, or to refrain from changing existing land-uses; c. the provision of grants for the protection of threatened species or habitats, and the restoration of degraded lands d. the development of programmes to ensure that local communities receive direct benefits from biodiversity, e.g. through sustainable use activities; e. incentives to encourage ex-situ propagation /breeding programmes for traded species of wild plants and animals, in order to reduce the drain on wild populations; f. The provision of incentives for staff (particularly field staff) working in institutions dealing with biodiversity- Possibilities upgrading employees to regular functional staff; g. the provision of extra training opportunities; and public recognition for outstanding service.
4.	Introduce a system of indirect incentives to promote the conservation and sustainable utilization of biodiversity that could include: a) fiscal incentive measures such as tax exemptions or deductions for the conservation of particular habitats or species; tax reductions for the import of equipment used in conservation programmes; and tax deductions for donations to conservation NGOs; b) Service-oriented incentives, designed to link community development programmes with the conservation of biodiversity. For example communities living adjacent to protected areas could be accorded priority for public education programmes and technical assistance in agriculture, forestry and other fields. c) Social incentive measures designed to improve the quality of life. d) Clarification of land tenure and the creation of new institutions to manage biodiversity	Introduce a system of disincentives to discourage unsustainable utilization and practices which deplete biodiversity. These could include: a. increasing the size of fines for the violation of conservation laws; b. revising the tax schedule to penalize undesirable land-use practices; c. Using fiscal disincentives e.g. pollution and effluent charges, for activities which are damaging to biodiversity. This could also include the use of a 'polluter pays' policy, requiring developers to take measures to mitigate the environmental damage caused by their activities; d. Promoting and strengthening traditional customs and practices which serve as disincentives to unsustainable use.
5.	Identify 'perverse' incentives and minimize their impacts on biodiversity.	Carry out a comprehensive review of programmes and policies, to identify perverse incentives and suggest measures to ameliorate their impacts
6.	Develop policies and laws to regulate access to genetic resources and promote the equitable sharing of benefits between	1. Collate baseline data relating to genetic resources and on current practices of access to such resources for academic and commercial purposes.

	resource owners and users.	2. Prepare or existing legal and institutional profile relating to the import, export, and use of genetic resources and traditional knowledge; 3. Formulate a national policy and strategy on genetic resources and access issues through the participation of stakeholders (government agencies, industry, scientific community, ex-situ conservation facilities, relevant NGOs, CBOs and private individuals). 4. Develop an action plan for implementation of priority actions through assigning responsibilities and identifying institutional development needs and designate an appropriate authority to oversee and implement the policy and relevant laws
7.	Develop biodiversity specific policy and legislation to drive process through.	Harmonize biodiversity specific policies and legal framework within countries of the Mano River Basin and tailor same base on the Authority of ECOWAS environmental instruments on biodiversity
8.	Develop national funding mechanisms to support priority biodiversity conservation and management programmes.	1. Re-assess national spending priorities, and consider financial re-allocations from those sectors which currently receive a disproportionate share of the national budget. 2. Re-assess existing expenditure on biodiversity related activities against the priorities identified in this Biodiversity Action Plan; re-align expenditure to address the most urgent priorities. 3. Establish a task force to look into the possibilities of developing sustainable revenues to support biodiversity.
9.	Seek increased bilateral, multilateral funding and OECD development assistance for biodiversity programmes	1. Create an informal working group of aid agencies and donors on biodiversity conservation and management in the country; 2. Establish a database of agencies/ donor development activities and locations to identify areas of possible donor interest. 3. Coordinate donor activities to maximize conservation efforts and resources. Invite donor agencies to assist with priority conservation activities in regions where they already have development programmes. 4. Strengthen national capacity to submit successful proposals to the GEF, through training in project development and proposal preparation using the GEF format. 5. Take steps to strengthen Liberia's 'voice' at the CBD COP;

5.3: COMMUNICATION STRATEGY

The successful implementation of the revised NBSAP will depend largely on how the various actors are engaged through effective communication channels. Hence, the CEPA approach will be employed. The Key elements of the communication strategy are as follows:

- Vision:** To be able to communicate biodiversity information to the greater majority of the population in line with AICHI Target I by 2020
- Mission:** To mainstream biodiversity conservation and sustenance into national and local development policies and regulations, plans, programmes and actions by means of public information provision and dissemination, and education throughout the country; thereby, raising the level of awareness among the general population and policy-makers; and placing importance on biodiversity and value on ecosystems goods and services to food security, livelihood, aesthetics and economy
- Goal:** By 2020, 80% of the population will understand the values of and use biodiversity resources sustainably.
- Objective:** The overall objective is to promote the conservation and sustenance of Liberia's rich biological diversity resources and culture as mandated by the country's NBSAP with identified targets using specific communication tools or mechanisms so that present and future generations of Liberians will enjoy the benefits of and appreciate their rich biological diversity resources and culture.

5.3.1 Approaches to ensure effective communication

5.3.1.1 Identification of Target Audience

The Strategy will endeavor to communicate key messages on the implementation of the NBSAP II and other biodiversity-related management activities to many different target groups, including decision makers at national and local levels, technicians in government agencies, NGOs, the private sector, development partners, religious groups, and the general public. Implementation of this strategy will be coordinated by the CBD focal point.

5.3.2 Key messages

The key messages to communicate the target audiences to facilitate their participation in implementation of the NBSAP will be as follows:

- ❖ The importance of biodiversity to the economy and human lives.
- ❖ The importance of species and protected areas (PAs) and how to safeguard the species and PAs for human growth.
- ❖ The use of alternative friendly technologies and appropriate approaches for livelihoods other than traditional methods such as charcoal burning for fuel wood and beach sand mining for building construction.

- ❖ Highlights of threats to biodiversity (human settlements and population pressures, shifting cultivation, beach erosion, poaching and hunting, etc); and the extent of biodiversity degradation (rate of biodiversity loss, threatened and endangered species, extinct species and forest fragmentation) raised in Liberia's revised NBSAP and that of 2004.

5.3.3 Media of Communication

The Communication Strategy (CS) will utilize many forms of media, communication materials and public awareness activities, as follows:

- ❖ Print (newspaper, magazine, brochure, press releases, etc.)
- ❖ Broadcast (television and radio)
- ❖ Digital (internet, social media (Facebook, Google, Twitter) , etc

Lobbying and Partnership

A series of lobbying and advocacy activities will be carried out under the CS to persuade government take appropriate actions in the form of policy change, enforcement of relevant legislations, supports for implementation of the revised NBSAP, etc. On the other hand partnerships will be forged with the private sector including the media and academia, NGOs, CBOs, to support specific activities of the NBSAP such as Public awareness and education, research, data sharing, etc.

SECTION SIX

Coordination Mechanism, Monitoring, & Reporting

The institutional arrangement for the implementation of the Revised NBSAP is structured to reflect stakeholders' participation at all levels. The implementation mechanism identified includes line ministries and agencies and specialized biodiversity management committees.

6.1: Sector Ministries and Agencies

The line ministries and agencies involved in biological diversity management and or relevant to the process include:

6.1.1: Environmental Protection Agency (EPA). The EPA is the principal authority in the country for the management of the environment and natural resources. As its key function, the EPA (Section 5 of the Environmental Protection Agency Act), is mandated to collaborate with line ministries and agencies to (i) Co-ordinate, integrate, harmonize and monitor the implementation of environmental policy and integrate environmental concerns in overall national planning; (ii) Collect, collate, and analyse basic scientific data and other information pertaining to pollution, degradation of ecosystems and on environmental quality and resource use, (iii) Train and build the capacity of line Ministries and agencies; and (iv) Ensure the preservation and promotion of important historic, cultural and spiritual values of natural resource heritage and, in consultation with local authorities, enhance effective natural resource management plans and activities.

6.1.2: Forestry Development Authority (FDA). The FDA is the agency responsible for the sustainable management of forest and forest resources, and is charged with ensuring the effective governance and management of the country's Protected Areas system. The FDA (i) Prepares long and medium-term plans in the forestry sector; (ii) Prepares documents or guidelines for forestry policy, law and administration; (iii) Monitors adherence to forest legislation and concession agreements; (iv) Assesses forestry fees and evaluates investment proposals; (v) Executes reforestation programs and forest research and training; and (vi) Monitors activities of timber companies.

6.1.3: The Ministry of Mines and Energy (MLME) has statutory responsibility for the development of mineral, water and energy resources of the country, and the administration of its land. It (i) supervises land surveys in all parts of Liberia; (ii) coordinates the activities of miners (gold, diamonds), including the granting of operational licenses; and (iii) regulates beach sand mining and works along with the Ministry of Agriculture and the University of Liberia to conduct training and research on land rehabilitation.

6.1.4: Ministry of Internal Affairs (MIA). The MIA is responsible for administering the affairs of all government functionaries within rural and urban areas of the country. Guarded by the revised Interior Regulation of Liberia, the Ministry supervises all county Superintendents, and oversees the activities of local government bodies such as districts, chiefdoms and clans.

6.1.5: The Ministry of Finance and Development Planning serves as the direct link between implementing agencies/ministries of government, NGOs and the international community. The

Department of Planning at the Ministry (i) Provides technical guidance to all GoL agencies in the preparation of development programs and projects; (ii) Reviews proposals for new development programs and projects in view of available resources; (iii) Makes recommendations to the National Planning Council; (iv) Initiates special investigation into the execution of programs and projects ; and (v) Reports/makes recommendations to the National Planning Council.

6.1.6: The Land Commission is required to propose, advocate and coordinate reforms of land policy, laws and programs in Liberia with ultimate aim of ensuring equitable and productive access to the nation's land, both public and private; security of tenure in land and the rule of law with respect to landholding and dealings in land; and effective land administration and management.

Other government agencies and ministries which share biodiversity conservation and management responsibilities include the Ministry of Defence, The National Bureau of Fisheries, Liberia Maritime Authority, National Bureau of Concession and the Liberia Extractive Industry Transparency Initiative.

6. 2: Specialized Biodiversity Management Committees

6.2.1 National Biodiversity Secretariat: The secretariat will conduct the day to day operation of the implementation OF biodiversity programmes as contained in the Revised NBSAP. It will ensure mainstreaming of the plan into biodiversity related ministries, agencies, NGOs' programmes and activities from the national to community levels. The secretariat will use an aggressive monitoring, evaluation and reporting regime to ensure compliant. The secretariat will be headed by the National Focal Point of the convention and assisted by team of technical personnel within the Department of Biodiversity in the Division of Multilateral Environmental Agreements- Environmental Protection Agency of Liberia.

6.2.2 National Biodiversity Steering Committee: The committee is responsible to approve biodiversity programmes and activities within the borders of the country in consultation with the Executive Director of the EPA ,the Ministry of Finance and Development Planning, and other stakeholders including the National Legislature responsible for national and sectoral legislations and allocation in the National Budget as true representatives of the Liberian people, local communities who directly interact and survival depend on biodiversity resources and international stakeholders such as development partners at all levels.

6.2.3 Rio Conventions Steering Committee: Liberia is among the countries that implemented a pilot project on synchronized reporting concept of the Rio Conventions and the results among other things called for the establishment of a National Steering Committee to coordinate synergies among the conventions.

The implementation of the programmes and activities of the Revised NBSAP will benefit from this platform to coordinate synergies in programming not only among the Rio conventions but biodiversity related conventions such as RAMSAR, CMS, CITES, ITTO etc.

6.3. Sub-National Level

The main activities at the sub-national level will be focused mainly on coordination of the activities of sectoral institutions with the secretariat. One key instrument to demonstrate that will be the Clearing House Mechanism (CHM) which will mirror the activities of sectoral institutions by reporting and disseminating information coming from the local, and community levels. Other structure to be used to get feedback from the sub-national level includes focus group discussions (FGDs), survey methods among others.

6.4: MONITORING, EVALUATION, REPORTING STRUCTURE

Mechanism to be employed to track progress of programmes in the implementation of the Revised NBSAP by sector line ministries and agencies, and others including research and academic institutions, conservation and development organizations (both local & international), local communities and individuals, concessionaires, businesses and industries on biodiversity conservation and sustainable management will be done through various channels including the following:

- Monitoring report (quarterly, biannual & annual reports)
- CHM web site
- ESIA report
- Environmental Audit report

The key evaluation tool to be used to track programmes deliverables will be the targets, actions and their indicators.

6.4.1 Monitoring Plan

The responsibility for implementing the NBSAP will be carried out by the Environmental Protection Agency of Liberia which is the DNA for the implementation of Multilateral Environmental Agreements in the country. The Agency is assisted in the process, by Focal Points of the CBD and its related protocols and relevant thematic focal points such CHM, Financial Resource Mobilization, Protected Areas etc. The National Steering Committee, the highest decision making body for the Convention's programmes and activities nationally, is next in line and followed by the Rio Conventions National Steering Committee. Other important elements include the line ministries and agencies, conservation NGOs/INGOs, CBOs and local government structure in the communities. The Biodiversity Section within the Division of Multilateral Environmental Agreements (MEAs) and the Environmental Protection Agency (EPA) of Liberia will be directly responsible to conduct the monitoring of the implementation of the NBSAP, making use of national consultants/experts.

The monitoring activities will focus on targets, its actions and indicators to track progress and ascertain challenges in the implementation process. The National Biodiversity Steering Committee will be informed of progress by the regular communication channel through its operational chairperson, the Biodiversity Focal Point, who is the head of the Biodiversity Section within the Division of MEAs with the appropriate recommendations to ensure resolution of any challenges.

6.4.2 Monitoring Matrix

The Revised NBSAP will be monitored using the matrix stated below. The monitoring plan was developed by the Biodiversity Project Team and the Thematic Expert Group composed of national experts that drafted the contents of the Revised NBSAP. The plan was subjected to stakeholder scrutiny in the four regions of the country and later taken to national validation workshops before its adoption. The targets, actions and indicators were used as standard to determine progress in the implementation process. The Monitoring Matrix is presented below as Table 23.

Table 23: The Monitoring Matrix- Revised NBSAP alignment with the CBD's Aichi Targets ()

Targets	Actions	Impact Indicators	Responsible organizations		Timeframe (yr)	Cost (USD)
			Lead	Collaborators		
Target 1: By 2019, at least 60 per cent of Liberians are aware of the the meaning and importance of biodiversity and its sustainable utilization.	- Conduct national survey to gauge knowledge gaps about biodiversity and conduct public education and awareness campaigns. - Organize a series of national workshops to define/describe biodiversity and explore its importance in detail. - Develop and introduce a biodiversity training module for Liberian schools, colleges and for training in rural communities.	The number of public education and awareness campaigns conducted. List of participants Results of a national survey of target groups on biodiversity awareness and existing knowledge base about biodiversity Report on the list and description of the direct and indirect threats to biodiversity A training module on the participatory assessment of threats to biodiversity and how such threats can be avoided/ mitigated/interdicted	EPA	FDA, FFI,CI, LISGIS, MOE, UL,CUC,SCNL	2019-2020	100,000
Target 2: By 2020, biodiversity values and prioritized ecosystem services are quantified, monitored and mainstreamed to support national and sectoral policy-making, planning, budgeting and decision-making frameworks.	- Measure and map out representative samples of prioritized ecosystems. - Identify and estimate various goods and services ecosystem provides. - Identify and assess the forest, agricultural and biodiversity and quantitative values in monetary terms. - Develop a sectoral policymaking, planning, budgeting and decision-making frameworks on biodiversity values.	List of prioritized ecosystem Published ecosystem valuation reports	EPA, FDA	FDA, FFI,CI, LISGIS, MOE, UL,CUC, MFDP, UNDP, MLME, LIMA	2018-2020	500,000

Target 3: By 2020, selected incentives for biodiversity conservation and sustainable use are in place and applied, and the most harmful subsidies are identified and their phase out initiated.	○ Define and list set of selected incentives that support the conservation and sustainable use of biodiversity. ○ Craft a legal and regulatory framework to govern harmful incentive system for conservation and sustainable use of biodiversity.	List of identified incentives harmful to biodiversity conservation List of expunged harmful subsidies	EPA, MFDP	MOA, MOCI, MFDP, MOJ, FDA	2018-2020	50,000
Target 4: By 2020, at the latest, Government, business and stakeholders have drafted a management strategy that defines the indicators of sustainable production and use of natural resources as a first step towards keeping resources management and use within safe ecological limits.	○ Convene a series of national workshops to develop management strategy to identify and assess indicators of sustainable production and use of resources. Ensure mainstreaming of biodiversity conservation into relevant sectoral plans and policies	Reports from public and private sectors indicating sustainable practices in agriculture, fishery, forestry, water resources , etc.	EPA, FDA, MOA	FDA, MOA, LISGIS, MFDP, MLME,	2018-2020	300,000
Target 5: By 2024, the rate of loss and degradation of natural habitats outside protected areas serving ecological corridors or containing key biodiversity areas or providing important ecosystem services is minimized by 3% through integrated land use planning.	○ Ensure establishment of community forests and provide incentives to communities for ecosystem services ○ Carry out reforestation and afforestation projects; establish woodlots ○ Ensure SLM practices ○ Invest in the establishment and management of hydro and biogas technologies to reduce the over-dependence on woodfuel ○ Promote use of eco-stoves ○ Ensure sustainable forestry , agriculture and fishery	○ Number of functional community forests ○ Hectares of degraded land restored ○ Number of farmers carrying SLM practices ○ Number of eco-stoves in use ○ Amount of mega watts from hyrdo power plants and biogas contributing to national grid	EPA, FDA, MOA, RREA, L EC	FDA, MOA, LISGIS, NFDP, MLME,	2018-2020	5,000,000
Target 6: By 2023, at least 20-25% of living marine and aquatic resources are managed sustainably and guided by the ecosystem approach	○ Establish at least 2 marine protected areas ○ Enforce fishery regulations on illegal fishing practices ○ Ensure restoration of at least 30 % of degraded wetlands ○ Ensure protection of mangrove forests of global importance through community participation ○ Finalize National Wetlands Policy	○ Number of marine protected areas established ○ Incidents of illegal fishing reported and prosecuted ○ At least 35% of mangrove forest of global importance is protected ○ Number of mangrove protected areas managed by local communities ○ Wetlands Policy approved and in force	EPA, CI, FDA	CI, FDA, CL, MIA, LIMA,	20-16-2023	6,000,000

Target 7: By 2022, principles of sound rangeland and sustainable forest management, and good environmental practices in agriculture and forestry are applied on at least 50 per cent of all relevant areas.	○ Carry out a desk study on the expanse of rangeland and their management regimes. ○ Review current legal and regulatory frameworks in forestry and agriculture and amend, where necessary, to ensure adherence to sustainable practices. ○ Ensure development and enforcement of appropriate environmental regulations relative to chemicals and modern biotechnology/biosafety	○ Report on management of rangeland and impact on the environment ○ Review and amendment of laws/regulations in forestry/agriculture to ensure adherence to sound environmental standards and practices ○ Chemical register developed ○ Biosafety risk assessment regulation and guidelines prepared and in use	EPA	MOA, FDA, MOH, MOCI, MOJ	2018-2022	100,000
Target 8: By 2022, pollution, including from excess nutrients, has been brought to levels that are not detrimental to biodiversity and ecosystem health and functioning.	○ Conduct a number of studies to identify the various types of pollution associated prioritized ecosystems. ○ Conduct baseline studies to determine levels of pollution ○ Examine, upgrade and implement existing legislations on pollution and monitor enforcement. ○ Provide guidelines on use of agro-chemicals	○ Report on baselines studies of pollution from chemicals ○ % drop in pollution from excess nutrients ○ Appropriate pollution legislations/ regulations and guidelines in place ○ Cases of noncompliance reported and addressed	EPA	MOA, FDA, MOH, MOCI, MOJ	2019-2022	1,000,000
Target 9: By 2018, National compendium on invasive alien species in Liberia is prepared and by 2020, priority measures are in place to control and manage their spread and impact	○ Identify and document alien species in prioritized ecosystems and determine various means by which enter the country and sources. ○ Promote integrated management of invasive alien species ○ Undertake research into effective control of IAS ○ Put in place robust monitoring system of IAS	○ National compendium on IAS prepared ○ % reduction in the rate and impact of IAS ○ Research papers developed on control of IAS ○ Monitoring reports on IAS	EPA, CARI, FDA, CA F	EPA, MOA, FDA, CARI, FAO	2018-2020	1,000,000

Target 10: By 2018, ecosystems most vulnerable to climate change and their anthropogenic pressures are identified and assessed, and by 2020 appropriate adaptation measures are developed and implemented in priority areas.	○ Conduct studies on prioritized ecosystems vulnerable to climate and take appropriate to reduce/avoid/ threats. ○ Conduct studies in agriculture, fisheries forestry practices on felt or potential negative impact on the natural environment	○ % of vulnerable ecosystem restored ○ Number of adaptation projects carried ○ Number of studies carried out to determine negative impacts of climate change in agriculture, fishery and forestry	EPA, CARI, FDA	EPA, MOA, FDA, CARI, FAO	2018-2020	2,000,000
Target 11: By 2020, at least 4% of existing terrestrial protected areas (national parks, nature reserves, conservation areas set aside in community forests, etc.) are conserved, effectively and equitably managed, within an ecologically representative and well-connected system, and by 2022, at least 5% of coastal and marine areas of particular importance to biodiversity and ecosystem services, are identified, assessed and measures taken for their protection.	○ Conduct baseline surveys of terrestrial and aquatic(freshwater, marine) protected ecosystems to determine their current conservation status and threats they face ○ Establish additional ecologically representative protected areas ○ Update/develop management plans for the PAs ○ Conduct economic valuation of the Pas ○ Promote REDD+ program	○ Report of baseline studies carried out to determine conservation status of Pas ○ Number of PAs gazetted ○ Number of management plans developed or updated for PAs	EPA, FDA,	FDA, LIMA, LA, MIA, CI, FFI, SCNL	2020-2022	4,000,000
Target 12 By 2018, threatened and vulnerable species lists are updated and measures effected by 2019 to improve their conservation status	○ Assemble and review documents on threatened vulnerable species ○ Carry out ecosystem surveys to collect baseline information on the status of endangered/threatened animals and plants. ○ Upgrade the IUCN RED list on both animals and plants. ○ Ensure robust enforcement of regulations to protect endangered or threatened species	○ Report on threatened/endangered species ○ IUCN Red List for Liberia updated ○ Number of noncompliance cases reported and addressed	EPA, FDA, MOJ	FDA, MOJ, MIA, FFI, CI, SCNL	2018-2019	900,000

Target 13: By 2020, Genetic diversity of cultivated plants and farmed animals is maintained and enhanced.	○ Carry out a national germplasm collection activities. ○ Establish and maintain gene banks for both agricultural crops (forestry included) and domestic animals. ○ Characterize and evaluate germplasm in genebanks ○ Strengthen Biosafety Risk Assessment for GMOs that may be introduced into the country ○ Conduct national surveys to document Traditional Knowledge on conservation of agro-biodiversity	○ Number of genebanks established ○ Number of accessions of landraces collected, characterized, and evaluated ○ Number of accessions maintained in the genebanks ○ Number of in-situ conservation sites established and maintained ○ Number of surveys carried out to document traditional knowledge ○ Biosafety Regulations approved ○ Functional GMO monitoring lab established ○ Number of permits issued for GMO introduction	EPA, CARI	CARI,MOA, FDA, UL	2018-2020	3,000,000
Target 14: By 2022, ecosystems that provide essential services and contribute to health, livelihoods and well-being, are safeguarded, and restoration programmes have been initiated for degraded ecosystems covering at least 15 per cent of the priority areas.	○ Identify and map out the country's terrestrial and aquatic ecosystems, document the essential services they provide. ○ Determine threatened ecosystems and the extent of such threats. ○ Develop and initiate implementation of measures to restore and/or rehabilitate at least 2% of these ecosystems. ○ Identify and monitor threats to all ecosystems	○ Map showing types and locations of threatened ecosystems and services they provide ○ Number of ecosystems restored ○ Monitoring reports of ecosystems under threat	EPA,FD A	FDA, CI,FFI,SCNL, FACE, LIMA, MOA, UL,MIA	2020-2022	3,000,000

Target 15: By 2018, ecosystem resilience and the contribution of biodiversity to carbon stocks will be enhanced through the protection of additional forest ecosystems which Liberia's current REDD+ project will create, in addition to the project's enhancement of the mitigation of climate change and restoration of degraded grasslands through reforestation by 2023.	○ Promote and support community-based forest management programs ○ Support reforestation and afforestation ○ Establish woodlots in degraded landscapes ○ Put in place program to provide incentives to forest dependent communities for ecosystem services under the REDD+ Project	○ Number of community forest established ○ Number of hectare restored through afforestation and reforestation ○ Hectares of woodland established ○ Number of forest dependent communities receiving incentives for ecosystem services from their forests ○ Hectares of forest under conservation through the REDD+ project	EPA, FDA	EPA, FDA	FDA, World Bank, CI, FFI, SCNL, FACE, LIMA, MOA, UL, MIA, Norway	5,000,000
Target 16: 3 By 2018, national legislation giving effect to the Nagoya Protocol is in force and by 2020, fully operational to ensure that benefits are fair and equitably shared from the conservation and sustainable use of biodiversity.	○ Accede to/ratify the Nagoya Protocol on Access and Benefit Sharing ○ Ensure enactment of the draft ABS legislations and develop implementing regulations and guidelines ○ Strengthen ABS Unit to effectively handle and process application for permits ○ Build capacity for use of ABS Clearing House	○ Record of accession document deposited with relevant UN Agency ○ Gazetted national legislation on ABS ○ Published ABS regulations and guidelines ○ Number of permit issued to access genetic resources and TK ○ Regular updates on Central Portal on ABS	EPA	Tertiary institutions, CARI, FDA, MIA, National Traditional Council,	2017-2019	100,000
Target 17: By 2017, Liberia would have developed and adopted as a policy instrument, and has commenced implementing an effective, participatory and updated its NBSAP	○ Review the first NBSAP. ○ Collect additional information to revise and update draft NBSAP. ○ Conduct national consultations with stakeholders to validate the revised NBSAP, and seek political support for implementation.	○ Revised NBSAP ○ Monitoring and evaluation reports	EPA		2015-2025	200,000

Target 18: By 2020, Traditional knowledge and the innovations and practices of indigenous and local communities relevant to the conservation and sustainable use of biodiversity are recognized, respected, documented and promoted.	○ Conduct a series of case studies on indigenous knowledge systems. ○ Document indigenous knowledge system and local languages through which it is channeled. ○ Mainstream indigenous knowledge into the planning and implementation of biodiversity conservation interventions. ○ Institutionalize the use of indigenous knowledge into the management of natural resources.	○ Reports on case studies conducted ○ Documentation on TK ○ Biodiversity documents referencing use of TK ○ Appointment of National Focal Point on TK	EPA, MIA	MIA, Traditional Council, FDA, MOA, MOH, CARI	2018-2020	300,000
Target 19: By 2025, knowledge, science base and technologies relating to biodiversity and ecosystem management are improved and made relevant to political decision makers.	○ Collect, collate and analyze information about biodiversity, the reason(s) for its conservation and the significance of managing ecosystems ○ Convene a series of workshops with relevant political decision makers to discuss importance of biodiversity and ecosystem in terms of the values, functions and the consequences of their loss. ○ Promote and support research into biodiversity and ecosystem conservation	○ Reports on biodiversity and ecosystem conservation ○ Workshop report with political decision on importance of biodiversity and ecosystems ○ Number of research carried out on biodiversity and ecosystem services	EPA, CARI, UL	CARI, FDA, UL, CI, FFI, National Legislators, MICAT	2018-2025	2,000,000
Target 20: By 2020, mobilization of financial resources from all sources will be increased compared to the period 2008-2012 to allow for the effective implementation of this strategy and action plan.	○ Organize financial resource mobilization committee. ○ Establish a biodiversity conservation Trust fund. ○ Lobby national and international support for financial resources to implement the NBSAP,	○ List of Financial Resource Mobilization Committee(FRMC) ○ Enactment of Biodiversity Trust Funds ○ List of donors and their financial contribution for implementation of the revised NBSAP ○ Number of projects implemented from the revised NBSAP	EPA, UNDP, MFDP	UNDP, MFDPM MOFA, WB, USAID, Norway	2017-2020	100,000

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APPENDICES

APPENDIX A: The NBSAP Revision Process and Lessons Learned

Lessons learned from the earlier NBSAP(s).

Liberia developed her National Biodiversity Strategy & Action Plan between August 2002, and March 2004 in line with the obligations and responsibilities of parties under the Convention on Biological Diversity, and the strategy was launched by the Government of Liberia in March 2004. At the time of the development of the strategy in 2002, environmental knowledge and the technical capacity to write a comprehensive and realistic strategy was low; thus some of the strategies and actions were a little overambitious and could not be accomplished in the timeframe without a strong financial mechanism in place. Seven years later, a revision/updating is taking into consideration gaps in the first NBSAPs, as well as establish goals, objectives and targets in line with the global, regional, and sub-regional strategies; especially with the 2011-2020 Strategic Plan.

In the NBSAP of 2004, a number of items in term of synergies and linkages with other MEAs and some key stakeholders were either omitted or inadequately covered. Therefore, the elaboration of the current NBSAP took into account these important omissions and applied every effort to involve all key actors; integration of the objectives of biodiversity-related conventions and MEAs in order to achieve greater coherence and efficiency at national level were also given greater consideration.

The issue to do more research in order to collect adequate data on the various thematic areas as some of the data been used is more than half century old which by all indication exposes the issue of limited capacity and expertise in some of these areas in a more practical manner. It was observed further that the previous NBSAP was not done consistent with the guidelines and ignores the thematic areas of the convention. Now that more studies have been carried out and there is now an increased capacity in the area of biodiversity, the new NBSAP is structured in the traditional conventional structure and shape to inform national actions.

RATIONALE OF THE REVISION

The first NBSAP was completed in 2004 along with other primary enabling activities to demonstrate national commitment to the implementation of objectives of the Convention on Biological Diversity and the Johannesburg Action Plan. Despite the development of the strategy, there continues to be continuous loss of biodiversity resources to a scale never seen before. The moment to examine the problem came with the new strategic plan of 2011-2020 calling for much more realistic plan with new targets and action plan to address the inadequacies experienced under the old strategic plan-2001-2010 which triggered the revision of the old plan. The key conclusion of the stocktaking and inventory of the 1st NBSAP says, the “plan was short on appropriate strategies and actions needed to motivate the implementation process. Key points cited include:

- The plan lacked a resource mobilization strategy and financial mechanism to source funding strategy and infrastructure at the national level, thus leaving the at the mercy of donor driven programmes;

- The plan lacked a communication strategy to market it to relevant stakeholders including policy makers who are responsible to formulate the national budget which defines priorities for national development initiatives. Policy makers did not have any level of understanding of the importance of the plan and therefore did not see any reason to prioritize it by mean of allocation in the national budget in successive years despite good reason to do so for its implementation; and
- Because policy-makers did not recognize biodiversity conservation and sustainable utilization as being relevant to national development programmes, they were not concerned about appropriating any fund in the national budget for its execution. In the new programmes of work under the revised NBSAP, these missing links have been addressed to serve as tools to market the plan to stakeholders at all levels to better understand the issues, promote behavior change toward nature conservation, sustainable use and access to and equitable use of it.

The rationale of this revised strategy therefore recognizes resource mobilization; financial mechanism and communication strategies to be key elements that will enable policy makers to appreciate the resource implication that goes along with clear and concise action plan and the need for users to better understand the issues and change behaviors toward sustainable biodiversity management at the national level.

THE METHODOLOGY OF REVISION:

The process of developing the updated NBSAP, including stakeholder participation and consultation, the methodology used in this process was not fundamentally different from the first NBSAP. Consultants were recruited, contracts were signed, a National Steering Committee was established, and a Project Management Team set up. The revised NBSAP was developed with multi-stakeholders' participation from the various environment sectors. A stocktaking & Inventory exercise was undertaken to gather data from all sectors. Thematic teams' meetings were conducted; expert review panel was established to consider contents by the drafting team and participation at various levels during workshops and data gathering. Collation of data, analysis, and summary was made by the Project Technical Team at the Biodiversity Section of the Division of Multilateral Environmental Agreements, Environmental Protection Agency.

With the approval of the project funding and activities by the GEF and UNEP the implementing agency for GEF, the National Focal Point for CBD who heads the project team submitted the project's activities programme, the Project Team members, and the budget to the National Steering Committee for approval. The various studies, working groups meetings and activities were guided by the national steering committee whose duty is to approve the action plan of the Biodiversity Coordination Section. The Thematic working groups were experts from Forestry, Agriculture, Fisheries, land Use, Conservation and Ecology sectors; Social-economic, policy and legal experts, communication, public Awareness and education strategists' expertise were brought to bear on the process. Members of the groups came from line ministries, agencies, research institutions and academia, donor agencies, civil society, members of the national legislature, representatives of farmers' organizations and local communities. Local, regional and national consultations were attended by conservation, development NGOs (Both local and International).

The first and second drafts of the NBSAP were circulated first to line ministries, agencies, civil society organizations, individuals' experts for scrutiny and peer review to ensure completeness. Final stages of the methodology include international peer review, regional and finally, national validation workshops to give the opportunity to every stakeholder to impact the preparation of the document.

APPENDIX B: Agenda for Transformation and Biodiversity and Cross Cutting Issues for Coherent Implementation of Biodiversity-related MEAS

Opportunities and timelines for linking the NBSAP to national development plan, and key sectoral plans and policies.

Agenda for Transformation (AfT)

The Agenda for Transformation (AfT) which is the current development agenda up to 2017 renewable up to 2030 to make Liberia a middle income country has a section for the environment. Unlike the Poverty Reduction Strategy (2008-2011), which did not consider the environment, the new development plan has provision to consider the management of natural resources and the environment. The pillar is co-chaired by the Environmental Protection Agency thus allowing sectoral plans and policies to be considered in the national blueprint.

Biodiversity and Cross-cutting Issues

Opportunities for coherent implementation of biodiversity-related MEAs. Biodiversity and cross cutting issues.

Liberia's ratification of the Convention on Biological Diversity and biodiversity related conventions signifies her commitment to sustainable management of natural resources and Agenda 21, the Johannesburg Plan of Action and the Millennium Development Goals.

The writing of this revised NBSAP strengthens that commitment especially to Article 6 of the CBD which calls for development of national strategies, plans and the integration of conservation and sustainable use of biological diversity in relevant national development plans, sectoral programmes and policies. The national legal and policy imperative for writing of the revised NBSAP is Article 7, Chapter II of the 1986 Constitution and the three environmental frameworks legislations (policy, Agency Act, Management & Protection law) of November, 2003. These instruments guarantee the right to have a clean and healthy environment and sustainable management of natural resources including biodiversity. The passage in 2006 of the Forest Policy and the Forest Reformed Act which specifically spelled out conservation priorities and how that can be carried out in a network of protected areas management regime further strengthened the legal mandate for environmental quality and sustainable resource management.

Cross Cutting Issues

Poverty and biodiversity: Poverty is a major threat to management and sustainability of biodiversity conservation in Liberia. The Poverty Reduction Strategy developed by the Government of Liberia in 2008 identified poverty as one of the key threats to natural resources. Extreme pressure is exerted on all ecosystems as a result of this. Dealing with poverty is one of the strategies to sustainable biodiversity conservation. **Human health and biodiversity:**

Biodiversity's relevance to human health is becoming an international political issue, as scientific evidence builds on the global health implications of biodiversity loss (Chivian & Bernstein 2008, Corvalan et al 2005). Plants provide huge benefit to human health through both scientific and cultural means, as well as adding nutritional value to human wellbeing.

Climate change and biodiversity: Several direct impacts of climate change have been identified, among them are changes in the timing of biological events, changes in species distribution and behavior in plants and animals, and increased frequency and intensity of pests and diseases. Potential impacts include increased vulnerability of species to extinction and potential losses of net productivity of ecosystems. Adopting biodiversity-based mitigation and adaptation strategies can reduce the impact of climate change. Undertaking biodiversity-related activities such as reforestation using indigenous species can help increase the capture of carbon dioxide existing in the atmosphere, prevent flooding and drought, and contribute to the resiliency and ability of ecosystems to provide goods and services. In Liberia climate change impacts are manifested as high temperatures mostly at night, rising sea levels (as exemplified by strong sea waves that are cutting into the country's 350-mile coastline) and change in rainfall intensity and patterns (Koffa 2009, Sweeney et al 2008).

There is an urgent need for adaptive response measures. For the poor, this must start with actions that could reduce the current vulnerabilities and increase adaptive capacity so they can face the longer-term impacts of climate change. Reducing current vulnerabilities and increasing adaptive capacities, however, require an understanding of how livelihoods are conducted and sustained, as the assets and capabilities that comprise peoples' livelihoods often shape vulnerabilities and the ability to reduce vulnerability (IPCC 2001, Chambers & Conway 1992). **Tourism and biodiversity:** Statistics produced by the World Travel and Tourism Council (WTTC) indicate that tourism generates 11% of global GDP, employs 200 million people, and transports nearly 700 million international travelers per year, a figure that is expected to double by 2020 (Christ et al 2003). This field has not been developed in Liberia, and would require significant investment to sustain and contribute to the reduction of threats on biodiversity in the country.

Gender and biodiversity: Gender refers to the differences in socially constructed roles and opportunities associated with being a man or a woman and the interactions and social relations between women and men.

In Liberia's forest-dependent communities, women and men often have disparate knowledge about forest resources and different roles in tree and forest management in any given forest ecosystem. Women contribute to forest management and extraction of forest products. As a UNDP (1995) study found, their practices include those of gathering wild plants for food and medicinal purposes, fodder and firewood for household consumption and sourcing of organic matter for their farms to generate cash income. Other studies suggest that forests and trees are more important to rural women's livelihoods than those of men, and women tend to maximize utility of natural resources for the family in comparison to men (Agarwal 2010, Agrawal et al 2006). However, the search for gender equality, if not pursued carefully, is likely to impact men at a socio-psychological level in a male-dominated society that Liberia's is, particularly when it focuses primarily on women and their empowerment to address past or current disenfranchisement. This seems to be the case with the Liberia National Gender Policy (LNGP) (MoGD 2009) in its

mandate, content and intent. Such a social change has the potential to destabilize gender relations that could breed conflict (Yves-Rene 2012).

Governance and biodiversity: The World Bank (1997) refers to governance as the traditions and institutions by which authority in a country is exercised for the common good. This includes: (i) the process by which those in authority are selected, monitored and replaced; (ii) the capacity of the government to effectively manage its resources and implement sound policies; and (iii) the respect of citizens and the state for the institutions and the economic and social interactions among them. Lack of governance structures at the indigenous community levels has contributed to massive loss of biodiversity through encroachment and other forms of violations.

Access, benefit sharing and biodiversity: There has been a growing concern over the monopolization of benefits from biological resources and the traditional knowledge about such resources. This led to the successful negotiation for an international regime which, among others, regulates access and benefit sharing known as the CBD that integrates the objectives of conservation, sustainable use and benefit sharing. It seeks to balance the right of resource-rich, resource-providing countries to share in benefits, with the right of technology-rich countries to access biodiversity resources in biodiversity rich countries. Liberia, through assistance from the ABS Initiative for Africa has developed a draft national law on Access & Benefit-Sharing in 2010-2011 and has acceded to the Nagoya Protocol on Access & Benefit Sharing under the Convention on Biological Diversity. National implementation of the Protocol remains a huge challenge.

Technology transfer and biodiversity: Technology transfer, also called transfer of technology, is the process of transferring skills, knowledge, practices, methods of manufacturing, samples of manufacturing and facilities among governments or universities and other institutions. Its objective is to ensure that scientific and technological departments are accessible to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, and materials or services (Grosse 1996).

Liberia has benefitted from a number of national and international capacity building workshops and conferences on technology transfer, but much remains to be done. Support to the NBSAP and CBD-related conventions would enhance help harness and harmonize skills and knowledge in biodiversity related fields.

Invasive alien species and biodiversity: Invasive alien plants (IAPs) are widely considered as a major threat to biodiversity, human livelihoods and economic development. This country has identified four main types of alien invasive species that are threats to forest, agriculture and the marine& coastal ecosystems. Recently, the development of oil palm monocultures have increased the potential of IAS to outclass natural breeds.

Incentive measures and biodiversity: A recent CBD Decision (X/44) as Incentive Measures (CBD 2010) encourages Parties to the Convention to adopt a range of policy measures and regulations designed to promote positive incentives and phase out perverse incentives, as well as to account for the value of biodiversity and ecosystem services in decision making. The Strategic Plan for Biodiversity 2011-2020, prepared by the Working Group on the Review of Implementation (of the CBD), is intended to promote effective implementation of the Convention through a strategic approach that will inspire broad-based actions by all Parties and

stakeholders. Target 3 of the Strategic Plan is that “By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phase out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio-economic conditions”.

Although the focus of this document is on incentives harmful to biodiversity, it is important to recognize that such incentives fall into the broad, well recognized category of environmentally harmful subsidies (EHS ‘Liberia has not developed the capacity to fully implement this target. Thus, it remains to be seen how the lack of, or inadequate incentives would contribute to loss of biodiversity.

Capacity building and biodiversity: Capacity deficiencies in biodiversity conservation and management are the major root causes of biodiversity loss in many countries in the tropics, Liberia among them. Insufficient capacity now constrained these countries’ ability to respond to and meet their global commitments. In the Liberian case, pertinent capacity deficiencies have been a limiting factor in the preparation and much less implementation of the National Biodiversity Strategy and Action Plan. The biodiversity sciences represent the disciplines of whole-organism biology, including systematics, ecology, population biology and the fields of comparative biology. The biological sciences are critically important in society because knowledge of whole organisms are essential for managing and conserving the world’s species.

Mainstreaming biodiversity: Biodiversity mainstreaming is the embedding of biodiversity considerations into policies, strategies and practices of key public and private actors that impact or rely on biodiversity, so that it is conserved and sustainably used both locally and globally (Huntley & Redford 2013). Biodiversity concerns need to be incorporated into land-use planning at all levels and integrated into production sectors, sustainable development and poverty reduction plans. One of the key ways to mainstream biodiversity is the approach exemplified by the economics of ecosystems and biodiversity study. The study shows how economic concepts and tools can help equip society with the means to incorporate the values of nature into decision making at all levels.

Applied economic thinking to the use of biodiversity and ecosystems services can help answer the two critical questions (in the attempt to integrate biodiversity into all levels of government planning) of : (i) why prosperity and poverty reduction do depend on the flow of benefits from ecosystems, and (ii) why successful environmental protection needs to be grounded on sound economics, including explicit recognition, efficient allocation and fair distribution of the costs and benefits of conservation and sustainable use of natural resources (TEEB 2010). TEEB’s analysis builds on extensive work in this field over the last decade. The approach can help decision makers recognize, demonstrate and, where appropriate, capture the values of ecosystem services.

Efforts have also being made in the past ten years at mainstreaming environment into the National Development Agenda. Beginning with the Poverty Reduction Strategy (2008-2011), and in 2012 with the Agenda for Transformation, (AfT) which is the present strategy up to 2017 and then to a middle class economy by 2030. Under this strategy, an environment pillar has been established under cross-cutting issues.

IPBES (Intergovernmental Platform on Biodiversity and Ecosystem Services): A major challenge for the conservation and sustainable use of biodiversity and ecosystem services is ensuring that decisions and policies are made with the best available scientific information. Until IPBES was founded, there was no on-going global mechanism recognized by both the scientific and policy communities to gather, synthesize and analyze information for decision making in a range of policy issues for the global environmental conventions and development policy dialogues. An intergovernmental science-policy platform on biodiversity and ecosystem services (IPBES) was needed to serve as a mechanism to build on these various processes and strengthen the science-policy interface relating to biodiversity and ecosystem services. IPBES is an interface between the scientific community and policy makers that aims to build capacity for and strengthen the use of science in policy making (UNESCO 2013, IUCN 2013).

Research and biodiversity: The relationship between biodiversity and the rapidly expanding research and policy field of ecosystem services is quite complex and challenging, and is damaging efforts to create a coherent policy. Using the widely accepted CBD definition of biodiversity, it is clear that biodiversity has key roles at all levels of the ecosystem service hierarchy as a : (i) regulator of underpinning ecosystem processes; (ii) final ecosystem service; and (iii) goods that are subject to valuation, whether economic or otherwise. Ecosystem science and practice has not yet absorbed the lessons of this complex relationship, which suggests an urgent need to develop the interdisciplinary science of ecosystem management bringing together ecologists, conservation biologists, resource economists and others (Mace et al 2012,

Biodiversity information system: By way of leading examples, three biodiversity information systems are the focus here. The first, Biodiversity Heritage Library (BHL), is a consortium of major natural history, botanical and research libraries that digitize and make accessible the literature of biodiversity held in their collections as part of a global “biodiversity commons”. It joined the Global Biodiversity Information Facility (GBIF) as an Associate Participant. GBIF operates through a network of global nodes to develop and maintain an open data infrastructure for sharing digital biodiversity data. Its participants include countries, intergovernmental and international organizations, and organizations with an international scope that seek to share data under common standards, and invest in tools, services and capacity building within biodiversity information frameworks. To date, over 90 participants have signed the GBIF MOU. The purpose of the GBIF is to promote, coordinate , design, enable and implement the compilation, linking, standardization, digitization and global dissemination and use of the world’s biodiversity data, within an appropriate framework for property rights and due attribution (<http://www.gbif.org>). The Clearing House Mechanism which is the key information portal of the convention is replicated in most party states including Liberia. It requires capacity to strengthen and maintain the portal.

Biodiversity and Energy: Biodiversity is a central issue to consider in the production, distribution and consumption of energy – now and in the future (IUCN 2006). It is the source of many forms of energy, and is frequently affected by its use. For hundreds of years, biomass energy and in particular wood, were the primary sources of energy for cooking and heating. More recently, societies have mobilized wind energy and fossil fuels, and learned to harness the power of water, the sun and even atoms. The result is a highly complex system of energy supply upon which economic development depends. The International Energy Agency predicts a 50%

growth in demand for energy by 2030, with 80% of that demand to be met by fossil fuels. Energy-related CO₂ emissions are expected to climb by 52% in 2030 (IEA 2005).

Biotechnology/bio-engineering and biodiversity: Current rates of disappearance of biological and cultural diversity in the world are unprecedented. Intensive resource exploitation due to social and economic factors has led to destruction, conversion or degradation of ecosystems. Reversing these trends requires time to integrate conservation and development. Liberia completed her National Biosafety Framework in 2009, and began the implementation in 2011. The application of biotechnology to food security and poverty has been the hallmark of all actions developed consistent with the Cartagena Protocol and the ECOWAS Biosafety Policy and Action Plan.

Millennium Development Goals (MDGs)/Sustainable Development and Biodiversity: The variety of life forms on earth, including genes, species and ecosystems, is known as biological diversity or biodiversity. Loss of biodiversity results in serious reductions in the goods (such as food, medicine and raw materials) and services (such as clean water and nutrient cycling) provided by the earth's ecosystems, which make human survival and economic prosperity possible. The Millennium Development Goals (MDGs) were formally established when the United Nations General Assembly adopted the Millennium Declaration in September 2000. Adoption of the Millennium Declaration paves a significant way to addressing issues of poverty eradication and sustainable development. The poverty goal of the MDGs addresses issues of extreme poverty, hunger and malnutrition, which are closely related to the livelihoods and vulnerability of households (World Bank 2002). Not much progress has been recorded under the Millennium Development Goals from the national perspectives up to 2015. The introduction of the Sustainable Development Goals should help in meeting specific targets and goals.

APPENDIX C: Biodiversity and Related Conventions to which Liberia is a Signatory

The seven international biodiversity and biodiversity-related conventions of which Liberia is a party are listed below, along with a brief description of each(www.cbd.int/brc/default.shtml):

Convention on Biological Diversity (CBD): The objectives of the CBD are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising from commercial and other utilization of genetic resources. The agreement covers all ecosystems, species, and genetic resources.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): The CITES aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Through its three appendices, the Convention accords varying degrees of protection to more than 30,000 plant and animal species.

Convention on the Conservation of Migratory Species of Wild Animals (CMS): The CMS, or the Bonn Convention aims to conserve terrestrial, marine and avian migratory species throughout their range. Parties to the CMS work together to conserve migratory species and their habitats by providing strict protection for the most endangered migratory species, by

concluding regional multilateral agreements for the conservation and management of specific species or categories of species, and by undertaking co-operative research and conservation activities.

The International Treaty on Plant Genetic Resources for Food and Agriculture: The objectives of the Treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security. The Treaty covers all plant genetic resources for food and agriculture, while its Multilateral System of Access and Benefit-sharing covers a specific list of 64 crops and forages. The Treaty also includes provisions on Farmers' Rights.

Convention on Wetlands (popularly known as the Ramsar Convention): The Ramsar Convention provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The convention covers all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities.

World Heritage Convention (WHC): The primary mission of the WHC is to identify and conserve the world's cultural and natural heritage, by drawing up a list of sites whose outstanding values should be preserved for all humanity and to ensure their protection through a closer co-operation among nations.

International Plant Protection Convention (IPPC): The IPPC aims to protect world plant resources, including cultivated and wild plants by preventing the introduction and spread of plant pests and promoting the appropriate measures for their control. The convention provides the mechanisms to develop the International Standards for Phyto-sanitary Measures (ISPMs), and to help countries to implement the ISPMs and the other obligations under the IPPC, by facilitating the national capacity development, national reporting and dispute settlement. The Secretariat of the IPPC is hosted by the Food and Agriculture Organization of the United Nations (FAO).