NATIONAL ENVIRONMENTAL ACTION PLAN (NEAP) FOR THE REPUBLIC OF LIBERIA

2019-2023

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- The Stakeholder Engagement Report: EPA, 2019b. *State of the Environmental Report for Liberia for 2007-2018*. Environmental Protection Agency: Monrovia.
- The State of the Environmental Report (SoER): EPA, 2019a. *State of the Environmental Report for Liberia for 2019-2023*. Environmental Protection Agency: Monrovia.

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LIST OF ACRONYMS

CARI	Central Agriculture Research Institute
CIL	Carbon-in-Leach
CITES	Convention on International Trade in Endangered Species
CSO	Civil Society Organisation
EMP	Electricity Master Plan
EPA	Environmental Protection Agency
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
FDA	Forestry Development Authority
FGD	Focus Group Discussion
GBIF	Global Biodiversity Information Facility
GHG	Greenhouse Gas
GoL	Government of Liberia
Greencons	Green Consultancy Inc.
IAS	Invasive Alien Species
IWRM	Integrated Water Resource Management
KII	Key Informant Interview
LFSP	Liberian Forest Sector Project
LLA	Liberia Land Authority
LWSC	Liberia Water and Sewer Corporation
MICAT	Ministry of Information, Cultural Affairs and Tourism
MME	Ministry of Mines and Energy
MoA	Ministry of Agriculture
MoH	Ministry of Health
NAP	National Action Plan
NBSAP	National Biodiversity Strategy and Action Plan
NDC	National Determined Contributions
NEAP	National Environmental Action Plan
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organisation
NoI	Notice of Intent
NOSCPL	National Oil Spill Contingency Plan in Liberia
NPO	Non-Profit Organisation
PAPD	Pro-Poor Agenda for Prosperity and Development
PES	Payment for Ecosystem Services
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SoER	State of the Environmental Report
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WABiCC	West Africa Biodiversity and Climate Change Project
WASH	Water, Sanitation and Hygiene
WHO	World Health Organisation

1. INTRODUCTION

1.1 CHAPTER OVERVIEW

The Environmental Protection Agency (EPA) of Liberia contracted Green Consultancy Inc. (Greencons) in 2018 to prepare the second State of the Environmental Report (SoER) for Liberia for the period 2007-2018. A key outcome of the SoER is a first National Environmental Action Plan (NEAP), which has been compiled to guide the management of Liberia's environmental resources for 2019-2023. The following NEAP should therefore be read alongside the SoER (2007-2018), as it contains the data upon which the recommendations in this NEAP are based.

The following chapter describes the NEAP process and briefly touches on the methodology which was employed by the specialists to conduct the various assessments upon which the data and recommendations in this plan are based.

1.2 THE NATIONAL ENVIRONMENTAL ACTION PLAN PROCESS

The NEAP is based upon the findings presented in the SoER; the latter which provides an assessment of the status and trends of the environment and its natural resources, and their effect on the wellbeing of the country's population. Once in every five years, there is a nation-wide study carried out to establish the State of the Environment, as well as to develop a five-year NEAP to guide the Government of Liberia (GoL) in managing its environmental resources. The preparation of the SoER and NEAP is largely participatory, drawing knowledge and resources from lead agencies, development partners, research institutions and Civil Society Organisations (CSOs)/Community Based Organisations (CBOs) amongst others. Although an SoER technical committee is responsible for overall quality control, the preparation of these reports is outsourced to ensure transparency and quality data from environmental specialists.

Developing the NEAP essentially assesses the country's current environmental state, and it also finds key trends and indicators to evaluate how particular environmental resources affect the country's economy and the livelihoods of its citizens. The term 'environment' is used holistically to include biophysical, social, and economic indicators.

The SoER process is guided by the following six key questions:

I. How and why is the environment important to the people of Liberia?
II. How is the environment of Liberia changing (if at all)?
III. What challenges and opportunities does such change hold for the country?
IV. Are there special issues which affect the environment and the development of the country that require attention and new management approaches?
V. How will different policy choices/strategies affect the future of the country and its citizens?
VI. What can be done to ensure that environmental value is retained/enhanced so as to ensure that the lives of the population are improved?

Answering these questions, the NEAP considers four essential country resources (or themes) which can be used for assessing Liberia's environmental state and trends. These resources are:

- **Terrestrial Resources** (forestry, soil etc.);
- **Aquatic Resources**;
- **Cross-Sectional Resources and Environmental Linkages**; and

- **Emerging Issues and Outlooks**.

The last type of cross-sectional resources considered are also referred to as environmental linkages, as these resources 'link', and bear reference to, various resources already discussed. Themes such as biodiversity, culture and heritage and energy are explored thereunder. It should be stressed that a fourth environmental resource, namely **atmospheric resources**, is not discussed in this plan due to a lack of available scientific data. Under Emerging Issues and Outlooks, topics such as the spread of Invasive Alien Species (IAS), or solid waste management, both which are more 'recent' and emerging issues, are discussed.

The EPA is responsible for managing the NEAP process. Following the publication of the first SoER for Liberia in 2006, the current (second) SoER and the drafting of this NEAP commenced in June 2018 following a publication of a Notice of Intent (NoI) in two national newspapers for the purpose of informing the general public and soliciting public inputs. On the 10th of September 2018, an inception workshop was held in Monrovia to initiate the reporting process and to identify all the relevant stakeholders involved. The meeting was attended by representatives from various government ministries, agencies, and commissions; from representatives of CSOs, and CBOs, Non-Governmental Organisations (NGOs) to international NGOs. During the inception meeting, the consulting team presented the approach and methodology for the preparation of the SoER and considered stakeholder inputs and recommendations.

Drafting this plan involved the following steps:

Literature review: The literature review was conducted by the specialists contracted by Greencons to serve the following purposes:

- Providing the required foundation of knowledge for the various themes;
- Identifying under each of the themes explored areas of previous research (i.e. secondary data);
- Identifying data inconsistencies, such as gaps in research, contradictions in previous studies or open questions left from other research;
- Identifying the need for further research; and
- Placing the SoER within the context of existing available literature and consequently reasoning as to why further investigations are needed in specific identified fields.

Stakeholder consultation: A range of stakeholders were consulted as part of the data gathering process. A stakeholder can herewith be defined as an individual and/or organisation who/which is actively involved in the project, or whose interests may be positively or negatively affected/impacted as a result of project execution or successful project completion. This therefore ranges from all government institutions, CSOs, CBOs, INGOs/NGOs to the private sector and academia. Included would also be any community, individual or group which has a shared interest in, or contribution to, the findings or outcomes of the SoER and NEAP. The purpose of the stakeholder's consultation process for the current SoER/NEAP programme was to assist the GoL through its EPA to assess the current state of the Liberian environment and draft action plans for enhancing environmental management.

Consulting key stakeholders is essential for harnessing valuable knowledge directly from the primary source, data which are not always available in a literature search (secondary data). Often, 'stakeholders might apply principles and strategies which are not well documented, but which could have profound outcomes to their work, for developing the SoER and NEAL.' Engaging with a government department based on its own understanding of the department's

role, for example, could offer insight into possible limitations or areas for improvement not reflected in any secondary data. Stakeholders' expectations of their own departments/institutions and roles and responsibilities could also profoundly affect the management tools to develop. The stakeholder engagement process is not only essential to obtain data for the report and plan. It is also essential for creating awareness about the functions of the SoER and NEAP.

In summary, the objectives of these consultations were as follows:

- Identifying key stakeholders and their interests and concerns in relation to the management of the environment;
- Ensuring that stakeholders understood the importance of the SoER and received information thereof;
- Informing and involving affected/impacted and interested individuals and organisational stakeholders in the development of the SoER and to incorporate their concerns in the preparation of a NEAP;
- Collecting baseline data on a range of environmental resource related to (but not limited to) air quality, soil, agriculture, socio-economy, waste and sanitation, ecology, watershed and integrated water resource management, forestry, etc.;
- Allowing for meaningful stakeholder input in the design of the NEAP. Including concrete measures for addressing environmental issues in various sectors; and
- Ensuring that stakeholders have access to information on the SoER/NEAP process.

The methodology used to solicit stakeholders' views, inputs, and recommendations regarding Liberia's environmental state principally revolved around a stakeholder engagement exercise. The stakeholder engagement exercise was conducted across 14 of the 15 counties and in 11 strategic communities in Liberia. Topics discussed with each stakeholder centred on essential issues relevant to the country. In order to collect data, Greencons dispatch a team of specialists across Liberia to undertake a comprehensive stakeholder engagement programme. The team was authorised by the GoL to conduct a series of engagement consultations with various stakeholders from the communities, local government, concessions, and the general public. The engagement meetings were aimed at soliciting the views and concerns of government and the wider public on a couple of issues. Such issues ranged from the status of the country's biodiversity and socio-economy to other relevant drivers influencing environmental change.

The methodology encompassed the following phases:

- Public notifications;
- Administering a questionnaire to key stakeholders;
- Site assessments;
- Key Informant Interviews (KIIs); and
- Focus Group Discussions (FGDs).

The objective of the consultation process was not only for the key stakeholders identified to provide needed data for the SoER and NEAP. It was intended also for providing them with an opportunity to discuss their concerns regarding Liberia's environment. For example, stakeholders were identified in their specific fields of interest and work to provide in-depth knowledge about the challenges and potential opportunities related to a specific environmental resource. It offered an opportunity for these stakeholders to be part of any possible solutions because they were able to provide recommendations and mitigation measures. The data gathering process can therefore be seen as a form of capacity building, which allowed

representatives across several sectors and fields to contribute to environmental solutions. This was captured in the NEAP.

Refer to the Stakeholder Consultation Report (EPA, 2019a) for a comprehensive account of the methodology and stakeholder engagement component to this study.

Drafting the NEAP: The drafting of this plan consisted of reviewing secondary data and gathering primary data, then reporting this in a concise and structured manner across different environmental themes. Part of this process was also to identify gaps in literature or data received from stakeholders, and to present different management options for various environmental challenges faced by the country. After considering and incorporating all the data sourced from the various specialists on the team, the final structure of the NEAP deviates in many ways from what the team envisaged the structure would look like in the beginning of the data gathering process. For example, initially, our team envisaged that there should be a session on cross-section resources, and one on 'environmental linkages'. After having reviewed and incorporated the data obtained into the report, we realised that these two sections can be merged. Other sections, such as atmospheric resources, were taken out, as insufficient data could not be obtained.

SoER and NEAP validation workshop: Subsequent to submitting this report, a range of stakeholder engagement meetings was scheduled to obtain stakeholders' comments on this and the NEAP.

Final SoER and NEAP: This phase involved incorporating all the comments received on the drafts and finalising the documents for submission to the EPA. Given the volume of the report, it was recommended for the EPA to prepare a number of policy briefs for distribution to policy makers. Particularly, important constituencies, (which often miss out on important environment messages) include people who are illiterate and school-going children. Therefore, it was recommended that the EPA shall produce leaflets in simple English, comprising the SoER and NEAP. These should cover a wide range of thematic areas with recommendations and messages regarding the environmental challenges faced by Liberia.

1.3 PLAN STRUCTURE

The report commences with Chapter 2 which provides recommendations pertaining to terrestrial resources. Under this theme, recommendations were provided for improving the management of Liberia's land, soil, agriculture, forestry, and woodland. This is followed by Chapter 3 which covers aquatic resources and which considers wetland management and the management of the increasingly important fishery sector. This chapter is followed by Chapter 4, which considers cross-sectional resources and environmental linkages. These largely include recommendations for improving government's responses to environmental resources which are related to, and influenced/intersected by, other resources. Also include the provision of safe drinking water and sanitation services, the management of biodiversity, energy scarcity, and culture and tourism. Lastly, Chapter 5 provides recommendations for emerging issues and outlooks. The latter include, for example, IAS, the usage of chemicals and the challenges faced by the government in terms of solid waste management. The plan concludes with a table summarising the main recommendations in the NEAP.

2. ENVIRONMENTAL STATE AND TRENDS: TERRESTRIAL RESOURCES

2.1 OVERIEW

Land resources provide a variety of functions and services that can be used to support a country's ecosystem processes, livelihoods and food security. Such land resources include, but are not limited to:

- Agriculture;
- Forestry;
- Tourism;
- Human settlements;
- Wildlife;
- Mining; and
- Industrial development.

However, a combination of interlinked factors is presenting a threat to the sustainability of land resource management within Liberia. Such factors include, but are not limited to:

- Unregulated mining;
- High impact logging;
- Inappropriate agricultural practices;
- Unplanned human settlements; and
- Industrial expansion.

Poor land-use management in Liberia can be attributed to a lack of land-use planning and the current land tenure system. In Liberia, land-use planning and zoning regulations are virtually non-existent. The lack of a land-use planning means that land is not being used to its best advantage, which ultimately affects the sustainability of the land and its land-use potential.

Liberia is dominated by lowland and wet evergreen tropical forests. In fact, Liberia has one of the largest remaining contiguous forest blocks in West Africa. In recent times, land and infrastructural development, timber extraction and the introduction of rubber and oil palm plantations have opened up areas of high-density forests and resulted in the expansion of agriculture and mining. As a result, man-made savanna is spreading along the coast and extending inland, whilst the same can be observed along the northern Liberian border.

Liberia's Forestry Development Authority (FDA) is responsible for the sustainable management and conservation of all forest resources, including forest lands, protected or conservation areas (national parks, reserves, sanctuaries, etc.) and wildlife. The FDA also provides medium- and long-term planning within the forest sector, as well as prepares forest-strategic policy and strategic laws and regulations for maintaining a regulatory framework consistent with Liberia's laws and its commitments to international agreements/treaties and conventions foresees to the administration thereof. The FDA ensures that all activities within the forestry sector of Liberia are based on sound scientific and technical principles and, at the same time, ensures that a complete range of goods and services of the state are provided. Lastly, FDA is responsible for all forest concession agreements. It monitors activities of timber companies and oversees the creation and sustainability of protected areas and community forest management programmes. Apart from the FDA and its mandate, the administration and management of land-related portfolios are the statutory responsibilities of several ministries and agencies of the Liberian

Government. Such ministries that may have various roles in the administration of land affairs include:

- **Ministry of Internal Affairs:** This ministry is responsible for local government administration and government functions within local and urban areas. The ministry is the overseer of all chiefdoms and clans and has custodianship over all private and public properties within the territorial confines of Liberia. It also mediates all disputes arising from sale and ownership of land;
- **Liberia Land Authority (LLA):** LLA is primarily mandated to develop policies on a continuous basis, undertaking actions and implementing programmes in support of land governance, including land administration and management;
- **Ministry of Agriculture (MoA):** This ministry is responsible for the planning, executing, administration, management, and supervision of agricultural programmes;
- **Ministry of Mines and Energy:** This ministry has the statutory responsibility for the development of minerals, water, and energy resources of the country. It is the principle administrator of lands, including survey of private and public lands and issuance of deeds for all lands; and
- **FDA:** The FDA is responsible for the sustainable management of forests and associated resources. It provides medium- and long-term planning within the forest sector, as well as the preparation of a promulgation of forest policy and strategies, law and regulations and administration. The portfolio includes forest concession agreements, monitoring activities of timber companies and custodianship of protected area programmes, wildlife, and national parks.

There have been several initiatives from the government to manage its terrestrial resources. Some of these include the development of a land tenure policy. Post-civil-war Liberia has seen a number of strategic policies, laws and regulations being drafted by the Liberian Government in an attempt to address land issues and challenges. Most of these have been in response to land tenure, governance, and forest management. These developments are still ongoing with minor changes continuously being made to policy and implementation planning; which are often scrutinised by some stakeholders.

Another more recent government initiative, with assistance from international agencies, to protect Liberia's terrestrial resources is the Liberia Forest Sector Project (LFSP). This project aims to curb illegal logging strength management of targeted forest landscapes through biodiversity conservation and unsustainable agricultural practices in Liberia. The partnership between the GoL and international agencies holds a promise of reducing carbon emissions related to deforestation and forest degradation, facilitating the process green growth, and enhancing livelihoods. Another project is the West Africa Biodiversity and Climate Change Project (WABiCC), which aims to combat wildlife trafficking, improve coastal resilience, reduce deforestation, forest degradation, and biodiversity loss in key forests.

Examples of initiatives aimed at improving the management of Liberia's terrestrial resources include, for example, the International Timber Trade Organisation Afforestation and Reforestation Project, the TRANSCO CLSG Reforestation Project, and the current REDD+ (Reducing Emissions from Deforestation and Forest Degradation in developing countries) Strategy Project in Foya, Lofa County. The Foya Corridor has been selected due to the significant encroachment of savannah grass from Guinea, causing extensive degradation and increasing environmental fragility. This project seeks to enhance mitigation efforts directed at climate change and sets a target for restoring degraded grasslands through reforestation by 2023. Actions planned in the Revised National Biodiversity Strategy and Action Plan (NBSAP) (2014) to achieve this target includes, but are not limited to:

- Promoting and supporting community-based forest management programmes;
- Supporting reforestation and afforestation;
- Establishing woodlots in degraded landscapes; and
- Putting in place programmes to provide incentives to forest-dependent communities for ecosystem services under the REDD+ Project.

2.2 RECOMMENDATIONS

Institutionally, the Liberian Government is more than adequately placed to manage issues of terrestrial land-use and the challenges highlighted above. There are many programmes, locally and through international organisations and collaborations, that are doing reputable work in rebuilding the nation on this front. It is glaringly obvious, however, that at a national and local government level, Liberia succumbs to a shortage of skilled specialists. Another challenge is that many of the current programmes aimed at protecting and managing Liberia's terrestrial resources are highly fragmented and uncoordinated. What is needed, rather, is to improve the coordination of such programmes to address key issues, concerns, and emerging challenges.

The following section considers key recommendations, particularly for soil management, but also sustainable forest management.

Soil Management

In order to promote best sustainable soil management practices in Liberia, the government is encouraged to:

I. Provide aid and budgetary support to the agriculture sector to enable the use of improved technologies;
II. Promote nation-wide sustainable soil management practices. This could be achieved by conducting a general awareness and training program aimed at farmers, in order to inform them of the significant role of soil as a resource to sustaining production and crop growth;
III. Conduct a detailed and periodic soil survey in Liberia to guide land usage and related practices; intact
IV. Conduct broader studies that deal holistically with the soil resource, developing a detailed soil map showing all aspects of the resource;
V. Place a premium on reforestation of degraded land, whilst afforestation efforts concentrate on the planting of trees (reforestation) in an area where there was no previous tree cover, in order to create forests and increase carbon capture. These two land restoration activities instituted by the GoL should help to reduce desertification and excessive erosion, thereby ensuring that the major soil properties and fertility potential remain intact for successive agricultural development. This could be achieved through, for example, considering drafting a policy to promote reforestation and afforestation in order to replace deforested land and grasslands/savannah areas for the sake of reducing desertification and excessive land-use;
VI. Develop legislation to guide the sustainable soil management across Liberia. Penalty systems could be introduced against violators;
VII. Mainstream fragmented national soil policies, laws, and regulations to safeguard the soil resource of Liberia;

VIII. Promote low-land development and integrated farming in order to reduce upland shifting cultivation; thereby increasing sedentary farming,

IX. Encourage sustainable soil management, especially through awareness, in order to keep all farmers and other end-users informed about the essential role of soil related socioeconomic development; and

X. Provide support to the Central Agriculture Research Institute (CARI) and all academic institutions involved with agricultural skills development.

Forestry and Challenges to Sustainable Forest Management

In order to develop the forest sector, the government is urged to consider the following:

I. Establishing forest trees' plantations and woodlots establishment as key approaches to sustainable forest management;

II. Reviewing and strengthening current law enforcement mechanisms for all forest management activities;

III. Designing a community-wide programme to educate and raise awareness on the Community Rights Law with respect to forest lands (CRL, 2009);

IV. Promoting and supporting small-scale forest-based enterprises and ensuring value addition in communities that have signed community forest management agreements with the FDA and linking harvested forest products to potential markets;

V. Reconciling the differences between external (state-organised) and internal (traditional) structures of governance in recognised community forest establishments;

VI. Introducing to the FDA a standardised method to threat definition and ascertaining its application to other government agencies where and when it is deemed necessary;

VII. Developing, in all forest conservation endeavours, a framework and legal instrument for the recognition and employment of pertinent indigenous knowledge;

VIII. Enacting an energy policy and strategy that will assist Liberia to reduce the level of dependence on wood (such as for charcoal or firewood);

IX. Funding more studies on the biophysical characteristics of inland and coastal (mangrove) forest ecosystems and the socio-economic assessment of the impact of their managements and uses;

X. Developing and implementing sustainable farming methods, as well as encouraging lowland farming practices and offering training to farmers in the usage of such methods and practices;

XI. Develop sustainable ecotourism and tourism programmes from the conservation landscapes/protected areas that will provide direct financial benefits to fringe protected area affected communities and, at the same time, provide positive experiences to host protected area affected communities, visitors, and the state as a whole;

XII. Promoting and supporting sustainable livelihoods of forest-dependent communities and other rural residents which could provide food and generate income;

XIII. Advocating for, and lending support to, participatory land-use planning projects at district- and clan-level in the regions now housing the lion's share of the remaining forests (coastal and inland areas). A similar plan has already been prepared for Foya District, which is essential for Liberia where no national land-use plans exist;

XIV. Developing a training and capacity building programme to enhance community-based forest management endeavours. This could build capacity in forest-dependent

communities to develop rural forest-based enterprises, which could provide sustainable economic activities and combat deforestation and biodiversity loss;

XV. Preparing and seeking support (funds, technical assistance, etc.) for a national rehabilitation programme for mangroves and logged areas of inland forests;

XVI. Developing and implementing a nation-wide education and awareness creation programme on the ecosystem services that forests provide;

XVII. Developing and managing community forests to generate income, as well as a wide range of other goods and services, so as to contribute to a reduction in rural poverty and, on the other hand, meet rural timber requirements to the greatest extent possible;

XVIII. Encouraging and supporting sustainable livelihoods that are ecosystem service-dependent;

XIX. Funding a comprehensive study (through a series of country-wide case studies) on the challenges and threats (direct/indirect) of agro-industrial crop plantations, logging, mining, firewood collection and charcoal production of forest trees;

XX. Recording disputes and conflicts generated by extractive industries and their socio-economic impacts and environmental consequences;

XXI. Developing and implementing a program to improve the usage of forestry resources and to create awareness of the ecosystem services the forests provide to forest-dependent communities; and

XXII. Developing and designing a national forest health monitoring program in order to determine the status, changes, and trends in indicators on forest health on an annual basis. This program will help us collect information from a wide variety of sources, including ground surveys, aerial detection, and remote sensing.

3. ENVIRONMENTAL STATE AND TRENDS: AQUATIC RESOURCES

3.1 OVERIEW

Liberia has approximately 570 km of North Atlantic Ocean coastline along its southern border, with an economic zone of 13 nautical miles and a territorial zone of 200 nautical miles. Liberia has a surface area of approximately 111,400 km^2 with the majority of Liberia's population living along the coastal zone. The livelihoods here depend, to a large extent, on the resources and economy associated with the coastal region.

Liberia, as a developing nation, needs to develop appropriate policies and programmes to combat the increasing pressure on its watershed and water resources. The governance of water resources is the responsibility of several agencies and ministries in Liberia. However, a disintegrated legal framework governing water resources in Liberia has led to an uncoordinated and fragmented approach to resource management. This has also resulted in cumulative water issues and decreasing water quality across many aquatic habitats. Liberia's human population growth is exponential, and therefore, any programmes to provide quality drinking water and sanitation to communities must take into consideration such population growth and what this means for the water sector.

The following chapter relates to data provided in the SoER (2007-2018) for the recommendations of the management of water resources.

3.2 ISSUES EXACERBATING LIBERIA'S WATER RESOURCE MANAGEMENT

There are several issues which exacerbate the GoL's ability to manage its water resources affectively. Some of these issues revolve around the following considerations:

- Liberia shares several international rivers with its neighbours. A coordinated management approach to these transboundary waters is missing;
- Lack of suitably qualified and experienced water resource practitioners due to specialists migrating to other countries;
- Lack of available funding and adequate training opportunities;
- Human resources and enforcement capacity almost non-existent, especially in the regulation and monitoring of the fishery sector;
- There are no statutory regulations regarding water ownership, control, and use. For example, the ownership of water running in a defined channel (e.g. a river) is not effectively managed, as water is generally seen to be a freely available resource. Moreover, groundwater, which does not flow in a well-defined channel and which therefore cannot be assigned to surface water courses, are often regarded as the property of the owner of the land. This means that such water can be withdrawn by the owner without any liability to adjoining land. The issue of reasonable water use or proportionate sharing of, and withdrawal from, a common water source currently does not appear to be considered in Liberia's water management sector; and
- The granting of a mining concession presupposes the right to take water and use it. Currently, such mining concessionaires do not need to secure ownership of land adjacent to water courses in order to draw water for the mine's own purposes.

As Liberia's human population relies heavily on the supply of groundwater, there is an urgent need for a hydro-geological programme to delineate, characterise and monitor the country's water aquifers comprehensively.

3.3 WETLANDS AND FISHERY CHALLENGES

The challenges related to the management of wetlands and fisheries can be summarised as follows:

For wetlands, there is an:

- Exponential human population growth with more people who depend on such resources;
- Influx of people from rural areas to coastal areas, which accelerates the need for improved management of these resources; and
- Inadequate water supply and poor sewerage/sanitation practices in the country.

The challenges to the management of the fishery sector include, but are not limited to:

- Poor infrastructure (for example, a lack in harbours, poor transport, and roads);
- Limited research on fishing stocks;
- Limited research on aquaculture species, feed etc.; and
- Illegal fishing by foreign trawlers/no system to monitor/enforce such fishing.

Economic considerations and funding are at the very core of improving water resources management. In the process of establishing appropriate fees and tariff structures, economic, environmental, financial, and social considerations play a crucial role. There is also no national budget allocation for a National Integrated Water Resources Management Policy (IWRM) that can guide water resource development, use, protection, and conservation.

3.4 CURRENT ACTIONS ALREADY TAKEN

On the 2nd of November 2003, the Liberian Government made a concerted effort to address the management of its wetlands by the accession and ratification of the Ramsar Convention. A post-conflict assessment of the war on the wetlands was subsequently initiated, which resulted in the production of a national report of impacts of the conflict on the wetlands. Moreover, a National Wetland Policy was developed and adopted in 2006 and a National Wetlands Committee was subsequently established.

The key principles underlying the wetland policy include:

- The health and health needs of Liberians who are dependent on wetlands and the ecosystem services that such wetlands provide;
- The need for communication and education of Liberians with respect to people's perceptions and attitudes towards wetlands and wetland uses;
- The need for an ecosystem-based approach to ensure the conservation of wetlands;
- The conservation of wetlands through the co-ordination and involvement of all relevant stakeholders, including local people and the private sector;

- The role of the government in the conservation of wetlands, whilst still considering the rights of the local people and their land ownership; and
- Management and conservation of Liberia's wetlands through continuous scientific research and expertise development.

In order to achieve the goals as set out in the policy referred to above, strategic priorities were acknowledged and included the following:

- Identifying existing relevant legislation to enact the proposed policy and develop additional laws for those principles not covered in the program, laws which target both communities living in wetland areas, as well as the relevant policy-makers;
- Developing a national awareness;
- Incorporating wetland issues into the national planning processes; and
- Promoting international co-operation with neighbouring countries that share water resources through recognised joint projects and strategies.

The GoL has attempted to address the constraints and challenges of the fisheries sector through the promulgation of the Fisheries Regulations Act of 2010 (GoL, 2010) and the development of a Fisheries and Aquaculture Policy Strategy (Bureau of National Fisheries, 2014). Existing collaborations include research and professional training from the Government of Norway through the Water Resources and Energy Directorate (NVE) and the Ministry of Mines and Energy.

Through support from UNICEF and the European Commission, preparation of the National Integrated Water Resources Management Policy commenced in 2004 and was published in 2009. This was followed by the preparation of the Water Supply and Sanitation Policy of 2009, which was a precursor to the Water, Sanitation and Hygiene (WASH) Compact and ultimately the Water Supply and sanitation Strategic Plan launched in 2012 and followed also by the preparation of Liberia's roadmap for the adoption of the IWRM Framework. The Water and Environment Centre of the United Nations Environment Program (UNEP-DHI) assumed a supportive technical assistance role in this process, under the auspices of ECOWAS Water Resources Coordination Centre.

3.5 PROPOSED ACTIONS

The following actions are proposed:

I. The Water Resource Management Sector is fragmented with roles and responsibilities split amongst key line ministries and agencies. There is a need to have a single public entity for efficient, sustainable, and accountable water resource management and sanitation service delivery to the public;
II. The GoL must invest in capacity building and the development of specialists. Specialists include policy makers, environmental lawyers, hydro-geophysics, hydro- geologist and water resources specialist etc.;
III. The GoL should monitor wetland usage;
IV. Research of ecosystem functions and services should be conducted, especially focusing on the use of wetlands as nursery habitats for fishery and other marine and freshwater species;

V. Periodic monitoring of watersheds within land areas of higher elevations should be undertaken;

VI. The GoL should regulate fishing activities;

VII. To promote sustainable community fishery livelihoods, fishery stocks should be assessed. This should be coupled with economic and statistical analysis, community development, upgrading of gear and vessels, and the initiation of workshops and training opportunities;

VIII. The GoL should explore international and regional co-operative agreements and management policies for shared water resources with adjacent countries such as Sierra Leone, Guinea, and the Ivory Coast;

IX. The GoL needs to legislate an act on point-source pollution, especially in and around mining areas;

X. The government needs to develop a policy against open defecation in and along major river banks;

XI. The management and maintenance of water quality need urgent attention;

XII. Where these are not yet established at community-level, the government should enforce cost recovery and local management of water points by community WASH committees;

XIII. At county-level, the government should build capacity to manage spare-part supply-chains and train pump mechanics;

XIV. At national-level, the government needs to improve the registration, vetting, and quality control of pump installers and roll out technical guidelines on hand pumps and water quality; and

XV. The Gol should develop an urban water sector investment plan aligned with a sector strategic plan.

4. ENVIRONMENTAL STATE AND TRENDS: CROSS-SECTIONAL RESOURCES AND ENVIRONMENTAL LINKAGES

4.1 OVERVIEW

This section of the plan considers environmental state and trends which intersect with each other, and which cannot be viewed in isolation. One example of this is the provision of safe water and sanitation, for example. According to UNICEF reports, Liberia has abundant water resources. However, close to 90% of its population have limited access to safe drinking water. The state of sanitation is deplorable, with the vast majority of people in rural areas lacking decent toilets and restrooms, and having to defecate in the open instead.

Another issue, for which proposed recommendations are provided, is biodiversity. The word biodiversity is used to mean the variety of life on our planet, measurable as the variety within and between species, and the variety of ecosystems. A discussion on biodiversity therefore intersects with other environmental states and trends, such as Liberia's terrestrial or aquatic resources. As part of biodiversity, the concept of Payment for Ecosystem Services (PES) is also discussed under this section, which provides a link with various resources already considered. This include culture and economic resources, for example.

Another resource for which proposed government actions are provided is culture and tourism, which also transverses to cover issues related to biodiversity, terrestrial and aquatic resources. Lastly, energy is also considered under this section. By discussing energy, several environmental states and trends, already discussed, intersect. Most of these relate to the ecology (such as biomass), climate and pollution.

4.2 SAFE WATER AND SANITATION

4.2.1 OVERIEW

According to the World Health Organisation (WHO) and UNICEF's Joint Monitoring Programme Report (2017), 42% of Liberians lack access to quality drinking water. Moreover, less than 10% of Liberians have access to safe drinking water and sanitation services.

A fundamental concern related to the quality of either groundwater or surface water is the common practice of open defecation in Liberia. A study conducted in 2017 along the Duport Road in Greater Monrovia found that around 28% of families living along this road openly defecate next to this road. This contributes severely to health problems and concerns. Open defecation is associated with a microbial contaminant that can be washed into surface waters and groundwater *via* run-off or flooding during the rainy season. Open defecation is a major cause of fatal diarrhoea. For example, according to a WHO country profile for Liberia, diarrhoea is among the first three diseases with a high mortality rate among children under five years of age. Inadequate sanitation is associated with significant morbidity mainly from diarrhoea-related diseases. In 2005, the open defecation prevalence rate in Liberia was 51% with a 16% projected reduction in 2015. Improved sanitation contributes enormously to human health and well-being, especially for children and women. We know that simple, achievable interventions can reduce the risk of contracting the diarrhoea-related diseases by a third.

Drinking water sources should be improved to ensure that the quality is maintained right from the water source to the point of use. Safe drinking water supply supports public health activities by contributing to a reduction in diarrheal cases, particularly amongst the vulnerable population, which include pregnant women and children under five. Improving access to sanitation is a

critical step towards reducing the impact of these diseases. It also helps create physical environments that enhance safety, dignity, and self-esteem. Safety issues are particularly crucial for women and children, who otherwise risk sexual harassment and assault when defecating at night and in secluded areas.

4.2.2 CURRENT ACTIONS ALREADY TAKEN

The delivery of safe drinking water is vital for protecting public health and promoting more secure livelihoods. Historically, ensuring delivery of safe water has relied on testing water quality at the point of entry to the distribution system, the location of delivery, or at the end of use.

In 2011, the GoL signed the Liberia WASH Compact with the following principal objectives:

- Establishing and strengthening institutional capacity to manage, expand and sustain WASH services;
- Increasing access to sustainable water; and
- Developing information management systems and improving monitoring, data collection, communication, and sector engagement procedures.

WASH sector reports on Liberia showed a minimum gain in the case of drinking water and sanitation. However, more training is needed for the collection and analysis of data in the Liberian Water Sector. In addition to the availability of safe drinking water, the GoL launched the Mar del Plata Action Plan, targeting rural and urban communities. The plan aims increase access to safe drinking water to 63% of the population by 2015. However, in the absence of baseline data in regard to in the Mar del Plata Action Plan, the 63% target population cannot be measured. Also, in 2017, WASH reports on Liberia provided information on the poor-quality water infrastructure and sanitation in the country.

A comprehensive database on Liberia's water sector could provide information on source water quality and water-related illnesses. Therefore, improvement in policy that will upgrade Liberia's drinking water quality production from basic to safely managed drinking water will reduce any potential water-related diseases.

4.2.3 PROPOSED ACTIONS

Liberia's water sector needs to be revitalised to meet the needs of every citizen. Primary treatment of drinking water in Liberia is inadequate as there is no policy to control run-off and sewage, which empties directly into source water. Therefore, the creation of a National Drinking Water Standard using the WHO Drinking Water Standards will be relevant to the production of quality water.

To see to the improvement of sanitation and access to quality drinking water in Liberia, the following actions need to be taken into consideration and implemented:

I. Increase investment in integrated water resources and the management of freshwater ecosystems and sanitation at local-level;
II. Support and strength the participation of local communities in the improvement of water quality and sanitation management;

III. Strengthen local water governance structures established under project interventions in the affected counties and especially neighbouring counties to help these counties conserve water resources coordinative and collaboratively;
IV. Develop a Liberia Drinking Water Quality Standard using the WHO Water Standard;
V. Construct withholding pit latrines in rural Liberia to mitigate the increase open-defecation; and
VI. Strength source water protection and resilience of drinking water supplies.

4.3 BIODIVERSITY

4.3.1 OVERIEW

Coming to grips with Liberia's biodiversity issues is a challenge as there are so much data, yet the data are uncoordinated and need verification in some cases. This is especially important considering pressures coming from all sectors of Liberia's economy and society. Some of these pressures, as referred to in the SoER for 2007-2018, include:

- Monoculture plantations associated with Liberia's agricultural economy are established on landscapes which were once forested. In this decade, more than any other in Liberian history, an upsurge of oil palm plantations is occurring at an unprecedented rate;
- 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;
- The high importance of bush meat, and the lack of adequate alternatives to native animal protein, have put tremendous strains on Liberia's wildlife; and
- Shifting cultivation, a traditional farming system which the majority of Liberia's population are engaged in. Traditionally, domestic production of the country's main staple foods still relies on a traditionally low input/low output, shifting cultivation-mixed crop system which has been responsible for the loss of large proportions of indigenous forest and vegetation.

4.3.2 CURRENT ACTIONS ALREADY TAKEN

The Global Biodiversity Information Facility (GBIF) is an international network and research infrastructure funded by the world's governments and aimed at providing to anyone, anywhere, open access to data on all types of life on earth. The project seeks to build capacity of local data collectors, academic institutions, government agencies and other stakeholders to mobilise, process and conserve Liberia's biodiversity data in standard data sharing formats to be published and accessed by national and international data users. Development of such information resources will have important implications for the management and conservation of biodiversity in Liberia and across the West African region.

Coordinated by the University of Liberia, in collaboration with the FDA, Fauna Flora International (Liberia) and the University of Kansas (USA), the GBIF will enhance national capacity for biodiversity data mobilisation, processing, management and publishing through multi-stakeholder training workshops for data managers and users in Liberia. Combined efforts will result in mobilisation of high-quality occurrence and distribution data for species in Liberia, as well as comprehensive checklists of key fauna and flora species of global conservation concern occurring in the country.

Additional actions include the following:

- The passage of the National Wildlife Conservation and Protected Area Management Law of 2017;
- Liberia as party to the Convention on International Trade in Endangered Species (CITES). This convention requires signatories to protect certain species of wild flora and fauna, including timber species, against illegal trade. It also requires signatories to conserve ecosystems' biological diversities through the conservation of ecosystems and natural habitats, the maintenance of such ecosystems and recovery of viable fauna and flora population of species in their natural surroundings; and
- The conduct of a National Forestry Inventory (NFI) and Reference Emission Level (REL) aimed at taking stock of the forest resources in Liberia.

4.3.3 PROPOSED ACTIONS

Biodiversity protection provides an opportunity for less formal, nature-based community initiatives to act as economic engines and job creators, e.g. tourism. For this, environmental institutional capacity and law enforcement must be strengthened. Without strengthening interdepartmental/interagency cooperation, Liberia will not be able to continue with its obligations in terms of biodiversity protection.

Liberia should mainstream biodiversity in land-use planning and decision-making. Mainstreaming biodiversity considerations into socio-economic agendas holds most promise to turn the situation around. For this, it is necessary to:

I. Integrate the protection and management of biodiversity resources with all human development by means of local, national regional, and global conservation initiatives;
II. Build capacity in the areas of conservation assessment, CITES and other MEAs, taxonomy, green technology, and knowledge transfer;
III. Formulate and enforce user-friendly strategies for countering and combatting illegal wildlife trade and trafficking;
IV. Increase capacity in environmental law enforcement, management, and education;
V. Strengthen existing biodiversity conservation programmes to identify ecosystems, species and genetic resources that are at imminent risk of extinction;
VI. Implement strong countermeasures to reduce the speed at which the loss of biodiversity occurs; and
VII. Prevent the hunting of wild animals. To ensure this, the GoL needs to empower the livestock and aquaculture sectors which could serve as suitable alternative sources of protein for human population.

4.4 CULTURAL HERITAGE AND TOURISM

4.4.1 OVERIEW

Due largely to its abundance of cultural heritage resources, but also with environmental considerations, Liberia has enormous prospects for a vibrant tourism sector in areas of wildlife tourism, surf tourism, cultural tourism, and ecotourism. These can spur growth in furniture manufacturing, foods and beverages, and infrastructure development with the participation of the public and private sector, as well as host communities playing a critical role.

Despite the potentials and opportunities presented thus far, the tourism sector can also contribute both directly and indirectly to significant environmental impacts. These include, but are not limited to, exerting pressure on ecologically sensitive resources, increases in waste disposal, increases in the demand and consumption of water, electricity, and the occupation of land for tourism infrastructure.

The preservation of cultural heritage, on the other hand, whether tangible or intangible, is important to consider for educational purposes and promoting ecotourism and tourism both internally and externally. Mr. Gweh, the Director of Cultural affairs at the Ministry of Information, explained in an interview in 2018 that:

"If they are totally lost, part of history will be gone forever and difficult to recover. The continued endangerment of our cultural heritage is not a good sign for the present and future generations".

In post-war, unfortunately, the importance of cultural heritage is argued by many, including Kekura Kamara who is president of the Liberia National Cultural Union. Interviewed by the Daily Observer in 2018, Mr. Kamara said: "We must understand there can be no strong sense of nationalism where a strong sense of cultural identity and appreciation are lacking" (Daily Observer, 2018).

The following section commences with recommendations for both improving Liberia's cultural heritage, and its tourism and ecotourism sector.

4.4.1 CURRENT ACTIONS ALREADY TAKEN

As explained in the SoER (2007-2018), Liberia has a unique and significant cultural heritage. Much of this opens Liberia up to tremendous opportunities for harnessing ecotourism and tourism for growth and improved livelihoods. This, indirectly, could also contribute significantly to conservation of its vast biodiversity and coastal resources. The culture and tourism sector can play a key role within the Liberian economy. Development and promotion of these sectors can result in a direct and indirect increase in production; and the rise in promotion can generate higher consumption and additional increases of production in the other sectors of the economy.

Although many scholars and academics seem to argue that not enough is being done by the government to protect this, the following actions have been taken by the GoL to support and develop the country's cultural sector:

I. Cultural differences are enshrined and protected under Liberia's current constitution of 1986:

"All Liberian citizens shall have equal opportunity for work and employment regardless of sex, creed, religion, ethnic background, place of origin or political affiliation, and all shall be entitled to equal pay for equal work" (Article 18).

II. The preservation of cultural heritage received a major boost with the creation in the early 1963 of the National Cultural Centre near Kendeja, a village located around 10 miles from Monrovia (Daily Observer, 2017). The objectives of this centre are to:

- *Project the cultural image of Liberia;*

- *Provide a base for an organized national dance troupe and craft artists from every ethnic group in the country;*
- *Preserve some of the traditional art forms of the country;*
- *Open an archive where documents, films and ethnographic and archaeological research materials will be reserved, etc.*

(Daily Observer, 2017)

III. The Ministry of Information, Cultural Affairs and Tourism (MICAT) was created in 1965 under an act of the National Legislature to bear the responsibility for the preservation of cultural heritage and tourism in Liberia (MICAT, 2019). This is accomplished through institutions such as the national museum, which is a custodian of important Liberian artefacts; and

IV. The Pro-Poor Agenda for Prosperity and Development (PAPD) has in its medium-term intervention a target for tourism promotion with focus (albeit little) on the importance of the sector and its potential contribution to socio-economic growth. However, the key action plans for development of the sector are well-documented in the Liberia National Export Strategy on Tourism 2016-2020 grounded on 5 strategic objectives:

- *Spur policy focus and improve the business/investment climate for the Tourism sector;*
- *Improve necessary infrastructure for supporting the sector;*
- *Improve skills development in the sector;*
- *Ensure environmental sustainability and integration of local community involvement in sector development; and*
- *Improve institutional capacities and coordination in the sector.*

4.4.2 PROPOSED ACTIONS

The following recommendations are provided:

I. Very often, communities themselves should be the custodians of particularly important cultural artefacts, such as ruins or buildings in their villages. Herewith, the government should improve funding and resourcing to allow organised citizens (especially entrepreneurs or businessmen) within civil society groups to take the lead in managing cultural heritage and tourism;

II. A national cultural preservation policy should be created for giving directions to the preservation and promotion of cultural heritage through safeguarding measures;

III. The government can increase budgetary support to MICAT;

IV. The government can provide required research into identifying cultural heritage in Liberia and to develop possible tourism opportunities. In addition, monitoring plans should be established to manage any environmental impact on such heritage resources and identify mitigation measures for addressing such impacts;

V. Tourism and cultural preservation initiatives could be coupled with sustainable development objectives through existing programmes or plans; and

VI. Chance-find procedures should be established by a national policy which requires developers or anyone finding cultural remains of high significant to take certain actions to protect and preserve the remains.

4.5 ENERGY

4.5.1 OVERIEW

Liberia's total national greenhouse gas (GHG) emissions for the baseline year of 2000 was estimated to be 8,022 Gg of equivalent CO^2, with the energy sector identified as the most significant: accounting for about 67.5% of the national total. The latter is as a result of a reliance on the use of traditional fuels such as firewood, charcoal and palm oil and fossil fuels (Liberia, 2015).

There is a continuous increase in the trend of forest degradation in supplying biomass for fuel to rural households and urban households that rely on it for domestic cooking. The increasing growth of the population means that the forested areas may continue to disappear at a much faster pace than before. However, there are sufficient alternative energy sources, which remain largely unexploited. There is a need for the country to move swiftly towards increasing the energy options available and making such options available for the major consumers' households and industrial users.

In summary, some of the most significant challenges faced by the government within the energy sector include, but are not limited to:

- High dependence on imported petroleum;
- Limited private sector investment, public financing, and political support;
- Electricity theft, which undermines transmission and distribution, as well as sustainability;
- Low human capital and technical capacity;
- Lack of transparency and accountability; and
- Lack of awareness on the affordability options for electrification and a marketing strategy.

4.5.2 CURRENT ACTIONS ALREADY TAKEN

In the medium- and long-term, the country intends to move away from heavy fuels as a source of energy; as such fuels increase the country's carbon footprint. Several important steps have been taken by the GoL to improve access to energy. Some of these include, but are not limited to:

- The rehabilitation of the Mount Coffee Hydropower Plant;
- Private sector engagement for the provision of renewable small-scale and utility scale electricity generation plants; and
- Investments in associated transmission and distribution projects, and steps by the Ministry of Mines and Energy (MME) towards the implementation of an Electricity Master Plan (EMP) for the developing the sector.

The key objectives for the EMP up to 2030 involves:

- Reconstruction and expansion of the transmission and distribution infrastructure;
- Expansion of firm generation capacity;
- Diversification of generation sources;
- Reduction in the cost of electricity;

- Increasing the reliability of electricity supply;
- Development of the effective management of the sector;
- New legal and regulatory frameworks; and
- Attracting private investment to the energy sector, particularly in generation, transmission, and distribution facilities.

Consistent with international requirement, the country plans to review its National Determined Contributions (NDCs) by 2020. There is a need to include clear indicators and milestones for measuring achievements against targets as part of the monitoring, reporting and verification requirements of the United Nations Framework Convention on Climate Change (UNFCCC). It is also important to develop a detailed implementation framework for the NDC.

Another initiative is PAPD, which recognises energy as a key driver of economic growth with a strategy of supporting sustainable fuel-wood and charcoal production, whilst creating alternative energy sources for domestic energy needs. The government plans to create a modern, efficient, diversified and environmentally sustainable energy sector based on affordable and accessible energy supplies to sustain national development. The targets are to:

- Increase universal electricity access by 30% and electricity generation from 134 mw to 270 mw by 2023;
- Reduce energy costs from 0.36 kwh to 0.25 kwh; and
- Increase transmission and distribution from 511 km to 2279 km.

Furthermore, the government plans for enhancing the sector involve:

- Revising the energy sector policy;
- Establishing an energy task force; and
- Investing in the generation, transmission, and distribution of electricity, with emphasis on enabling a private sector distribution network and accelerating the implementation of the rural and renewable energy agency strategic master plan.

4.5.3 PROPOSED ACTIONS

The long-term targets of the country for mitigating emissions in the energy sector include:

- Reducing GHGs by at least 10% by 2030;
- Improving energy efficiency by at least 20% by 2030;
- Raising share of renewable energy to at least 30% of electricity production and 10% of overall energy consumption by 2030; and
- Replacing cooking stoves that have low thermal efficiency (5-10%) with the higher efficiency (40%) stoves.

The GoL is encouraged to consider:

I. Strengthening the implementation and coordination mechanisms for improving climate change mitigation actions;

II. Implementing quantitative and qualitative research and improving systematic priority sequencing between the National Energy Policy, Low Carbon Economy, and National Vision 2030 Developmental Goals;

III. Strengthening institutional and individual capacity in renewable energy technology and management;

IV. Implementing and strengthening policy that promotes public-private investment in renewable energy (hydro, biomass and solar etc.);

V. Rehabilitating existing hydro-power plants and building new hydro-power plants to increase hydro-power production capacity;

VI. Producing and distributing 280,543 energy-saving cooking stoves that use fuelwood and 308,004 energy saving cooking stoves that use charcoal by 2030; and

VII. Implementing large-scale biomass projects to generate about 30 MW by 2030.

5. EMERGING ISSUES AND OUTLOOKS

5.1 CHAPTER OVERVIEW

As with any other country, new environmental challenges surface with the development of technology or expansion of the human population. For example, although technology and new ways of accelerating development and creating infrastructure can improve a country and its people's livelihoods, so too can it create new problems needing new, equally innovative solutions. There are many such instances in Liberia, such as human trafficking, climate change, IAS, illegal fishing, commercial use of noxious chemicals, and solid waste management. The need for innovative technology to improve solid waste management is also another problem at hand, equally so the use and management of new chemicals which were not used in the past.

These are 'emerging' environmental threats that are discussed under this chapter. The first section considers climate change, followed by IAS. Thereafter, chemicals are discussed, followed by solid waste management.

5.2 CLIMATE CHANGE

5.2.1 OVERIEW

Liberia, like other developing countries, is vulnerable to the impacts of climate change. Climate change poses a severe challenge to Liberia's emerging development priorities. In terms of agriculture, significant climate-related risks are linked to seasonal variations of rainfall patterns and an increase in rainfall during critical moments in the growing season, leading to reduced crop yields.

Climate change in Liberia has increased flooding. It is further predicted that climate change will lead to a rise in sea levels of as much as 60-100 cm over this century. This will affect the subsistence-based livelihoods of communities living in low-lying coastal areas, such as in West Point Township and Buchanan (SoER, 2006). However, in the previous SoER (2006), climate change was not discussed in detail and no recommendation was provided in the fight against climate change.

5.2.2 CURRENT ACTIONS ALREADY TAKEN

The GoL has initiated several policy frameworks to revitalize the agriculture sector in order to enable it contribute to sustainable economic development, food and nutritional security and employment generation. The principal objective of these frameworks is to provide farmers with improved alternative farming methods for increasing farm productivity and farmers' resilience to the negative impact of climate-related changes. Such frameworks have already been highly influential in several agriculture-dependent communities in some counties in Liberia, and it demonstrated to improve and boost farmers' resilience to climate change.

The EPA, along with its partners, has engaged in several climate change issues. In 2015, Liberia, in collaboration with the United Nations Development Programme (UNDP), launched the National Adaptation Plan (NAP) with a focus to develop a road map in consultation with the main stakeholders in the country. This roadmap was based on an evaluation of the existing climate adaptation and mitigation initiatives, an assessment of the knowledge, capacity, and implementation gaps, as well as an evaluation of the capacity development needs.

There are other projects under the NAP which are ongoing. These include, for example:

(1) Inception Report: Mainstream Climate Change into Budgeting and Planning Processes; and

(2) Disaster Management Programme, the University of Liberia Climate Change Programme, among others.

On the 15th of August 2018, Liberia's EPA, supported by the UNDP, launched its National Policy and Response Strategy on Climate Change. The Policy and Response Strategy aims to ensure an effective and coherent climate change adaptation process and serves as the pillar for comprehensive sectoral strategies and action plans.

5.2.1 PROPOSED ACTIONS

Recommendations which are brought forward with regard to climate change include, but are not limited to:

I. Developing further policy to enhance Liberia's adaptive capacity through the rebuilding of the national hydro-meteorological monitoring system and improved networking for the measurement of climate parameters;
II. Enacting policy for climate change impacts in Liberia should be mainstreamed in all water resources management plans and programmes to secure environmental safety and sustainable freshwater supply for the country in the immediate, near, and long-term future; and
III. Conducting fundamental knowledge-based research in climate change within rural and urban communities.

5.3 INVASIVE ALIEN SPECIES

5.3.1 OVERIEW

IAS are non-native to a particular ecosystem whose introduction and spread cause, or are likely to cause, socio-cultural, economic, or environmental harm or harm to human health.

Invasive species are considered one of the biggest environmental challenges of the 21st century. They constitute the second greatest cause of biodiversity loss and lead to economic disruption and public health. Despite significant financial and human investments made by countries and world conservation of biodiversity agencies, there are no known government strategies that lead to appropriate measures for sustainable management and control (Noba *et al.*, 2017).

5.3.2 CURRENT ACTIONS ALREADY TAKEN

In 2018, a National Compendium on IAS in Liberia was prepared, calling upon the government to put in place priority measures by 2020 to control and manage the spread and impact of IAS. Actions planned in the revised NBSAPs to achieve this target include:

- Identifying and documenting IAS in prioritised ecosystems to determine the means by which these enter the country and their origin. Concerted and determined efforts are critical if the multiple pathways for invasive species are to be identified and controlled through improved border controls and quarantine;
- Promoting integrated management of IAS, including through better coordination with national and regional bodies for plant and animal health;

- Undertaking research into effective control of IAS. Currently, Liberia does not have the capacity to control or eradicate IAS in the country; and
- Putting in place robust IAS monitoring systems.

5.3.3 PROPOSED ACTIONS

The following actions are proposed:

I. Whilst addressing biodiversity and wildlife management issues, the control of IAS and exotic species should be integrated into the protection and management of biodiversity resources;
II. Increase capacity in environmental law enforcement, management, and education to deal with IAS at all levels, i.e. Local, regional and national level; and
III. Strengthen existing biodiversity conservation programmes to identify ecosystems, species and genetic resources that are at imminent risk of being invaded or over-run by IAS and exotics.

5.4 CHEMICALS

5.4.1 OVERIEW

Humans and animals are exposed to chemicals in the environment daily. Some of the factors associated with daily exposure include the production of foods, smoke generated from solid fuels, sewage run-off, and the use of pesticides for plants. However, the dramatic increases in industrial development over the past three centuries have impacted human exposures to both natural and synthetic chemicals, and Liberia is no exception. In combating the exposure to chemicals or other environmental pollutants, the use of environmental health risk assessment has been widely used in the identification of potential hazards to human health.

Globally, the uncontrollable use of some chemicals affects the natural environment and can contaminate water supplies. The presence of toxic metals in the atmosphere is determined both by natural processes (e.g., weathering of rocks, volcanic eruptions, and forest fires) and by their supply from anthropogenic sources (e.g., industrial methods, traffic). Some toxic metals (e.g., zinc and copper) are considered necessary as trace elements for organisms to thrive, while others (e.g., lead, cadmium, chromium, and nickel) are deemed unnecessary and even harmful (Didwania, *et al*., 2018). In general, toxic metals and, in particular, lead, and cadmium are considered dangerous to humans due to their poisonous effects. Research has shown that several chemical effluents have been identified in potable water, but no data are available on particular chemicals in the water bodies of Liberia. These contaminants reach drinking water supplies from various sources, including municipal and industrial discharges, urban and rural run-off, natural geological formations, drinking water distribution materials, and the drinking water treatment process.

From the SoER in 2006, there is little information regarding the concentration of chemical usage in Liberia. This is, however, discussed in more detail in the SoER for 2007-2018. Such a risk assessment and characterisation of chemical usage are both fundamental in understanding and categorising the usage of chemicals in Liberia.

One of the biggest issues related to chemical usage is the safety of drinking water. It is fundamental for the GoL to implement the recommendations in this NEAP for the production and distribution of safe drinking water. The agricultural and mining sectors, both of which rely

on the use of chemicals, are thought to be the main contributors to drinking water contamination. They will be discussed in the next section.

Mining Sector

Liberia is endowed with an impressive stock of mineral reserves and has traditionally relied on mining, namely iron ore, gold, and diamonds, as a significant source of income. The recent growth in the mining sector has the potential to contribute significantly to employment, income generation, and infrastructure development. However, the development of these mineral resources has significant environmental impacts. Currently, there are four large-scale industrial mines (two in gold production and two producing iron ore) operating in Liberia with several others into exploration and mine development for both gold, but mainly iron ore. The metal is extracted from the mine and processed through the plant to produce a concentrate using various methods.

One method frequently used for gold operation is the conventional Carbon-in-Leach (CIL) method, which allows the use of sodium cyanide. For example, in the Kokoya mining areas of Bong County, habitats have been exposed to cyanide in the past. This raises the question of whether such exposure could be the result of the CIL method used in gold processing.

5.4.2 AGRO CHEMICALS (CROPS AND LIVESTOCK)

Clearly, agrochemicals can have economic, social, public health and environmental benefits. However, there are significant risks associated with the use of pesticides, particularly the use of chemicals which are not environmentally friendly. This is further underpinned by the inappropriate use of such chemicals which can cause significant harm to human, the society, and other living organisms. For a society as a whole, it is important that the benefits of pesticide use outweighs all the costs, and that any risks associated with their use are both acceptable and minimised as far as possible.

Chemicals such as acaricides/insecticides are widely used in Liberia to treat ectoparasites, such as ticks and lice. Such agrochemicals affect the soil (for example altering pH levels and increasing nitrate content) and water bodies. Acaricides are pesticides that include pyrethroids and chlorinated hydrocarbons. The pyrethroids are amongst the safest and most effective pesticides and are now widely used for tick control. Meanwhile, in the absence of an established national plant protection bureau and right policy framework, there is no substantiated/empirical data on the extent of agrochemicals usage or its effects on the environment of Liberia. A database to document the type of agrochemicals imported into the country is fundamental to improving the agrochemical management process.

5.4.3 CURRENT ACTIONS ALREADY TAKEN

In the absence of a national plant protection policy (including a pesticide regulation), there is a draft plant protection policy pending legislation by the Liberian Bicameral House of Representative and Senate. In an effort by the GoL to promote sustainable agriculture leading to food security and improved living standard for the population, it adapted the ECOWAS pesticides regulation and domesticated the Regulations (based on the ECOWAS Framework) for use in the national pesticide program in order to fit into, and derive the required benefit from the Community’s pesticide trade. Currently, since the adaption of the regional pesticides regulation by Liberia, there has been no administrative structure formed to affect the domesticated regulation for the benefit of the country.

5.4.4 PROPOSED ACTIONS

The following recommendations are made:

I. The government should create a database for agrochemical and chemical sector and usages in Liberia;
II. The government needs to develop a policy on the use of chemicals to extract precious minerals;
III. The government should fund risk assessment research on agrochemical and chemical use in the mining sector. Such risk assessment research should include exposure identification, hazard identification, dose/response assessment, and risk characterisation; and
IV. There has to be a listing of all banned chemicals and agrochemicals at all ports of entries to regulate the types of chemicals to be used in order to avoid environmental contaminations.

5.5 WASTE MANAGEMENT

5.5.1 OVERIEW

Solid waste management is the process of collecting, treating, and disposing of solid material that is discarded because it has served its purpose or is no longer useful (Leblance, R, 2018). Hence, solid waste is defined as the range of garbage arising from animal and human activities that are discarded as unwanted and useless; it can be generated from hospitals, agriculture industry, industrial, residential and commercial activities in a given area, and may be handled in a variety of ways, such as landfills typically classified as sanitary, municipal, construction and demolition or industrial waste sites (Leblanc, R, 2018; UNDP, 2006). Solid Waste can be toxic and dangerous to public health and it can carry with it litany of other negative chain reaction such as economic prosperity and social integration if goes unmanaged and unabated.

Poor solid waste management largely contributes to poor environmental conditions such as pollution and contamination, especially in urbanised that are densely populated. The following cities are catalysts of such descriptive phenomenon: the city of Monrovia, Paynesville City, and the Borough of New Kru Town, among other. It is reported that the most prevalent diseases from poor solid waste conditions are acute bloody diarrhoea, acute malaria, and acute respiratory disease among others. These are responsible for the massive influx of hospital/clinic visits, and they at times lead to death (GoL/UNDP, 2006). These acute diseases are responsible for droves of patients at local clinics and hospitals and leaving the national government to directly or indirectly shoulder the cost, since most of the residents do not have insurance. Addressing this causative problem at source could save the GoL thousands of dollars if not millions of dollars.

With a steady population growth and more purchasing power, there are an increase in consumption patterns and a slide in economic growth; hence generation of solid wastes will continue to be on the rise especially in the domestic wastes category and the toxic wastes sector, as well as the bio-medical wastes sector. The cities and communities are breathing in filth from piles of garbage. Contamination and pollution, unmanaged medical wastes, so often found in ecological zones, pose greater threats to the quality of drinking water, air quality and the soil from which food is produced.

Solid waste management has been a daunting challenge in Liberia, particularly in densely populated communities; it is an age-old problem for decades, especially after the 14 year civil

conflict and the recent Ebola outbreak, all of which destroyed infrastructure and created major economic hardship and social paralysis. Of the many social problems facing Liberia in its post war era, is the solid waste management sector, which is the third worse crisis in Liberia because it threatens and impacts public health, social integration, economic prosperity, climate change, and flooding as well as political stability if uncontrolled.

The poor state of solid waste management has reached a crisis point from obvious visibility and public outcry, especially in cities with huge population density as per the research. Currently, the mayors of Monrovia and Paynesville were summoned by the House of Representatives of the Republic of Liberia to answer to the current state of deplorable solid waste conditions in their respective cities (FPA, 2019). This, by all account, is an attestation to the solid waste problem on hand. The immediate impact from solid waste, if not effectively managed, can cause an indelible harm to public health and bring about economic hardship. No nation succeeds in its economic developmental goals and social coherence if the impact of solid waste becomes unmitigated. Therefore, as a way forward, NEAP examines and evaluates the baseline recommendations: if they were implemented more than ten years ago or not, what can be done. For example, some of the waste items listed below in Table 5.1, contain compound chemicals emitting into the environment, which becomes health vector as time progress for so long and impacts human well-being.

Table 5.1: *Types of Waste*

TYPE OF WASTES	TIME IT TAKES TO DEGENERATE
Organ waste such as vegetable and fruit	One to two weeks
Paper	10-30 days
Cotton cloth	2 – 5 months
Wooden items	1 year
Wood items	10 -15 years
Tin, aluminum, and others metal items such as can	100 and more years
Glass bottle	Undetermined

If solid waste is not properly managed, the discarded materials, some of which are food products, newspapers and others biodegradable materials can rot and decompose under improper unhygienic and uncontrolled conditions, which after few days of decomposition, produce foul and bad odours and becomes breeding grounds for different types of diseases such as malaria. It can also breed insect and other infectious organisms. Toxic wastes on the other hand (such as metal, hazardous wastes and chemicals, when release in the environment) can cause biological and physicochemical problem to the environment and may alter the productivity of the soil from which foods are produced. Toxicity may cause inflammation, making disposal process even more risky. When hazardous wastes like pesticides, unwanted batteries containing lead, mercury on zinc, cleaning solvents, radioactive materials, old computer and cell phones, e-waste and plastic, mixed up with papers and other scraps, are burned they produced dioxin and gases. These toxic gasses have a potential to cause various diseases including cancer and other life-threatening diseases.

Implementing measures for improving solid waste management in Liberia would have a significantly positive impact on the public health sector that has been in peril for decades. It will also improve economic prosperity and social integration in a balanced way while protecting the human and physical environments.

5.5.2 CURRENT ACTIONS ALREADY TAKEN

The EPA, which is the regulatory agency for the holistic management of environmental issues including solid waste management in Liberia, was created in 2003 by an Act of Legislature of the Republic of Liberia. The mandate is to protect and manage the environment as well as the natural resources of Liberia, as enshrined under Article 7 of Chapter II of the New Constitution of Liberia. It guarantees every person in Liberia the right to life, and by extension, the right to a clean and healthy environment that supports that life; committed to the pursuance of social and economic development, but without undermining the ecosystem's renewal and re-supply process (EPA, 2006). As an autonomous agency, the EPA is charged with the responsibility to regulate environmental protection and management. The Act mandates the right of a clean and healthy environment to all within the territorial borders of Liberia. Such mandate includes but not limited to solid waste management and sanitation. The "Agency" as it is referred to, is vested with the regulatory power to regulate, and ensure solid waste management and liveable sanitary conditions (EPA, 2010). It became fully operational in 2006.

Considering the aforementioned, the achieved actions include:

- In 2007 the ILO build the capacity for waste recycling and reuse. It was the first pilot project to set up Community Based Enterprises (CBEs) to take primary waste collection in the capital city, Monrovia. The service is provided by CBEs duly registered with the respective cities. Over 100 CBEs received trainings tailored to helping managers and owners develop their approach to capacity building and doing better business

- Municipal Solid Waste Management infrastructures have begun to develop with concentration in the capital of Liberia. In 2009, investment from the Liberia Trust fund supported the construction of two solid waste transfer stations and a landfill. Stockton Creek Transfer Station in the south and Fiamah Transfer Station in the North of Monrovia are infrastructures for Solid Waste Management.

- Whein Town Landfill is Liberia's first known engineered solid waste disposal site. The landfill was operationalised under the Monrovia Urban Sanitation (MUS) Project 2010. Whein Town landfill is an inter-medium landfill to what is hopefully the main landfill to be constructed under the CLUS[1] Project in Cheesemanburg near Monrovia.

- The Municipalities have been granted, by the Public Health Law of 1975 (still valid), the responsibility of ensuring clean and sanitary environmental conditions on the territory under their respective jurisdictions. They are thus responsible for sanitation activities including the cleaning, collection and disposal of generated solid waste.

- The Monrovia City Corporation MCC), MCC Ordinances' Chapters 1 and 7 (1975), designate various departments of MCC as being in charge of municipal waste disposal sites, prohibition of the littering, and requiring residents to clean in front, and around, their properties up to the sidewalk. Furthermore, Chapter 7 of MCC's Ordinances stipulates that all residents in Monrovia shall pay various monthly fees for solid waste collection and disposal. However, as the charges for the planning, development, operation and maintenance of the solid waste management systems and equipment are been put into place to resolved the problem in Monrovia and it environ.

[1] CLUS Project is funded by the World Bank and the Government of Liberia with the aim of constructing an engineer landfill for Liberia.

5.5.3 PROPOSED ACTIONS

It is abundantly clear therefore, that from all the information gathered from literature reviewed, interviewees' participation and selected site visits, it can be concluded that over 75% of the baseline recommendations from the 2006 SoER have not been accomplished nor gained significant progress to have averted the ongoing crisis of solid waste management. Of great concern is the fact that there is yet to be a sanitary landfill built after thirteen years. There are temporary dumps sites which are not sanitary landfills. If garbage is collected from communities, there is nowhere to deposit that properly maintains it (WB, 2014).

The EPA has a functional educational and communities' awareness programme in designated secondary and tertiary educational programme but more needs to be done to reach more communities and not just Monrovia. It was also observed that few hospitals in Liberia have incinerators to burn combustive materials such as bio-medical wastes, but it is not clear who verifies how functional they are and how they are monitored to maintain effectiveness and efficiency. There was no evidence to authenticate or verify and report on environmental and public health impact study that has been conducted or is being conducted on solid waste.

This research could not verify any integrated strategy management plan for solid waste management, but there is a document produced by World Bank under the title "Project Information Document/Integrated Safeguards Data Sheet" that addresses some of the issues that has to do with integrated strategy management plan for solid waste management. For a greater appraiser of these baseline recommendations, while some may be in progress or is being worked on, the research concludes that not much was completed, and therefore warrants redo.

The current state of poor waste management will continue to be a public health threat until these baseline recommendations are addressed and fully implemented and evaluated. The following is therefore recommended:

I. The baseline recommendations be revisited in terms of execution;
II. Liquid waste management should include treating laboratory and public health facility waste. There are many types of infectious waste that need to be securely treated to avoid unnecessary exposure to humans;
III. Waste management from an animal/livestock perspective should also consider proper carcass disposal in cases of disease outbreak, to avoid environmental contamination. It is worth mentioning that the nation is at a crossroad of this waste crisis, a recipe to harm the public health sectors, impact economic prosperity, social integration, and political stability. An effective solid waste management programme hinges on a successful Pro Poor Agenda. The option should not be anything less than doing is right for the sustainability of the nation and people;
IV. A plan for Liberia to develop a baseline integrated waste management strategy was addressed by the participants but EPA, the appropriate entity, said work is in progress. But research materials gathered (especially documented by World Bank) addressed and identified few reports and pilot projects, that are yet to be crystallized, which means they are still in the working process and have not been finalized;
V. Another baseline recommendation focused on the need for a waste management-related law regulation to be formulated along with existing laws. The EPA responded that it is work in progress;
VI. Waste management-related laws regulations should be formulated, and existing laws related to integrating waste management strategies for Liberia should be developed. All indications point to work in progress. They are guidelines for disposal of waste management-related laws and regulations to be formulated, and existing laws and

regulations updated to meet the demand of present. Identify, designate and establish landfill sites for all urban areas;

VII. Set up a joint monitoring and coordinating unit between agencies and institutions responsible for waste management programmes and involve the local communities (which indirectly acknowledges the existing lack of clarity of the division of responsibilities);

VIII. Design and instruct a waste sensitization programme at various levels, especially among women and the youth; and

IX. Empower local communities to dispose of their waste.

6. NATIONAL ENVIRONMENTAL ACTION PLAN SUMMARY TABLE

6.1 OVERVIEW

The following table summarises all the environmental-related actions plans which have been discussed and elaborated upon in this NEAP for 2019-2023. The SoER (2007-2018) should be consulted for more information on a particular environmental resource or theme.

6.2 NATIONAL ENVIRONMENTAL ACTION PLAN SUMMARY TABLE

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
TERRESTRIAL RESOURCES				
LAND GOVERNANCE	➢ Finding a land tenure solution with the emphasis of putting land in the hands of Liberians for the benefit of Liberians	➢ A clear framework on how Liberians can access the economy by owning/leasing land and making it productive	➢ Ministry of Internal Affairs, supported by the MoA, Liberia Land Authority, and the Forestry Development Authority	2025
LAND DEGRADATION	➢ Quantify and assess the extent of land degradation in the country	➢ Data on how much and to what extent the land of Liberia is degraded; and ➢ Data illustrating where the most degraded landscapes are.	➢ EPA, MoA, and Forestry Development Authority	End of 2021
GRASSLANDS AND DRYLANDS	➢ Quantify and assess the extent of grassland and dryland invasion	➢ Data showing the rate of grassland/dryland/savanna invasion; and ➢ Data illustrating how much of the land has been degraded and how much of this is recoverable/restorable.	➢ EPA, MoA, and the FDA	End of 2021
OVERGRAZING	➢ Quantify and assess the extent of overgrazing	➢ Data showing how much, and to what extent, overgrazing occurs in Liberia; and ➢ Data illustrating which areas are most affected.	➢ EPA, MoA, and the FDA	End of 2021
DEFORESTATION	➢ Quantify and assess the extent of deforestation	➢ Data indicating how much, and to what extent, deforestation occurs	➢ EPA, MoA, and the FDA	2021
	➢ Introducing penalties for offenders	➢ A record of penalties being issued	➢ FDA	2021

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
AGRICULTURE AND SOIL	➢ Develop an agricultural spatial development plan	➢ A database indicating which areas are suitable for which crops	➢ Ministry of Agriculture	2021
	➢ Conduct a SWOT analysis of Liberia's agricultural state	➢ Data on the strengths, weaknesses and threats to a viable, sustainable agricultural economy and an indication of the existing opportunities	➢ Ministry of Commerce and Industry and MoA	2021
	➢ Expanding the agricultural economy to be strengthened and transformed for more inclusive rural development	➢ An increase in the average annual GDP growth rate by 10%	➢ Ministry of Commerce and Industry and MoA	2025
	➢ Restore, maintain, and secure important agricultural infrastructure in a way that contributes to rural development, long-term job creation and livelihoods	➢ An increase in the number of commercial farms; ➢ A record of subsidies and incentivised agriculture upstarts; and ➢ Improved road networks to increase access to or to create markets.	➢ Ministry of Commerce and Industry, MoA and ➢ Ministry of Transport	2025
FORESTRY AND WOODLAND	➢ Continued support of REDD+ programmes; and ➢ Formalise the forestry industry to include all Liberians	➢ Audit indicating that all REDD+ obligations have been met on a regular basis	➢ EPA, MoA, and FDA	Ongoing
WILDLIFE RESOURCES	➢ Quantify the number of various species and map their locations; and ➢ Closer collaboration with indigenous peoples, NGOs, and Non-Profit	➢ Updated NSBA; ➢ Data on the types of specific species and their conservation status; and ➢ Yearly species monitoring reports.	➢ EPA, MoA, and FDA	Updated NSBA every 5 years

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	Organisations (NPOs).			
	➢ Formalise the wildlife tourism industry to create a platform to generate economic impetus that can be directed back into Liberian wildlife conservation	➢ Proof of training provided to locals; and ➢ A record of new incentives-driven tourism businesses.	➢ EPA, Ministry of Commerce and Industry, MoA, Ministry of Transport and FDA	2025
AQUATIC RESOURCES				
WETLAND RESOURCES	➢ An inventory of all wetlands should be established and classified in terms of their state	➢ Present Ecological State and Ecological Importance and Sensitivity data; and ➢ Updated data every 5 years.	➢ EPA	2022 and updated every 5 years
WATER RESOURCES	➢ Develop an effective Integrated Water Resource Management Plan (IWRMP) that is implementable; and ➢ The above-mentioned plan must be integrated and ensure co-operation from and between all ministries and agencies responsible for water use.	➢ A comprehensive IWRMP with clear targets; and ➢ Proof of the implementation of the IWRMP.	➢ All spheres of government. A coordinated effort should be spearheaded by the Ministry of Public Works.	2022
	➢ Infrastructure development	➢ The upgrading of the existing pipe supply infrastructure; and ➢ Building and maintenance of dams and reservoirs in water-short areas and those at risk of flooding.	➢ Ministry of Public Works and the EPA	Ongoing
	➢ Increase investment in	➢ Projects which can	➢ EPA, NPHIL, Internal	2019-2021

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	integrated water resources and the management of freshwater ecosystems and sanitation at local-level; ➢ Assess drinking water supply networks across Liberia; ➢ Conduct seasonal monitoring and research of surface- and groundwater and surface water; ➢ Work with stakeholders to develop surface- and groundwater protection policies; and ➢ Develop a national initiative to build the capacity of citizens to look after their own water sources more efficiently.	illustrate improved access to drinking water; and ➢ Post-monitoring results illustrating how the participants and/or beneficiaries of such initiatives benefitted and gained information on drinking water quality.	Affairs and the Liberia Water and Sewer Corporation (LWSC)	
FISHERIES	➢ Conduct a SWOT analysis of Liberia's fishing industry	➢ Data illustrating the strengths, weaknesses, and threats to a viable, sustainable fishing industry and what the opportunities are	➢ Ministry of Commerce and Industry, Ministry of Agriculture and NaFAA	2021
	➢ Expanding, strengthening, and transforming the fishery industry to be more inclusive of the subsistence and small-scale fishing economies	➢ An increase in the average annual GDP growth rate by 10%	➢ NaFAA	2030

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	➢ Advance the fishing industry infrastructure in a way that contributes to industry development, long-term job creation and livelihoods	➢ An increase in the number of fish farms; ➢ An increase in the number of subsidised and incentivised fish farms; and ➢ Improved road networks to increase access between the coast and inland.	➢ NaFAA	2025
CROSS-SECTIONAL RESOURCES AND ENVIRONMENTAL LINKAGES				
SAFE WATER AND SANITATION	➢ Development of Liberia Drinking Water Quality Standards, using the WHO Water Standards; ➢ Taking an inventory of water quality and pollution sources (establishing baseline data); ➢ Conducting an intervention study on the microbial, chemicals, physical contaminants of water or surface water and groundwater use for drinking; ➢ Develop national water quality standards based on the baseline and the intervention results; and ➢ Provide education and training in the water sector, focusing on water	➢ Data results (water quality studies) indicating safe and drinkable water to every Liberia; and ➢ A resulting policy document for businesses to adopt in their engagement in the sale of drinking water in the Liberian market.	➢ EPA, NPHIL, LWSC and the Ministry of Health (MoH)	2021

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	quality monitoring, data analysis, pollution control mechanisms and the development and application of different water quality regulatory instruments.			
	➢ Support and strengthen the participation of local communities in the improvement of water quality and sanitation management ➢ Increase public knowledge, attitude, and practice through a range of social mobilisation and sensitisation measure/research; ➢ Inclusion of gender-specific objectives in the water and sanitation and resources management sector; and ➢ Develop a Liberia Clean Water Act, which requires all water bodies in Liberia to be swimmable, fishable, and drinkable.	➢ Data and/or proof (post-monitoring, documentation, minutes, or results) illustrating the active participation of community members in their own water and sanitation initiatives/projects; and ➢ Data and/or proof (post-monitoring, documentation, minutes, or results) of community-driven projects where the results have indicated proper maintenance of water and sanitation infrastructure.	➢ EPA	2019-2021
	➢ Construction of withholding pit latrines in rural areas stop open defecation; and ➢ Identifying specific areas	➢ An increase in the number of constructed pit latrines, especially in areas where alarming cases of open defecation were recorded;	➢ EPA and Ministry of Public Works	2021

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	where open defecation has resulted in heightened health concerns and where immediate mitigation is therefore required; and ➢ Improve the sewage department at LWSC to collect waste from withholding tanks in a timely fashion.	and ➢ Health data illustrating a reduction in the contamination of water bodies from human faeces in selected sampling areas.		
	➢ Strengthening source water protection and the resilience of drinking water supplies; ➢ Update and act on source water assessments; ➢ Conduct geo-statistical and geo-spatial analysis of surface- and groundwater that may be affected by heavy rain downpours; ➢ Undertake source water monitoring pilot projects through technical assistance and funding; ➢ Work with key partners to develop a national community resilience initiative to comprehensively address community water resilience challenges (flood, drought, spills, harmful algal blooms, and	➢ Enhanced distribution of essential, clean drinking water to all Liberians (such as an increase in the number of water treatment works or points, for example)	➢ EPA, LWSC, NPHIL, Ministry of Public Works and MoH	2019-2021

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	other hazards); ➢ Promote efforts to increase water efficiency and re-use, such as the release of a summary of best practices in potable reuse in 2020; and ➢ Establish cooperative agreements amongst public and private sector entities to evaluate and demonstrate advanced treatment technologies and water efficiency guidelines to help promote water conservation by state and local governments and utilities.			
POLLUTION OF AIR, WATER AND SOIL AND IMPACTS ON BIODIVERSITY SOCIAL IMPACTS OF DISPLACEMENT AND LAND TAKE	➢ Develop an Environmental and Social Management Framework (ESMF) and Resettlement Policy Framework (RPF) to support especially the National Energy Policy; and ➢ Develop resettlement legislation specifically tailored to the Liberian context. ➢ Align ESMF and RAP legislation with international good	➢ ESMF developed and implemented consistently with the Environmental Protection and Management Law of 2003. Indicators for these deliverables will include the number of Environmental and Social Impact Assessments (ESIAs) and Resettlement Action Plans (RAPs) submitted to the EPA for approval.	➢ MME and the EPA	Medium- to long-term

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	practice guidelines, such as those of the International Finance Corporation (IFC), for example.			
	➢ Develop and implement national policy and legislation related to the development of alternative energy sources (solar, biofuels, etc.)	➢ Relevant national policies and legislation in place and implemented. An indicator for such deliverables would include the number of policies and legislation.	➢ Energy Regulatory Board, Rural Renewable Energy Agency, MME, EPA, and the private sector	Long-term
	➢ Strengthen the enforcement of legislation related to the import and management of energy products and their resulting waste	➢ Audit or post-monitoring data illustrating compliance with legislation related to energy products and their waste	➢ Ministry of Commerce and Industry, Energy Regulatory Board, Rural Renewable Energy Agency, MME, EPA, and the private sector	Long-term
	➢ Development of an Oil Spill Response Policy and Contingency Plan	➢ Strengthen the national oil spill response capability through the establishment of local partnerships between local businesses, the oil industry, and national authorities in charge of oil spill preparedness and response at national level; and ➢ Provide an overview of the national oil spill contingency planning process and identify actions and priorities for	➢ National Port Authority, Liberia Maritime Authority, EPA, National Disaster Management, Liberia Petroleum Refining Company, Bureau of Maritime Affairs, National Oil Company of Liberia, and Ministry of National Defence Coast Guide.	Short-term

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
		the implementation of a National Oil Spill Contingency Plan in Liberia (NOSCP) in Liberia and, more specifically, provide an overview of the contingency planning process, including risk analysis and sensitivity mapping.		
BIODIVERSITY	➢ Quantify the number of various species and map out where they are found; and ➢ Closer collaboration with and between indigenous peoples, NGOs and NPOs.	➢ Yearly species monitoring reports, illustrating how many species there are and indicating their conservation status; and ➢ Updated NSBA every 5 years.	➢ EPA, MoA, and FDA	Updated NSBA every 5 years
ECOTOURISM	➢ Formalise the wildlife tourism industry to create a platform to generate economic impetus that can be directed back into Liberian ecological biodiversity; and ➢ Train locals and provide incentives for people to establish tourism businesses.	➢ More tourism businesses; and ➢ Improved revenue from tourism sector.	➢ EPA, Ministry of Commerce and Industry, MoA, Ministry of Transport and FDA	2025

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	➢ Develop an ESMF to support the National Export Strategy on Tourism	➢ ESMF developed and implemented consistent with the Environmental Protection & Management Law of 2003	➢ Ministry of Information Culture Affairs and Tourism, EPA, and FDA	Medium- to long-term
	➢ Develop a Coastal Zone Management Plan; and ➢ Strengthen the enforcement of legislation related to urban pollution prevention and control along coastal areas.	➢ Coastal Zone Management Plan developed; and ➢ Enforcement of legislation implemented.	➢ Municipal authorities and EPA	Medium-term
CULTURAL PRESERVATION AND RELATED TOURISM DEVELOPMENT	➢ The government should improve funding and resourcing to allow organised citizens (especially entrepreneurs or businessmen) within civil society groups to take the lead in managing cultural heritage and tourism; ➢ A national cultural preservation policy should be created for giving directions to the preservation and promotion of cultural heritage through safeguarding measures; ➢ The government can increase budgetary support to MICAT; ➢ The government can	➢ More cultural heritage management programmes/endeavours/ businesses; ➢ Development of a national cultural preservation policy; ➢ An increase in the identification of cultural heritage across Liberia; and ➢ Establishment of chance-find procedures.	➢ Ministry of Information Culture Affairs and tourism, EPA, and FDA	Medium- to long-term

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	provide required research into identifying cultural heritage in Liberia and to develop possible tourism opportunities. In addition, monitoring plans should be established to manage any environmental impact on such heritage resources and identify mitigation measures for addressing such impacts; ➢ Tourism and cultural preservation initiatives could be coupled with sustainable development objectives through existing programmes or plans; and ➢ Chance-find procedures should be established by a national policy which requires developers or anyone finding cultural remains of high significant to take certain actions to protect and preserve the remains.			
EMERGING ISSUES AND OUTLOOKS				
INTEGRATION OF RESOURCE MANAGEMENT	➢ Collect national data on the status of Liberia's natural resources; and ➢ Develop well-defined institutional objectives	➢ A national natural resource database and information management system; and ➢ Formation of a	➢ Ministry of State and EPA	2025

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	with cross-sectoral integration to be implemented.	cooperative committee(s) with representation from various agencies and ministries.		
RESOURCE CAPACITY MANAGEMENT	➢ Increase capacity in the line ministries to ensure effective management; and ➢ Additional resources are needed in terms of financial, logistical, technological, and staffing. These resources are usually linked to allocation of an inadequate budget.	➢ Additional resources allocated (budget approvals/expenditures, etc.)	➢ Ministry of Finance and Development Planning	2022
CAPACITY BUILDING	➢ Investment in capacity building for individuals and organisations and enable people to obtain, improve and retain the knowledge, skills, and tools to effectively manage the country's resources; and ➢ Provide opportunities for training, internships, and collaborations across the various sectors within the country, as well as with international partners to equip the necessary specialists, policy-makers, environmental lawyers	➢ Number of training opportunities and internships provided; and ➢ Number of awareness and collaborations across various sectors within the country, as well as with international partners equipping the necessary specialists, policy-makers, environmental lawyers, etc.	➢ Ministry of Commerce and Industry and Ministry of Foreign Affairs	2022

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	etc.			
CLIMATE CHANGE	➢ Conduct fundamental knowledge-based research to mitigate climate change within rural and urban communities; and ➢ Conduct community awareness programmes.	➢ Research reports; and ➢ Number of community awareness programmes.	➢ EPA	2019-2021
	➢ Mainstreaming a policy mitigating climate change impacts in Liberia in all water resources management plans and programmes. This should secure environmental safety and sustainable freshwater supply for the country in the immediate-, near, and long-term future; ➢ Develop a framework and/or environmental safety plan to protect all surface- and groundwater sources in Liberia; and ➢ Conduct comparative research in the water and soil resource sectors; comparing the current data with that of the data	➢ Research outputs (reports) and data; ➢ An established framework and/or an environmental safety plan to protect all surface and groundwater in Liberia; and ➢ Consider GHG emissions from shipping and ballast Water Management Convention.	➢ EPA	2019-2021

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	we have of past conditions to understand the impacts climate change has already had in Liberia.			
	➢ Enact policy to enhance Liberia's adaptive capacity through the rebuilding of the national hydro-meteorological monitoring system and improved networking for the measurement of climate parameters; and ➢ Work with the Liberia Hydrological Survey to collect data using the hydro-meteorological monitoring stations.	➢ The pattern of Liberia's climate will be known, and a policy will be enacted	➢ EPA and MME	2019-2020
INVASIVE ALIEN SPECIES	➢ While addressing biodiversity and wildlife management issues, the control of IAS and exotic species should be integrated into the protection and management of biodiversity resources; and ➢ Develop an IAS Management Plan.	➢ Data on what the main IAS are and the spread of IAS in Liberia (and concentration); and ➢ IAS Management Plan.	➢ EPA, MoA, and FDA	Ongoing
	➢ Increase capacity in environmental law enforcement,	➢ Trained officials in the biodiversity and wildlife field that are able to	➢ EPA, MoA, and FDA	2021

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	management, and education to deal with IAS at all levels, i.e. local, regional, and national level	identify and remove IAS		
	➢ Strengthen existing biodiversity conservation programmes to identify ecosystems, species and genetic resources that are at imminent risk of being invaded or over-run by IAS and exotics	➢ Number of IAS training programmes; and ➢ Reviewed biodiversity conservation programmes, and/or results from monitoring and evaluation studies.	➢ EPA, MoA, and FDA	Ongoing - updated every 5 years
	➢ Combine the eradication of IAS with employment creation initiatives	➢ Employment provision (public works programme)	➢ EPA, FDA, Ministry of Labour and Ministry of Public Works	2021 (on-going)
CHEMICALS	➢ Create an agrochemical and chemical database in the mining sector.	➢ The types of chemical imported for agriculture and mining activities shall be known	➢ EPA, MoA, and MME	2019-2021
	➢ Conduct risk assessment research on agrochemical and chemical use in the mining sector in Liberia. Such a risk assessment research shall include exposure identification, hazard identification, dose/response assessment, and risk characterisation. As a suggestion, the government could identify a particular community or county for conducting the	➢ The quantity and quality of chemical usage in Liberia will be known	➢ EPA and NPHIL	2019-2021

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	risk assessment research. The study could then identify the exposure level in the environment and in humans. It can also identify the type of chemical(s) a certain community has been exposed to and conduct dose-response calculations. The pollutants can then be characterised.			
	➢ Develop a policy on the use of certain chemicals to extract precious minerals; and ➢ Work with relevant stakeholders to development chemical-use policy based on the characterisation of certain chemicals.	➢ Agriculture and mining companies will be aware of the type of chemicals to use in Liberia	EPA, MME, and MoA	2019-2021
WASTE MANAGEMENT	➢ Develop a clear definition of the roles and responsibilities of the principle agencies involved in waste management and sanitation. Their activities should be coordinated so as to avoid overlapping and duplication of function; and	➢ Define roles and responsibilities of the principle agencies involved in waste management and sanitation; and ➢ Number of workshops, seminars and/or conferences held.	EPA	Ongoing through workshops, conferences, and other means of communication

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	➢ Inform and educate relevant entities by circulating information, holding workshops/seminars and conferences.			
	➢ In adherence to the 1973 Municipal Act of Liberia, all policies and legislative provisions on waste management should be reviewed and revised, where possible. Although this is in process, it is not yet fully completed. The EPA can either do it themselves or contract an independent research team to complete this task.	➢ Revised policies and legislative provisions on waste management	EPA/GoL	Between 4-6 months
	➢ It should be mandatory for all facilities that produce a lot of wastes, such as factories and hospitals, to install and operate incinerators for burning their combustive waste fractions.	➢ Revised policies and legislative provisions on waste management, making it mandatory for all facilities that produce a lot of wastes, such as factories and hospitals, to install and operate incinerators for burning their combustive waste fractions	Ministry of Health and EPA	Immediately
	➢ The official waste disposal site in Fiamah should be abandoned. A	➢ A new dumpsite	EPA/GoL/UNDP	Within 3-6 months

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	new dumpsite should be gazetted in an appropriate location. Fiamah dumpsite waste site was relocated to Whein Town and became the new temporary dumpsite (World Bank, 2014).			
	➢ There is a need for a thorough environmental and public health impact study focusing on the impacts of solid waste and sewage on the environment	➢ A research study/report on the impacts of solid waste and sewage on the environment	EPA and Ministry of Health	None
	➢ A well-coordinated public awareness and education programme on waste management and sanitation must be developed. Such a programme should have a strong community capacity building component; ➢ An integrated waste management strategy for Liberia should be developed; ➢ Waste management-related laws and regulations should be formulated, and existing laws and regulations	➢ A public awareness and education programme and post-monitoring results showing the impact of such a programme; ➢ An enacted integrated waste management strategy; ➢ Enacted waste management-related laws and regulations; ➢ Enacted guidelines for the disposal of wastes from villages and rural communities including agricultural waste; ➢ Develop guidelines on the management and disposal of plastic waste; and	EPA/GoL/UNDP and Ministry of Health/MoA/City Corporations	None

THEME	PROPOSED ACTIVITY	EXPECTED DELIVERABLE	LEADING AND/OR SUPPORTING AGENCIES	DEADLINE OR TIMEFRAME
	updated to meet the demand of present realities; and ➢ Guidelines for disposal of wastes from villages and rural communities should be developed.	➢ Develop guidelines on the conversion of waste materials to reusable through Public private partnership.		

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