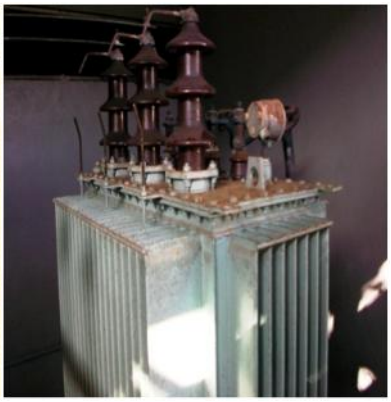
LIBERIA NATIONAL SITUATION REPORT ON THE SOUND MANAGEMENT OF CHEMICALS



By
Environmental Protection Agency of Liberia (EPA)

January 2013

Monrovia, Liberia

FOREWORD

The growing worldwide commitment to protect human health and the environment from dangerous chemicals has been a catalyst for action in many sectors in Liberia. Chemicals directly and indirectly affect many aspects of our lives and they can be helpful but also harmful in the situation that they are not properly managed. Due to the cross-sectoral natural of chemicals management and the focus of Liberia's Poverty Reduction Strategy (PRS) on a number of sectors in which chemicals and their management play a critical role, a well coordinated and integrated management approach at the national level is necessary to achieve maximum impact considering the limited resources available.

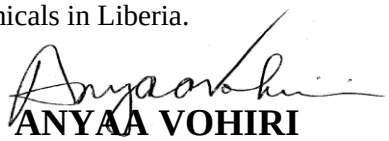
To galvanize the process, Liberia acknowledged the Johannesburg Plan of Implementation which was adopted at the World Summit on Sustainable Development (WSSD) in 2002, and which aims to "*by the year 2020, chemicals will be produced and used in ways that minimize significant adverse impacts on the environment and human health*." As a further reaffirmation of the importance of the Sound Management of Chemicals, the Government of Liberia created the Environmental Protection Agency (EPA) in 2003 in order to institutionalize environmental management of which chemicals management is an integral part. Liberia also took part in all of the activities that led to the birth of the Strategic Approach to International Chemicals Management (SAICM), a policy framework adopted in 2006 by the International Conference on Chemicals Management (ICCM).

This report presents Liberia's National Situation with respect to the Sound Management of Chemicals. It has been prepared as part of the project "*Liberia, UNDP and UNEP Partnership Initiative for the Integration of Sound Management of Chemicals Considerations into development plans and processes*", with technical assistance provided by EPA, UNDP and UNEP and financial assistance provided by the SAICM Quick Start Programme Trust Fund (QSP TF). The report is a first step in strengthening national and local focus on cross-sectoral governance that addresses overall chemicals management concerns rather than dealing with issues on a chemicals-by-chemicals basis.

The report builds upon earlier chemicals management related activities and assessments conducted in Liberia with the financial support of the Global Environment Facility (GEF) and the SAICM QSP TF and technical support provided by UNEP and UNITAR.

The National Situation Report (NSR) aims to identify specific areas of chemicals management that are likely to produce concrete environmental, health and economic benefits as a result of introducing sound management practices in economic and social sectors critical to the development of Liberia. The report also assesses the adequacy of current national development strategies in terms of protecting the environment and human health. Finally, the report presents the national chemicals management priorities that have been selected and agreed upon by the project's national stakeholders.

The findings of the NSR will be used for the development of a "*National Plan of Action*" to begin to address the identified national priorities as well as improve efforts to integrate chemicals management priorities into national discussions, development processes, policies and plans. In addition, the NSR is expected to provide guidance to address those areas considered of particular importance to the national situation, and may also serve as a basis for collaborative programs with international organizations and bi-lateral donors, United Nations Agencies, other developmental partners and the private sector to work towards the sound management of chemicals in Liberia.



ANYAA VOHIRI
EXECUTIVE DIRECTOR/CEO-EPA

ACKNOWLEDGEMENTS

The Government and people of Liberia wish to express sincere gratitude and appreciation to the Strategic Approach to International Chemicals Management (SAICM) Quick Start Programme (QSP) Trust Fund for the financial support provided towards the preparation of Liberia's National Situation Report on the Sound Management of Chemicals.

We are also grateful to the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP) for the technical assistance provided throughout the implementation of the project "*Liberia, UNDP and UNEP Partnership Initiative for the Integration of Sound Management of Chemicals Considerations into development plans and processes*" of which the preparation of the National Situation Report is a critical component.

Acknowledgement also goes to Mr. Cllr. Dexter Tiah & Mr. Phil Tarpeh (Legal Consultants), Mr. Charles Collians Yorke & Mr. Othello Kanda (Social, Gender and Economic Consultants), Mrs. Christina Synue & Ebenezer Yankey II (Education and Awareness Consultants), Dr. Oscar Vanyanbah & Mrs. Gloria Stevens (Health Consultants), Jerry T. Toe, Joachim Acolatse, and Jallah Gobeh (Research and Contamination Consultants), Prof. Frankie N. Cassell (national consultant) and Mrs. Hilda van der Veen (international consultant) who were involved in the preparation of the project's baseline analysis and who technically equipped the project stakeholders with the requisite knowledge to select the national chemicals management priorities.

The project acknowledges the support of the Executive Director of the Environmental Protection Agency (EPA), Madam Anyaa Vohiri, and the entire staff of the Agency for raising the importance of issues related to the Sound Management of Chemicals in Liberia and their continued commitment in this area. In particular the project would like to acknowledge Mr. Henry O. Williams, National SAICM and POPs Focal Point and National Project Director, for his continued guidance to the members of the expert teams, project steering committee members and consultants as well as the staff of the SAICM Secretariat at EPA. The major line Ministries and Agencies of the Liberian Government were very cooperative and provided highly relevant data and supports. We express heartfelt thanks to the authorities of the Ministries of Agriculture, Commerce and Industries, Planning and Economic Affairs, Health and Social Welfare, Finance, Justice, Agriculture, Lands, Mines and Energy, Transport, Labor and the Liberia Electricity Corporation (LEC).

Our thanks also goes to the various Stakeholders including NGOs, private sector partners, members of the expert teams and the members of the SAICM Project National Steering Committee for their continued support and guidance.

EXECUTIVE SUMMARY

In light of the years of conflict and the continued challenges which the country continues to face with respect to poverty, food shortages, unemployment, among else, has led the authors of the National Situation Report (NSR) on the Sound Management of Chemicals to decide to adapt the methodology for the report's preparation in order to better fit Liberia's national circumstances. As such the methodology applied and approach taken for the preparation of this report is different as compared to the methodology applied throughout the implementation of UNDP-UNEP Partnership Initiatives in countries not set in a post-crisis environment.

The reasons for taking this adapted approach was largely due to challenges faced by the project as well as the project's consultants related to very scarce data and information access, extremely limited financial and human resources and capacity in the field of chemicals management.

An additional compounding factor in adapting the methodology was based on the point of departure for the project. At the time the project started implementation, a National Chemicals Profile was not yet available. The project's approach was initially thought to benefit from the parallel efforts undertaken as part of a SAICM QSP TF funded project implemented with the support of UNITAR which had as objectives to i) *Develop a National Chemicals Management Profile*; ii) *Develop a National Capacity Assessment*; and, iii) *Hold a National SAICM Priority Setting workshop*. Unfortunately, considering the UNITAR supported project was facing similar challenges as the UNDP-UNEP Partnership Initiative, at the time this draft version of the National Situation Report was prepared, only a preliminary draft National Profile was available to help constitute the baseline for this report. That said, other reports which proved very useful to describe the baseline situation in Liberia with respect to the Sound Management of Chemicals were the "*Liberia National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs)"* (UNIDO, 2006), the "*Liberia Environmental Threats and Opportunities Assessment (ETOA)"* (USAID, 2008) and the "*State of the Environment Report for Liberia*" (EPA/ UNDP, 2006) as well as assessments and analysis prepared as part of the *UNDP-UNEP Poverty and Environment Initiative* (PEI).

Data availability and information has been limited throughout the preparation of the National Situation Report. In order to construct a useful baseline, efforts concentrated on two mutually reinforcing approaches. Firstly, research focused on major social-economic development sectors as presented in Liberia's Poverty Reduction Strategy-II (PRS-II). Based on past and current production levels, as well as growth projections, the type of chemicals likely to be used in these sectors and the potential health and environmental impacts that might arise from their unsound management (as well as the opportunities resulting from their sound management) were estimated and assessed.

Secondly, baseline information was gathered through research undertaken by 5 teams of national consultants (consisting each of two consultants), who focused on the 5 sectoral and cross-sectoral themes:

- Education & Awareness
- Health
- Research and Contamination
- Social, Gender & Economic
- Legal

These sectoral themes were agreed upon and validated during the project's Inception Workshop, held in Monrovia, Liberia on February 9-10, 2011. Following the Inception Workshop, the national consultant

teams started gathering relevant information/data and conducted a basic capacity assessment by disseminating and gathering questionnaires. Preliminary research results were presented at the project's Awareness Raising Workshop (15-16 December 2011) during which key project stakeholders were given the opportunity to provide their view points, insights and opinions related to Liberia's needs and gaps in the area of chemicals management as well as provide feedback on the preliminary priorities presented by the national consultant teams (a summary of these discussions and workshop outcomes is available through the workshop reports).

Following the drafting of a preliminary National Situation Report, identified priorities were presented to all project stakeholders for their validation at the "*National Priority Setting Workshop*" which was held in Monrovia on November 12, 2012. The short and medium term priorities as validated at the priority setting workshop are presented in this National Situation Report.

The validated national priorities will form the foundation for the "*National Plan of Action*" and the "*National Mainstreaming Roadmap*", which will be prepared as part of the same project.

The approach towards the selection of national priorities in Liberia has also been slightly adapted as compared to the selection of national chemicals management related priorities in other countries implementing the UNDP-UNEP Partnership Initiative. The main criteria applied were:

- Achievable within the short (2-3 years) to medium term (4 – 6 years).
- Achievable with minimal financial/human resources.
- Favoring priorities closely related to the (socio) – economic sectors considered key in the implementation of the PRS-II.
- Favoring efforts/priorities targeting capacity building as well as opportunities for livelihoods creation.
- Targeting efforts/priorities focusing on the safeguarding of public health, in particular health effects that are major causes of disease and death in Liberia – in particular those that are linked to the management of chemicals and wastes.
- Targeting efforts/priorities focusing on the sustainable management and protection of natural resources, upon which most livelihoods in Liberia depend, to ensure that livelihoods, critical to the recovery of the Liberian economy, are not negatively impacted by the unsound management of chemicals.
- Targeting efforts/priorities related to the unsound management of chemicals and wastes, which might fuel future tensions or conflicts.

Chapter 9 presents Liberia's national priorities pertaining to the sound management of chemicals, including a detailed summary of the proposed actions that would lead to the achievement of these priorities. A brief summary of the selected priorities and their argumentation resulting from research findings, has been presented below:

Validated National Priorities & Proposed Actions for their Achievement
1. Improve Inter-Agency Coordination on SMC
Argumentation: In compiling this report it became clear that there is very poor communication and coordination between and within Ministries, Institutions and the private sector operating in the area of chemicals management in Liberia. This lack of coordination and collaboration severely impedes any advances in the area of chemicals management in Liberia. Strengthened links and increased communication between actors and agencies involved in chemical management are therefore urgently needed.
2. Develop and Adopt a Classification System for Chemicals
Argumentation: Several entities keep records and collect data on the importation and use of chemicals. However,

in most cases the reasons for doing so are financial (payment of import taxes, meeting EMP requirements). Data collection is not undertaken with the purpose of sharing Health and Safety Information with chemical users. As a result collected data is grouped in random categories (e.g. "Assorted Chemicals"), is not recorded using the metric system (e.g. packages, cans, pieces, bags, boxes, containers, drums, etc.), is not consistent among agencies collecting data and doesn't provide any information on the Health and Safety hazards related to the handling of chemical. Classification of chemicals is inappropriate and does not indicate the risks and hazardous properties associated with imported chemicals, putting human and environmental health at serious risk. In addition, in order to take decisions at national level related to SMC issues, it is key for decision makers to form an opinion related to the Safety, Health and Environment hazards posed by chemicals, which currently is not possible. Therefore, it is critical that the GoL adopts and implements a chemicals classification system conform international MEA and WTO commitments.

3. Improve Centralized Data Collection & Dissemination for Decision Making

Argumentation: Several entities keep records and collect data, or have relatively easy access to information related to the importation and use of chemicals. However, none of this data is easily accessible to the general public or made accessible to other entities operating in the area of SMC. Data is not periodically collected in a central database to provide an overview of the chemicals management situation in Liberia. Each of these entities records data in a different manner and with varying intervals, and when data is compared it is often conflicting. Responsibilities regarding the centralized collection of chemicals data are not regulated, except in the case of the MoA. In order to achieve the sound management of chemicals in Liberia and in particular for decision making purposes, it will be critical to establish a central unit for data collection and maintenance within the agency that it best equipped to do so, and subsequently set-up a data collection system for continuous data logging, reporting and monitoring, providing easy access to it by all relevant entities as well as the general public.

4. Improve the Capacity of Institutions and Entities on SMC

Argumentation: Throughout the preparation of the National Situation Report it was observed that there is a limited number of staff in institutions/entities who are dealing with the management of chemicals. If such units/sections exist, they are poorly staffed and weakly funded. The few staff who act as the focal points for chemicals-related MEAs, spent a considerable amount of their time participating in international meetings and training, leaving little time and dedicated staff capacity to the implementation of activities at national level that aim to improve the management of chemicals. The absence of an approved National SMC Action Plan, which would stipulate the ToRs and time-bound objectives of such units, does not help. As pointed out by EPA itself, capacity remains a major constraint to the Agency, while private sector entities generally do not have trained personnel available who are able to properly handle the chemicals that are used, manufactured, stored and disposed of by the entity. The fact that there is almost no laboratory capacity in place to support monitoring activities jeopardizes the enforcement capacity of inspectorates. The low capacity of institutions and entities that are involved in the Management of Chemicals has an immediate impact on the success of any initiatives carried out in this area and on a day-to-day level puts at risk human and environmental health.

5. Improve Opportunities for Education & Training in the area of SMC

Argumentation: All project stakeholders identified lack of technical capacity as the major underlying cause of environmental degradation and the poor management of chemicals and their wastes. Building future capacity in the environment management and natural resources sector in Liberia depends to a great extent on its educational facilities. Bringing the colleges up to any recognized standard of education will require longer-term donor and GOL commitment. Other reasons cited for the lack of capacity are the lack of "on-the-job" training opportunities related to safety measures and handling of chemicals. Finally, the absence of a knowledge management system containing research findings and reports produced in Liberia that have a bearing on the SMC is also cited by many project stakeholders as impeding training and education opportunities.

6. Create Awareness on SMC

Argumentation: Overall, public awareness related to the sound management of chemicals can be considered extremely low. Too a large extent this is the result of the years of conflict, throughout which the general population did not have the opportunity to benefit from elementary, secondary and tertiary education as well as vocational training. Public knowledge on the handling of hazardous chemicals is most often gained through schooling, on-the-job training, extension services and public awareness raising through newspaper articles,

environmental publications, radio and TV coverage, drama plays, posters, etc. However, not much awareness raising has been conducted in the area of chemicals management, except for workshops and training conducted as part of internationally funded chemicals management programmes. Many of the distributers, users and manufacturers interviewed throughout the preparation of the NSR were not aware of the existence of Materials Safety Data Sheets (MSDS), nor do they know how to use them. The entities also admitted that they didn't provide training to their personnel on the sound management of chemicals and wastes, or provided personal protection gear to their staff. As a result their employees also are not aware of safety measures and precautions when it comes to the handling of chemicals, and - on a daily level – are exposed to the negative health effects of the chemicals they handle. Another compounding factor to low SMC awareness is that in Liberia – as in many other countries – chemicals and chemicals containing products with hazardous properties, are often repackaged into smaller containers for resale and do not contain labels describing what is in the package or how to use it. All the factors mentioned above result in significant risks to the general population as well as workers who on a daily level are in contact with hazardous and toxic chemicals.

7. Improve the Regulatory and Policy Framework for SMC

Argumentation: In Liberia, policies and legislation pertaining to environmental management are more than adequate to provide for a proper enabling environment for the sound management of chemicals. However, particularly with regard to their implementation, the policy and legislative framework for protecting the environment in Liberia is overly comprehensive, complicated and detailed to facilitate implementation. It was observed that the requirements setout within these frameworks that would have to be instituted by EPA to implement the law, go far beyond its current human and financial capacity. Therefore, it is imperative for EPA and other institutions to prioritize the implementation of its mandate, focusing on a few areas - in this case related to the sound management of chemicals - in which the protection of the environment and human health could be maximized. While the EPML law contains many significant provisions that could be used to protect the environment and human health, its lack of implementing regulations means that these provisions remain largely inoperative. Developing such regulations would go a long way towards increasing the Law's effectiveness.

8. Improve Enforcement of SMC related Regulations

*Argumentation***:** One of the main constraints to putting in place sound practices for the management of chemicals is the weak law enforcement in the area of environmental management. Considering environmental law enforcement is already weak, enforcement of (future) chemicals management related regulations would, at a minimum, be equally challenging. It is for this reason that meager resources of the EPA and inspectorates of various line ministries, would have to be sufficient capacitated and trained to take on additional enforcement responsibilities pertaining to the sound management of chemicals.

9. Improve the Implementation of Chemicals-related MEAs

*Argumentation***:** Liberia is a signatory to the most chemicals-related Multilateral Environmental Agreements. However, due to the years of conflict, not much progress has been made on the implementation of these chemicals-related MEAs. Besides certain bans on prohibited chemicals (e.g. POPs pesticides, PCBs, certain ODS), the development of a National Implementation Plan (NIP) for the Stockholm Convention, and some preliminary activities undertaken as part of the UNDP/UNEP & UNITAR SAICM projects, not many national priorities have been addressed within the framework of these convention. The promotion and implementation of all relevant international instruments pertaining to chemicals and hazardous waste should be encouraged to ensure that necessary procedures are put into place and national commitments can be met.

10. Improve the Management of Hazardous and Toxic Wastes

Argumentation: The project's stakeholders identified on multiple occasions that the management of hazardous and toxic wastes remains an issue of major concern, considering the necessary infrastructure (e.g. disposal sites/hazardous landfill sites) to accept such wastes are not available, and best practices and technologies for hazardous and toxic waste disposal are not being applied. Combined the unsound management of wastes is resulting in human health effects and water, soil and air pollution from a multitude of sources and inappropriate practices.

11. Create Funding Opportunities for SMC activities

Argumentation: A major constraint to the advancement of the sound management of chemicals in Liberia, are

funding constraints. In order to address any of the selected priorities and undertake any of the proposed actions as included in this National Situation Report, it is critical to mobilize funding (both at national and international level) to implement such actions and address national priorities.

12. Development of Partnerships with the Private Sector

Argumentation: The capacity of certain private sector entities in the area of Safety, Health and Environmental (SHE) can be considered advanced, in particular related to practices in the area of chemicals and waste management. This is mostly because certain internationally owned corporations have to adhere to relatively stringent internal corporate requirements – that more often than not are more rigorous that the regulatory framework currently in place in Liberia. As such, there are many opportunities to learn from the best practices and approaches as implemented by these corporations, and it would be beneficial to the advancement of SMC in Liberia to establish lasting partnerships with private sector entities to facilitate the implementation of this National Plan of Action on the Sound Management of Chemicals.

TABLE OF CONTENTS

FIGURES

TABLES

LIST OF ACRONYMS

ARTI	Acute Respiratory Tract Infections
BIVAC	Bureau of Inspection, Valuation, Assessment and Control
BNF	Bureau of National Fisheries
CMI	Chemical Management Issues
DDT	Dichlorodiphenyltrichloroethane
EMP	Environmental Management Plans
EPA	Environmental Protection Agency
EPML	Environmental Protection and Management Law
EU	European Union
FAO	Food and Agriculture Organization
FDA	Forestry Department Authority
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GEF	Global Environmental Fund
GHS	Globally Harmonized System of Classification and Labeling of Chemicals
GOL	Government of Liberia
ICM	Inter Agency Coordinating Mechanism
IPD	Import Permit Declaration
ADB	African Development Bank
IMF	International Monetary Fund
IPM	Integrated Pest Management
LRPC	Liberian Petroleum Refining Corporation
MOA	Ministry of Agriculture
MOC	Ministry of Commerce
MDG	Millennium Development Goals
MHSW	Ministry of Health and Social Welfare
MLME	Ministry of Lands, Mines and Energy
MPEA	Ministry of Planning and Economic Affairs
NGO	Non Government Organizations
NIP	National Implementation Plan
NPHC	National Population and Housing Census
NSR	National Situation Report
OECD	Organization for Economic Cooperation and Development
PCBs	Polychlorinated Biphenyls
PEI	Poverty and Environment Initiative
PIC	Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade
POP	Persistent Organic Pollutant
PRS	Poverty Reduction Strategy
QSP TF	Quick Start Programme Trust Fund
SAICM	Strategic Approach to International Chemicals Management
SMC	Sound Management of Chemicals
TDI	Toluene Di-isocyanate
TEF	Toxic Equivalency Factor
TEQ	Toxic Equivalent
TOR	Terms of Reference

UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNITAR	United Nations Institute for Training and Research
USA	United States of America
WHO	World Health Organization
WWF	World Wildlife Fund

1. INTRODUCTION

There are clear inter-linkages between environment, development, security and good governance in Liberia. Poor environmental management, overexploitation of natural resources and poverty are some of the issues that have fuelled conflict in the past. After years of instability, war and destruction, Liberians with the support of Government and the international community have begun the process of transformation, recovery and reconstruction. This is a major challenge. Areas to be addressed include the provision of basic services, security and public sector reform, governance and the rule of law, decentralization and community revitalization, and economic recovery (SOE, 2006).

Liberia is rich in natural resources, and in a quest to develop its economy and meet the needs of its growing population, wants to make maximum use of its abundant biological and environmental wealth. The link between environment and development is one that needs to be understood if Liberia is to achieve sustainable development. Economic growth affects the environment through the increased use of natural resources. In the same way, environmental change can affect the economy, especially those sectors that are based on natural resources, such as agriculture and forestry. Economic growth provides the resources needed for investment in the productive capacity of the economy. Such resources are necessary for poverty alleviation and can also be used to mitigate environmental problems (SOE, 2006).

The Liberia economy has been in decline since the 1980s due to extreme social and political upheaval and mismanagement. The war destroyed productive capacity and physical infrastructure on a massive scale. The result has been a precipitous economic decline and the deepening of national poverty. Per capita Gross Domestic Product (GDP) in 2005 prices declined from US$ 1,269 in 1980 to US$ 163 in 2005, a decline of 87%. It is estimated that three fourths of the population is living below the poverty line on less than US$ 1 a day (IPRS 2007).

During the war, agricultural production dropped precipitously as people fled their farms and markets closed. Mining and timber activity nearly ceased, rubber plantations closed, manufacturing dropped sharply and services ground to a halt. Basic infrastructure was badly damaged by the conflict. There was virtually no public source of electricity or piped water in the country for 15 years until July 2006 when power and water was restored to parts of Monrovia. Schools, hospitals, and clinics were badly damaged, and most government buildings were in shambles. Many roads are still impassable, which seriously constrains peace-building efforts, weakens economic activity and undermines basic health and education services.

Liberia's economy is largely dependent on agricultural crops (e.g. rubber, rice, root, tuber, vegetables and fruit, oil palm, coffee and cacao), timber, gold and diamonds. The heavy reliance of the production sector of the Liberian economy (agriculture, forestry, fisheries, mining and quarrying) on national resources underscores the need to sustainable manage natural resources and safeguard current and future opportunities for livelihoods creation.

Liberia's development strategy, its Poverty Reduction Strategy (PRS), is founded on four pillars:

1) Peace, Security and Rule of Law
2) Economic Transformation
3) Human Development
4) Governance and Public Institutions

The focus of Pillar 2 "Economic Transformation" is on the Agriculture and Food Security, the Forestry and Mineral Development and Management. All of these sectors, which are critical for the development and recovery of the Liberian economy and the wellbeing of its population, are closely linked to the use

and application of chemicals and can be sectors that can also be potentially seriously impacted by the unsound management of chemicals.

Increased environmental degradation as a result of the poor management of chemical products and poor disposal of (chemical) wastes can result in the loss of biodiversity, soil erosion and water pollution and could further place human health, ecosystems, and national economies at risk. This in turn could lead to reduced crop outputs, damage to fisheries and watersheds, increased health care costs, reduced worker productivity and greater environmental degradation.

Liberia, like most developing countries, has recognized that the Sound Management of Chemicals is in its national interest to achieve sustainable development and that the introduction of sound management of chemicals practices can produce concrete environmental, health and economic benefits.

To this end, Liberia has adopted various international commitments towards that end (see also Table 7 – Chapter 7), of which the most recent is the implementation of the Strategic Approach to International Chemicals Management (SAICM). The preparation of this National Situation Report is one of the first steps towards the implementation of SAICM in the country.

1.1 Strategic Approach to International Chemicals Management (SAICM)

The Strategic Approach to International Chemicals Management (SAICM) is a policy framework adopted in February 2006 by the International Conference on Chemicals Management (ICCM). SAICM was developed by a multi-stakeholder and multi-sectoral preparatory committee and supports the Johannesburg Plan of Implementation goal that, *by 2020, chemicals will be produced and used in ways that minimize significant adverse impacts on the environment and human health*. It acknowledges the essential contribution made by chemicals to modern societies and economies while at the same time recognizing the potential threat to sustainable development if chemicals are not managed soundly. The overall objective of the Strategic Approach is to achieve the sound management of chemicals throughout their life-cycle by 2020, among other ways, through the implementation of activities set out in the SAICM Global Plan of Action[1].

Four major value-added features of SAICM, relative to the international management of chemicals work that preceded it, are:

- ✓ Strengthened focus on cross-sectoral governance at both the national and local level that addresses overall chemicals management concerns rather than dealing with issues on a chemical-by-chemical basis.
- ✓ Emphasis on the role of the sound management of chemicals in achieving sustainable development goals, including poverty eradication, improvement of human health, environmental protection and elevation of living standards.
- ✓ Recognition that in order to significantly advance the chemicals management situation of countries, integrating sound management of chemicals into national and local development planning is essential.

[1] Resolutions of the International Conference of Chemicals Management (ICCM): Dubai Declaration on International Chemicals Management, Overarching Policy Strategy and the Global Plan of Action: http://www.saicm.org/images/saicm_documents/saicm%20texts/SAICM_publication_ENG.pdf

- ✓ A more comprehensive and holistic manner of addressing the increasing gap in the capacity of developed and developing countries to manage risks posed by chemicals.

As envisaged in the SAICM Overarching Policy Strategy[1], initial capacity building activities for the implementation of SAICM objectives are supported by the Quick Start Programme (QSP). The QSP includes a voluntary, time-limited trust fund, which aims to fund capacity building activities focusing on:

- Development or updating of national chemical profiles and the identification of capacity needs for sound chemicals management;
- Development and strengthening of national chemicals management institutions, plans, programmes and activities to implement the Strategic Approach, building upon work conducted to implement international chemicals-related agreements and initiatives;
- Undertaking analysis, interagency coordination, and public participation activities directed at enabling the implementation of the Strategic Approach by integrating – i.e., mainstreaming – the sound management of chemicals in national strategies, and thereby informing development assistance cooperation priorities.

Through funding provided to the Government of Liberia (GoL) by the SAICM QSP TF, the GoL decided to undertake initial capacity building activities in support of SAICM through two (2) different but mutually reinforcing activities and projects:

- ➢ *"Developing a National Chemicals Management Profile, Developing a National Capacity Assessment and Holding a National SAICM Priority Setting workshop in Liberia"* (UNITAR).
- ➢ "*Liberia, UNDP and UNEP Partnership Initiative for the Integration of Sound Management of Chemicals Considerations into Development Plans and Processes*" (UNDP – UNEP).

The UNITAR project focuses mostly on achieving objective "a" of the QSP while the UNDP-UNEP supported project focuses mostly on achieving objectives "b" and "c" of the QSP.

1.2 SAICM in the Context of the National Development Planning Process

Integrating Sound Management of Chemicals into development plans such as Poverty Reduction Strategy Papers and strategies to meet the Millennium Development Goals (MDGs) involves establishing links between poverty and sound chemicals management – such as improved human and environmental health, and increased economic security and income opportunities for the poor – and then identifying the policies and programmes needed to bring about pro-poor chemical management. It also involves looking at potential chemical risks arising from implementing sections of the development plans, and trying to mitigate such risks at the planning stager.

The overall aim is to establish enduring institutional processes within government ministries and the wider stakeholder community to bring about sound management of chemicals. The integration of chemicals management priorities into national development planning processes will be a means to help the government foster national budget commitments as well as donor assistance. To influence the development planning process requires an adequate knowledge of its functioning. In order to do so, environment and health officials must have a clear understanding of the way the development planning process is working within the unique circumstances of the country and where are the opportunities for interventions to influence the process.

Box 1: Mainstreaming of SMC Priorities

Purpose: Integration of sound management of chemicals priorities into national development planning to address the most serious problem areas, while making the utmost use of opportunities that link sound management of chemicals with sustainable development factors. Fostering national budget commitments, in partnership with donor assistance, following the integration of priorities into national policy and planning documents.

Goals: Making clear to national finance and treasury departments, and aid agency officials, the linkages between sound management of chemicals and progress in achieving the MDGs. Awareness raising targeted to political decision makers. Inclusion of priorities for the sound management of chemicals in national policy and planning documents.

Rationale: Decision makers are far more likely to opt for sustainable modes of development when health and environmental costs of alternative policies are fully valued in terms of natural resource depletion/conservation, human mortality and morbidity, health care costs, low wages, etc. Significant responses to hazards often only occur when a long-standing environmental risk erupts into a health crisis, or economic or political emergency. By moving from a reactive to a pro-active policy approach, risks that might develop into full-scale environmental and health emergencies can be mitigated, and crises that otherwise might have serious implications for a country's economic, political and physical infrastructure can be limited or even prevented.

1.3 Mainstreaming SAICM in Liberia

1.3.1 Analysis of the degree of SMC mainstreaming in the PRS-II

Introduction to the PRS-II (2012 – 2017)

Liberians have enjoyed relative peace and stability since 2003. Since that time, the Government of Liberia and its development partners, including international organizations, civil society, and the private sector have sought to do everything in their power to ensure that Liberians experienced the benefits of peace. Since 2006, several short and medium term plans were implemented ranging from the 150 Action Plan (2006) to the Interim Poverty Reduction Strategy (2007) and then the full Lift Liberia Poverty Reduction Strategy (2008-2011).

All of these interventions have contributed, in meaningful ways, to the relative stability, which Liberia enjoys today. These strategies and plans were geared toward removing some of the immediate hardships experienced by Liberians as a result of the war; providing a safe and secured environment for livelihood; rebuilding damaged infrastructure and providing basic social services (education, health, water, etc); rebuilding institutional capacity; and addressing some systemic deficiencies (policies and legislations). While some of these interventions were visible and had immediate impact, the majority of them were intended to lay the foundations for rapid, inclusive, and sustainable growth.

Recognizing the shortcomings of the Lift Liberia PRS-I and capitalizing on the gains made there from, the Government of Liberia has articulated a new medium-term economic growth and development strategy (2012 – 2017), an "*Agenda for Transformation and Action - ATA*" that will guide development activities in Liberia. This medium term plan is being deliberately linked to the long-term national vision "*Liberia Rising 2030*" of which the overarching goal is to achieve middle-income status by 2030. Toward these understandings, the "*Agenda for Transformation*" will focus on the following key investments:

- **Investing in Infrastructure:** Power/Energy; and Roads
- **Investing in People:** Youth Skills Development & Employment; Reconciling People**:** Health Improvement**;** Education and Manpower Development**;** and, Social Safety Net Provision
- **Investing in Institutions:** Security**;** Private Sector Development (SMEs); and, Public Sector Institutions

The Liberia medium-term economic growth and development strategy (2012 – 2017), is founded upon four pillars: 1) Peace, Security and Rule of Law; 2) Economic Transformation; 3) Human Development; and, 4) Governance and Public Institutions (see Box 2).

Box 2: Republic of Liberia: Agenda for Transformation and Action (ATA) – Steps towards Liberia Rising 2030, Liberia's Medium Term Economic Growth and Development Strategy (2012 – 2017)

Pillar 1: Peace, Security and Rule of Law

Goal: To create an atmosphere of peaceful co-existence based on reconciliation and conflict resolution and providing security, access to justice, and rule of law to all.

Sector Goals for Peace and Security:

- **Security: Maintain a secure and safe environment to enable sustainable socio-economic growth and development.**
- **Peace and Reconciliation: Ensure long term peace and stability through managing tensions in society to reduce the risk of future conflict, increasing social cohesion and ensuring that the principles of human rights are upheld**
- **Justice and Rule of Law: Build the effectiveness and integrity of legal institutions, increase equitable access to justice and strengthen the rule of law for the social and economic benefit of all Liberians.**
- **Judicial Reform: Protect the rights and dignity of all through a strengthened, credible and independent Judiciary delivering transparent justice.**

Pillar 2: Economic Transformation

Goal: To transform the economy to meet the demands of Liberians by developing the domestic private sector, including with resources leveraged from the FDI in mining and plantations; providing employment for a youthful population; investing in infrastructure for economic growth; addressing fiscal and monetary issues for macroeconomic stability; and improving agriculture and forestry to expand the economy for rural participation and food security.

Sector Goals for Economic Transformation:

- **Private Sector Development: MSME Growth & Financing; Industrial Development; Regulatory environment; Property Rights and Contract Enforcement; and, International Trade**
- **Macroeconomic Issues: Macroeconomic and Debt Management; and, Monetary**
- **Infrastructure: Energy; Roads and Bridges, Ports, and other transport; Post and Telecom; and, Public housing and buildings**

- **Agriculture and Food Security**
- **Forestry**
- **Mineral Development and Management**

Pillar 3: Human Development

Goal: to improve quality of life by investing in: quality education; affordable and accessible quality healthcare; social protection for vulnerable citizens; and equitable access to healthy and environmentally friendly water and sanitation services.

Sector Goals for Human Development:

- **Education: Ensure equal access to a high quality free and compulsory basic education and a variety of post-basic education and training opportunities that lead to an improved livelihood and / or tertiary education.**
- **Health and Social Welfare: Improve the health, nutrition, and social welfare status of the population of Liberia on an equitable basis**
- **Social Protection: Protect the poorest and most vulnerable households and groups from poverty, deprivation and hunger and support them in attaining a minimum standard of living.**
- **Water and Sanitation: Increase access to safe water supply and sanitation and improve hygiene practices, to contribute to improved human welfare, development and Liberia's long term growth.**

Pillar 4: Governance and Public Institutions

Goal: In partnership with our citizens, to create transparent, accountable and responsive public institutions that contribute to economic and social development as well as inclusive and participatory governance systems.

Sector Goals for Governance and Public Institutions:

- **Political Governance: Nation-Building and Decentralization; and, Management of Government Assets:**
- **Public Sector Modernization and Reform**
- **Economic Governance: Public Financial Management; Concessions; Land Tenure and Use; and, Transparency and Anti-Corruption**

Analysis of the mainstreaming of human and environmental health impacts related to the management of chemicals

As was the case in the PRS-I, in the PRS-II, Environment has again been regarded as one of the cross-cutting issues (other CCIs are: women and girls (Gender); children (Child Protection); the Disabled; Youth (Empowerment); Human Rights; Labor and Employment; HIV/AIDS; Conflict Prevention and Capacity Development).

Throughout the PRS-II there is no mentioning of the management of chemicals or their management. The issue of pollution (water) is only mentioned in relation with the disposal of untreated sewerage. Nevertheless, the exploitation of Liberia's abundant natural resources – agriculture, forestry, mineral development and management remains a key driver for poverty alleviation and a significant component of Liberia's Economic Transformation (see Pillar II: Box 2). These are socio-economic sectors in which chemicals and their management play a critical role and where the mismanagement of chemicals can have serious consequences, jeopardizing human and environment health, livelihoods and employment creation as well as creating further tension and conflicts.

However, as compared to the PRS-I, the PRS-II does to a much greater extent, integrate environmental considerations throughout the various pillars, in addition to discussing "environment" as a cross-cutting issue. However, the PRS-II doesn't provide in-depth information or details on what these "environmental considerations" are.

For example, throughout Pillar II: "Economic Transformation", environmental consideration are being referred to on multiple occasions in the sections on "Forestry", "Mineral Development and Management" and under Pillar III: "Human Development" in the section on "Water, Sanitation and Hygiene". Although Environment is referred to in a larger context, a number of the objectives and policy interventions proposed are definitely closely linked to the management of chemicals, as well as the protection of workers safety. A few examples are provided below in Box 3.

Box 3: Liberia PRS-II highlights showcasing the mainstreaming of environmental considerations

Pillar II: Economic Transformation: Private Sector Development
Sector Goal: Regulatory environment: Assure safe working conditions for workers
Pillar II: Economic Transformation: Forestry
Agents and Process for Change: The FDA will collaborate with the Liberia Extractive Industries Transparency Initiative (LEITI), Environmental Protection Agency (EPA) and Forest Carbon Partnership Facility (FCPF) to create the capacity to monitor and regulate the forestry sector and to inform the public better about the expansion of the forestry and its impact of society and the environment.
Pillar II: Economic Transformation: Mineral Development & Management
The large-scale part of the mineral extraction sector made significant progress during the PRS-1 by attracting local and foreign investors and yielding fiscal revenue. Getting more employment and capacity building of Liberians and domestic purchases of inputs at the large enterprises remains problematic. The informal small-scale mining, mainly gold and diamonds, has also grown, although its size is not well recorded. Due to inefficient practices, their recovery from alluvial gravels for gold is minimal - currently 30-40 percent - and health and environmental hazards from mercury, etc. are substantial. The Government recently established a regulatory framework for environmental management and sustainable development in the mineral extraction sector. *Sector Goal*: To promote an equitable and optimal exploitation of Liberia's mineral resources - bringing fiscal revenue to the government, enhancing economies of scale in provision of infrastructure services for the rest of the economy, creating linkages to the local economy, and protecting the environment. *Strategic Objectives*: To spread the benefits of the concessions beyond the mining enclaves, regulations will assure that mining operations observe environmental regulations and that they contribute to the expansion of employment and enterprises in the rest of the economy. *Priority Interventions*: The Government will encourage artisanal and small-scale miners to organize into cooperatives and provide them with safety and environmental awareness training and other technical assistance, so that they operate legally, safely and efficiently. Improvements require training and support, as well as enforcement of existing codes. Key challenges are 1) To make cooperatives and government involvement attractive to the presently independent miners, and 2) to prevent this government regulation from becoming a cause of inefficiency and corruption. For the large-scale

operations, the concessions agreements will contain environment protection conditions, and the Government will call on international help to monitor and enforce compliance with them. The Government will conduct public information campaigns and develop regulations and sanctions to keep environmental abuses in check.

Pillar III: Human Development: Water, Sanitation and Hygiene

In Monrovia a solid waste disposal program has made reasonable progress, including establishment of an environmentally acceptable landfill; but the rest of the country has no disposal program. It will be critical to develop a comprehensive policy on solid waste for Liberia, as well as to set up a National Water Resources and Sanitation Board to address the fragmentation in this sector.

Goal: The goal of WASH is to increase access to safe water supply, improve solid waste disposal, and improve hygiene practices on a national scale.

Strategic Objectives: Government programs for WASH will increase environmentally friendly and sustainable water and sanitation and solid waste disposal services; expand safe hygiene practices in communities; strengthen the utilities and municipalities responsible for service provision; and train and sustain the human resource base and management needed for WASH services in Liberia.

Pillar III: Human Development: Health and Social Welfare

Objective: "Strengthen programs for environmental & occupational health"

Summary

The management of chemicals or related wastes are not mentioned in the PRS-II. The issue of pollution (water) is only mentioned in relation with the disposal of untreated sewerage. However, as compared to the PRS-I, the PRS-II does to a much greater extent integrate environmental considerations throughout the four (4) pillars, in addition to discussing "environment" as a cross-cutting issue. The PRS-II doesn't provide in-depth information on what these "environmental considerations" are, as environment is referred to in a larger context. Nevertheless a number of the objectives and policy interventions proposed are definitely closely linked to the management of chemicals, as well as the protection of workers safety (e.g. the use of Mercury in artisanal gold mining).

In the PRS-II, environmental aspects are mostly highlighted in connection to the "Forestry" and "Mining" sector as well as "Water, Sanitation and Hygiene", which from a chemicals management perspective are priority sectors. Nevertheless, other sectors, in particular Agriculture and Energy (as discussed in this National Situation Report), are quite important from a chemicals management point of view, however environmental considerations are not highlighted in this context.

Although the PRS-II is an improvement over the PRS-I with respect to environmental mainstreaming, it can be concluded that further mainstreaming efforts are required, not only to integrate environmental dimensions in other sectors than the three discussed above, but also to advance the mainstreaming of SMC priorities in relation to the various economic sectors that have a bearing on the management of chemicals.

1.3.2 Baseline Analysis Objectives – Purpose of the National Situation Report

The purpose of the **Baseline Assessment** (UNDP, 2012) is to determine what type of information is available on a country's chemicals management situation and record it. Such relevant information could be retained in a National Chemicals Profile, a National Implementation Plan for the Stockholm Convention on POPs, a State of the Environment Report, Millennium Development Goals (MDGs) report, Poverty Reduction Strategy (PRS) Plan as well as other information sources.

The goal of the baseline assessment is the development of a **National Chemicals Management Situation Report** that summarizes the country's situation with respect to SMC and provides information on the degree of integration of the sound management of chemicals into national development planning (see section 1.3.1). A National Chemicals Management Situation Report is an essential prerequisite for an integrated assessment and analysis of the linkages between chemicals management and related economic, health and environmental impacts.

The Baseline Assessment is followed by the **identification of National SMC priorities**. Priority setting is based on a qualitative analysis of the links between major chemical problem areas and human health and environmental quality and the identification of opportunities (legal, technical and institutional) that can strengthen the national chemical management regime. In this sense it is important to explore and identify a full range of actions that can help improve environmental and health conditions. Decisions taken on the selection of the highest priorities are based on the opportunities identified and a priority-setting exercise. A priority chemical management issue will be one that is significant to national health, environment and development objectives.

This National Situation Report contains on overview of the Baseline Assessment, results and conclusions from the Needs Assessments as well as an overview of the selected priorities during the priority setting exercise.

1.3.3 Methodology

In light of the years of conflict and the continued challenges which the country continues to face with respect to poverty, food shortages, unemployment, among others, has led the authors of the NSR to decide to adapt the methodology for the report's preparation in order to better fit Liberia's national circumstances. As such the methodology applied and approach taken for the preparation of this report is different as compared to the methodology applied throughout the implementation of UNDP-UNEP Partnership Initiatives in countries not set in a post-crisis environment.

The reasons for taking this adapted approach was largely due to challenges faced by the project as well as the project's consultants related to very scarce data and information access, extremely limited financial and human resources and capacity in the field of chemicals management.

An additional compounding factor in adapting the methodology was based on the point of departure for the project. At the time the project started implementation, a National Chemicals Profile was not yet available. The project's approach was initially thought to benefit from the parallel efforts undertaken as part of a SAICM QSP TF funded project implemented with the support of UNITAR which had as objectives to i) *Develop a National Chemicals Management Profile*; ii) *Develop a National Capacity Assessment*; and, iii) *Hold a National SAICM Priority Setting workshop*. Unfortunately, considering the

UNITAR supported project was facing similar challenges as the UNDP-UNEP Partnership Initiative, at the time this draft version of the National Situation Report was prepared, only a preliminary draft National Profile was available to help constitute the baseline for this report. That said, other reports which proved very useful to describe the baseline situation in Liberia with respect to the Sound Management of Chemicals were the "*Liberia National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs)"* (UNIDO, 2006), the "*Liberia Environmental Threats and Opportunities Assessment (ETOA)"* (USAID, 2008) and the "*State of the Environment Report for Liberia*" (EPA/ UNDP, 2006) as well as assessments and analysis prepared as part of the *UNDP-UNEP Poverty and Environment Initiative* (PEI).

Data availability and information has been limited throughout the preparation of the National Situation Report, therefore the approach taken to construct a useful baseline was to concentrate efforts on two mutually reinforcing approaches. The first one was to construct the project's baseline and the National Situation Report itself by concentrating on the major social-economic development sectors of the country and the projections put forward in Liberia's Poverty Reduction Strategy-II (PRS-II) and fledge out, based on past and current production levels the type of chemicals that are likely used in these sectors and the potential health and environmental impacts that might result from their unsound management, as well as the opportunities that might arise from a economic, social, livelihoods, health and environment perspective when such chemicals and their wastes would be soundly managed.

On the other hand, baseline information was gathered through research undertaken by 5 teams of national consultants (consisting each of two consultants), who focused on the 5 sectoral and cross-sectoral themes:

- Education & Awareness
- Health
- Research and Contamination
- Social, Gender & Economic
- Legal

These sectoral themes, were agreed upon and validated during the project's Inception Workshop (February 9-10, 2011 – Monrovia – Liberia) while the preliminary results of the research were presented by the national consultants at the project's Awareness Raising Workshop (15-16 December 2011). In order to gather relevant information and data and conduct a basic capacity assessment, the national consultant teams conducted interviews and disseminated and gathered questionnaires. During the Inception and Awareness Raising workshops, key project stakeholders were provided the opportunity to provide their analysis, insights and opinions related to Liberia's needs and gaps in the area of chemicals management as well as the preliminary priorities as identified and presented by the national consultant teams (a summary of these discussions and workshop outcomes has been provided in Annex C).

Following the drafting of a preliminary National Situation Report, the priorities that had been identified throughout the research undertaken by the national consultant teams, the sectoral analysis and complemented by input from the project stakeholders at conducted workshops, were in a comprehensive manner presented to all project stakeholders for their validation at the "*National Priority Setting Workshop*" which was held in Monrovia on November 12, 2012. The short and medium term priorities as validated at the priority setting workshop are presented in this National Situation Report. Upon these validated national priorities the "*National Plan of Action*" and the "*National Mainstreaming Roadmap*" will be based and formulated.

The approach towards the selection of national priorities in Liberia has also been slightly adapted as compared to the selection of national chemicals management related priorities in other countries implementing the UNDP-UNEP Partnership Initiative. The main criteria applied were:

- Achievable within the short (2-3 years) to medium term (4 – 6 years).
- Achievable with minimal financial/human resources.
- Favoring priorities closely related to the (socio) – economic sectors considered key in the implementation of the PRS-II.
- Favoring efforts/priorities targeting capacity building as well as opportunities for livelihoods creation.
- Targeting efforts/priorities focusing on the safeguarding of public health, in particular health effects that are major causes of disease and death in Liberia – in particular those that are linked to the management of chemicals and wastes.
- Targeting efforts/priorities focusing on the sustainable management and protection of natural resources, upon which most livelihoods in Liberia depend, to ensure that livelihoods, critical to the recovery of the Liberian economy, are not negatively impacted by the unsound management of chemicals.
- Targeting efforts/priorities related to the unsound management of chemicals and wastes, which might fuel future tensions or conflicts.

2. COUNTRY PROFILE

2.1 Location, Size and Characteristics

Liberia is situated on the southwest corner of the West Coast of Africa. It lies between the longitudes of 7°30' and 11°30' west and latitudes 4°18' and 8°30' north. It covers a surface area of about 111,370 km2 (about 43,506 square miles). The dry land extent is 96,160 km2 or 37,570 sq. miles. Liberia is bordered on the west by Sierra Leone, on the north by Guinea, on the east by Côte d'Ivoire and on the south by the Atlantic Ocean. The perimeter is 1,585 km (990 miles), excluding the Atlantic Ocean. The border with Guinea is 563 km (352 miles), Cote d'Ivoire 716 km (446 miles), and Sierra Leone 306 km (191 miles).

There are four topographical regions at different altitudes, each with distinct physical features. Along the seacoast is the coastal plain of 350 miles (560 km), an almost unbroken sand strip, which starts from the lowest elevation up to 30 meters above sea level. Next to the coastal plain is the belt of inundated plateaux followed by the belt of high lands and rolling hills in the north and northwest. The lowest point is the Atlantic Ocean at zero meters and highest elevation is the northern highlands, which includes Mount Wutivi (1380 meters), the highest point in Liberia.

Figure 1: Liberia (Map no. 3775, Rev. 6, United Nations, January 2004)

2.2 History (PEI, April 2010)

The region of Liberia was inhabited at least as far back as the 12th century, perhaps earlier. Mende-speaking people expanded westward, forcing many smaller ethnic groups southward towards the Atlantic Ocean. The Deys, Bassa, Kru, Gola and Kissi were some of the earliest recorded arrivals. This influx was compounded during the ancient decline of the Western Sudanic Mali Empire in 1375 and later in 1591 with the Songhai Empire. Additionally, inland regions underwent desertification, and inhabitants were

pressured to move to the wetter Pepper Coast. These new inhabitants brought skills such as cotton spinning, cloth weaving, iron smelting, rice and sorghum cultivation, and social and political institutions from the Mali and Songhai Empires.

Coastal people built canoes and traded with other West Africans from Cape-Verde to the Gold Coast. Later European traders would barter various commodities and goods with local people, sometimes hoisting their canoes aboard. When the Kru began trading with Europeans, they initially traded in commodities, but later they actively participated in the African slave trade. Kru laborers left their territory to work as paid laborers on plantations and in construction. Some are even said to have worked building the Suez and Panama Canals. Another tribal group in the area was the Grebo, who were driven, as a result of the Manes invasion, to migrate to the coast of what later became Liberia. Between 1461 and late 17th century, Portuguese, Dutch and British traders had contacts and trading posts in Liberia. The Portuguese named the area Costa da Pimenta, (the Grain Coast) because of the abundance of grains of melegueta pepper (grains of paradise).

Modern Liberia is the oldest republic on the African continent. It was founded and colonized by freed American slaves with the help of a private organization called the American Colonization Society in 1821-1822. Recaptives rescued from slave ships were also sent to Liberia instead of being repatriated to the countries from which they had been captured (Sawyer, 2005). These colonists formed an elite group in Liberian society, and, in 1847, they founded the Republic of Liberia, establishing a government modeled on that of the United States.

A military-led coup in 1980 overthrew then-president William R. Tolbert, which marked the beginning of a period of instability that eventually led to a civil war that left an estimated 250,000 people dead and devastated the country's economy. Today, Liberia is recovering from the lingering effects of the civil war and related economic dislocation. The country's infrastructure is still, for the most part, derelict; pipe-borne water and electricity are generally unavailable to most of the population, especially outside Monrovia, and schools, hospitals, roads, and infrastructure remain derelict (US State Department, 2010)

2.3 Physiography

Mountains

Most mountains are located in the northern part of Liberia. They include the Bong, Nimba, Mano, Putu, Bomi and Wologizi ranges. Mount Wutivi (1380 meters at Yekepa) is the highest peak and Wologizi the second highest. Mount Putu is located in the southeast of the country. The major rivers in Liberia derive their sources from the mountains. They are also important for mineral deposits. Diamonds are found along the banks of the rivers that flow from the mountains. Mountains have not been surveyed systematically, but four of them (Nimba, Bong, Bomi and Mano) contain ore deposits and have been exploited for the resource. The Nimba massive is the most important, shared by Cote d'Ivoire, Guinea and Liberia. It has been recommended for world heritage site status.

Coastline

Liberia has a beautiful coastline that is a tourist attraction. The coast is pounded by powerful surf, which has produced a relatively straight coastline with many lagoons. The coastline is 560 km long (350 miles), characterized by an unbroken sand strip. The width of the coastal plain varies from 16-40 km and most of its land mass has an elevation of 9-30m. Most rivers meander slowly over the plain and then widen near their estuaries. The territorial water is about 159,200 km2 (70,000 sq. miles), larger than the land area of the country.

Rivers

The geomorphologic structures and relief determines the drainage patterns of the watersheds or river systems. The major river basins drain the territory in a general northeast to southwest direction to the Atlantic Ocean. Major exceptions to the pattern is the middle reaches of the Cavalla and Dugbe in eastern Liberia, which flow parallel to the coast in their lower reaches before entering the Atlantic Ocean.

There are six major rivers, which drain 66 percent of the country. These are Rivers Mano, St. Paul, Lofa, St. John, Cestos and Cavalla. The short coastal watercourses drain about 3 percent of the country and include the Po, Du, Timbo, Farmington, and Sinoe rivers. The largest and longest is the Cavalla River. These rivers are not navigable and therefore do not support water transport and industrial fishing.

Lakes

There are only two major lakes in Liberia – Lake Shepherd in Maryland County and Lake Piso in Grand Cape Mount County. Lake Piso is the larger of the two. Both of them are along the Atlantic Ocean. Lake Piso is characterized by a vast expanse of wetlands and lowland forest vegetation. They are one of six proposed protected areas of Liberia. There are other large ponds, which people refer to as lakes. The most popularly known in this category is the Blue Lake in Tubmanburg, Bomi county. This large pond was created from iron ore mining that left a large unclaimed land. It is now a tourist attraction.

Climate

The equatorial position and the distribution of low and high-pressure belts along the African continent and Atlantic Ocean determines the climate of Liberia and more generally, West Africa. Because of this position and the moderating influence of the ocean, a fairly warm temperature throughout the year with very high humidity is common.

Sunshine and Temperature

The sun is overhead at noon throughout the year, giving rise to intense insolation in all parts of the country. This results in high temperatures with little monthly variations. Temperatures would have been much higher had it not been for the effect of the degree of cloud cover, air, humidity and rainfall, which are influenced by the vegetation cover of the country. Daily sunshine hours are at a minimum during July, August and September. The days with longest hours of sunshine, fall between December and March, averaging more than six hours per day (MPEA, 1983).

The Atlantic Ocean also has an additional ameliorating effect on the temperature along the coast with maximum annual and daily variations. As a whole, the temperature over the country ranges from 27-32^{0}C during the day and from 21-24^{0}C at night. High altitude explains a pleasant climate near the Guinean border in the north. Along the coast, the average annual temperature ranges from 24-30^{0}C (75-85^{0}F). In the interior it is between 27-32^{o}C (80- 90^{0}F) (MPEA, 1983). The highest temperature occurs between January and March and the lowest is between August and September. The low temperatures are mainly caused by the amount of cloud cover.

Rainfall

The country has two seasons: rainy and dry seasons. The rainy season is from May to October, and the dry season runs from November to April. Average annual rainfall along the coastal belt is over 4000 mm and declines to 1300 mm at the forest-savannah boundary in the north (Bongers et al. 1999). The months of heaviest rainfall vary from one part of the country to another, but are normally June, July and September.

Rainfall is caused by the South Atlantic sub-tropical high wind called the southwest Monsoon of the Maritime Tropical Air between April and October. For the rest of the year, the Inter-Tropical Front moves south, and most of West Africa comes under the influence of the low pressure from the Sahara Desert. At this time low humidity prevails usually from the end of December to January, and sometimes till February. This dry wind sweeps across the continent and reaches Liberia between December and February bringing considerable amounts of fog and dust with low cool temperatures during the night.

Since the soils in Liberia have low moisture storage capacity, the amount and frequency of rain during the dry season becomes a limiting factor for crop cultivation. Despite the heavy torrential rainfall, it does not rain continuously during the rainy season. It is common to have sunny days even during months when rain is heaviest.

Observations concerning the diurnal distribution of rainfall prove that two-thirds of the rain along the coast, particularly in Monrovia and its environs, falls during the night between 18.00 and 07.00 hours. Most of the rest of the rain usually falls during the morning while only a minimum of rain is recorded between mid-day and early afternoon.

Humidity

Relative humidity is generally high throughout the country. Along the coastal belt it does not drop below 80 per cent and on average is above 90 per cent. There is a wider variation in the interior, where it may fall to below 20 per cent during the harmattan period. A relative air humidity of 90-100 per cent is common during the rainy season.

In Monrovia, the relative humidity shows a relationship with the existing air temperature and its variation depends on the prevailing season and the hour of the day. During the dry season it decreases to 80-85 per cent. In March and February the driest period of the year, relative air humidity may be as low as 65 per cent. Regardless of the season, the relative humidity at night and in the early morning is usually in the range of 90-100 per cent. Data from other weather stations such as Bomi Hills, Harbel and Greenville show similar results. Only the zone, north of the Inter-Tropical Front, where the continental air masses prevail from mid- December to end of January show arid conditions. At times due to the extreme dryness of the harmattan, the humidity may drop to below 50 per cent (Schulze, W. 1975).

Wind and Ocean Currents

Data on wind is incomplete. However, total wind speed is greatest in the rainy season and lowest in the dry season. The maximum wind speed is greatest between July and September and lowest in December and January. There are local variations, with the coastal area having much more wind than the interior of the country. The low wind speed in the interior can be attributed to the vegetation cover. High vegetation cover serves as a windbreak. Average wind speeds of 6.8 mph have been recorded at Harbel (Firestone). The highest wind speed (45 miles/hour) was recorded in Buchanan in April and May 1988. The average annual wind speed was 19.5 mph.

The coastline runs approximately from southeast to northwest and at right angles to the prevailing southwesterly rain-bearing winds. As the maritime air reaches the coast, it is forced to rise, cool and subsequently heavy conventional rain falls. The relatively marked seasons result from the movement of the Inter-Tropical Convergence Zone (ITCZ) from the northern hemisphere over the Sahara desert near the Tropic of Cancer while at the same time cool air mass over the south Atlantic ocean in the southern hemisphere is overhead south of the equator. As a result of these pressure shifts, the dry continental air mass and the moist south-equatorial maritime air mass replace each other at six-month intervals.

In the intermediate vicinity of the coast, there is another circulation of air. This is the daily change of sea and land breezes. On sunny days, the air over the land warms up rapidly, expands, rises and flows at high altitude towards the sea where it is displaced by the sea breeze. A circular flow of air in the opposite direction sets in and a land breeze, which has considerable cooling, provides good atmospheric conditions for recreation, work and agriculture.

Vegetation

There are three main vegetation zones in Liberia. They include the coastal vegetation (savannah woodland), northern savannah and the tropical rainforest (MPEA, 1983). The savannah vegetation is influenced by human activities and has developed as a result of clearing the rain forest for agriculture. The coastal vegetation consists of mangrove swamps, savannah woodland and patches of forest scattered in fields of grassland. The northern savannah is found in Lofa and Nimba Counties. The area is densely covered with elephant grass, which grows up to about 10 feet in height. There are also scattered trees and patches of forest in this savannah zone. This vegetation type is encroaching into the rainforest zone as it steadily moves southward.

Forests

Liberia is the only country in West Africa that once was covered entirely with rain forest. In total more than 50 per cent of the forests have been destroyed over the years (SOE, 2006). Forestry policy reforms led in 2006 to the lifting of the sactions of timber exportation, and the creation of an enabling environment for the Forestry Development Authority to improve forest management. Nevertheless, owing to the civil conflict combined with uncontrolled logging, expansion of land used for agriculture, mining and other threats, Liberia‘s forest area has decreased in recent years. The annual rate of deforestation is currently estimated to be approximately 12,000 hectares (0.3 percent), while the recorded planting of new forests since 1971 to date has amounted to approximately 11,000 hectares.

The two remaining dense forest areas are now found in the northwest and southeast of the country separated and isolated from each other by a corridor extending from Monrovia to Nimba County. These two forest blocks are further fragmented and dissected by the advances of shifting cultivation along existing roads and by the construction of logging roads.

Drawing on the State of the Environment report’s analysis (USAID, 2008), major threats to Liberia‘s tropical forests include illegal and quasi-legal logging, shifting cultivation, industrial and artisanal mining and potential threats from agro-industrial plantation expansion.

Wetlands and Swamps

Wetlands are transitional zones between terrestrial systems and open water systems and are highly productive and rich in flora and fauna. Their economic and ecological functions attract human activities that eventually impact on biodiversity. Liberia has a few wetlands that provide both subsistence and economic benefits to its many inhabitants. Like wetlands all over the world, they have become stressed by human induced activities. There are four wetland types: Inland riverine, inland swamp, coastal and coastal lacustrine. Presently, five of the eight wetlands of conservation status identified have been gazetted by the RAMSAR Secretariat. Swamps are traditionally important in the rural areas for two main reasons: they serve as a source of herbs and are used to augment rice production. Cultivation in swamps is only done on a small-scale basis.

Mangroves

Mangroves characterize the wetlands of Liberia and cover a small area along the coast, from Cape Mesurado to Cape Palmas, at the edges of lagoons, riverbanks, and river estuaries and in widespread areas

of swamps. Mangroves are estimated to cover 0.5 per cent of the land surface of Liberia, which is equivalent to a 500 km-wide belt extending along the total length of the coastline (Gatter, 1988). Mangroves are being degraded due to unregulated urban expansion, over cutting for fuel wood, charcoal and construction poles, uncontrolled solid and liquid wastes disposal, agricultural production and industrial expansion and constructions (UNITAR, 2010).

The biggest threat to Liberia's mangroves is urban expansion and accompanying landfills, particularly in Monrovia. This expansion began during the civil conflict when many displaced people – having very limited land space to carry out business activities – established landfills in Mesurado and Marshall Mangrove wetlands, causing large areas of mangroves to be destroyed (and to be used as dumps or for sewage disposal). The process continues today; Liberia's burgeoning post conflict economy and increased population have overwhelmed the original planned land area for Monrovia and other beach cities; originally made to accommodate 350,000 persons, Monrovia's now has a population of over 1 million (USAID, 2008).

The mangroves are a vital coastal system: they provide habitat for fish invertebrates and epiphytic plants, and are considered more efficient photo synthesizer than most plants. Besides, mangrove forests provide (UNITAR, 2010):

- Spawing grounds for many fish species, crabs, shrimps, mollusks and other forms of sea life.
- Habitats for many endangered species of manatees, crocodiles, turtles, migratory birds.
- Flood regulation and protection from violent storms.
- Protection of shoreline from erosion.
- Water re-charge and improve quality.

Urban Environment

Urbanization is a necessary part of development and is a good thing as long as it is planned, well managed and controlled. In Liberia, urban development is largely uncontrolled. There is a lack of long-term planning, management and monitoring of inputs that would nurture sustainable development.

Unplanned urbanization has negative impacts on both the environment and human wellbeing. For example, the inadequacy of basic urban services such as water supply, electricity, housing and sanitation creates environmental problems that manifest in diseases caused by drinking unsafe water or from air pollution caused by burning waste or poor ventilation.

During the years of conflict, Liberia's infrastructure was nearly completely destroyed and public services ceased to operate, including piped water, drainage, wastewater and solid waste management systems. As a result, residents in urban areas are exposed to contaminated drinking water and untreated wastes. During the rainy season, the lack of adequate drainage also results in ponds of stagnant water in urban areas. These conditions contribute to two of the primary causes of mortality and morbidity in Liberia, malaria and diarrhea.

2.4 Demography

Population and Settlement

According to the 2008 National Population and Housing Census – NPHC (LISGIS, 2008), the population of Liberia is 3,476,608 (approx. 3.5 million); and it presently has an annual growth rate of 2.1%, down from 3.4% in 1984 (see Table 1 below). Based on the trend of annual growth rate, the population of

Liberia would double the 2008 figure in 34 years (i.e. by 2042), which is a relatively short time to commensurately adjust the already slow rate at which public goods and services are being provided.

The overall population distribution is approximately 53% urban and 47% rural; and an excess of males over females is revealed in the sex ratio of 102.3 overall. The population density is 93 persons per square mile (36 persons per square kilometer), and this represents a 66% rise over the figure of 56 recorded in 1984. The average national density is exceeded only in the counties of Montserrado, Margibi, Maryland, Bomi, Nimba and Bong.

Table 1: Population Trend, 1962 – 2008 (LISGIS, 2008)

Index	Year			
	1962	**1974**	**1984**	**2008**
Population	1,016,443	1,503,368	2,101,628	3,489,072
Population Change	Not available	486,925	598,260	1,387,444
Av. Annual Increase	Not available	40,5777	59,826	57,810
Percentage Increase	Not available	48	40	66
Annual Rate of Growth	Not available	3.3	3.4	2.1

It is found that the pattern of population concentration follows a four-way divide as follows:

- **Very densely populated** – Montserrado County is the only qualifier in this category, being the most densely populated county in Liberia. The population density is over 1,500 persons per square mile and can be much higher in Monrovia and its environs. It has the highest total population (over 32 percent of the national population) and occupies the least geographic area.

- The City of Monrovia, which serves as the administrative hub of the Republic is located in this county. It has the most in opportunities for employment and availability of social amenities such as educational and health facilities. It is the country's business capital and home to its main seaport.

- **Dense population concentrations** – Margibi, Maryland, Bomi and Nimba counties are in this category, with densities ranging between 100 - 210 persons per square mile (39 - 81 per square kilometer).

- With the exception of Nimba County, the other counties have relatively small landmasses with high populations that condition the high densities.

- Other conditioning factors include better transport and communication facilities, fertile agricultural lands, local alluvial mining activities and the presence of international mining and agricultural companies, and opportunities for trade with contiguous West African countries

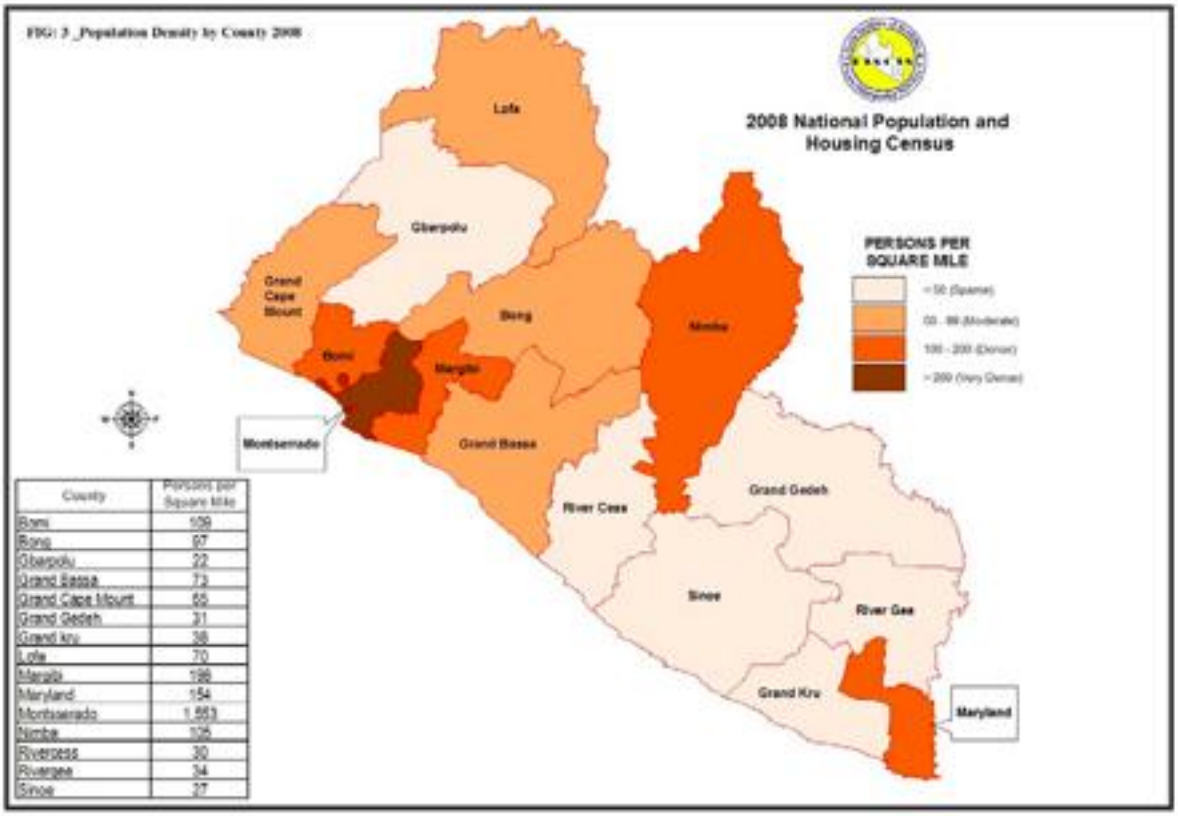
- **Moderate population densities** – Bong, Lofa, Grand Bassa and Grand Cape Mount counties are in this category, with densities ranging between 50-99 persons per square mile (19 -38 per square kilometer). They generally have large land masses and high population.

- The advantages of local alluvial diamond and gold mining; hosting former mining and agricultural companies; fertile arable lands for farming; moderate transport and communication facilities; and local trade attract and hold populations in these counties

- **Sparse population areas** – Gbarpolu, Grand Gedeh, Grand Kru, Rivercess, River Gee and Sinoe counties are in this category, with densities ranging between 22 and 40 persons per square mile (8 – 15 per square kilometer).

- The disadvantages of difficult relief and poor communication and transport lines; heavy forest cover, especially in parts of Grand Gedeh, Sinoe, River Gee and Gbarpolu; scanty other physical infrastructure and social amenities; and generally low employment opportunities are some of the reasons for the low population densities in these areas.

Figure 2: Population Density by County (LISGIS, 2008)



County	Persons per Square Mile
Bomi	109
Bong	97
Gbarpolu	22
Grand Bassa	73
Grand Cape Mount	65
Grand Gedeh	31
Grand Kru	38
Lofa	70
Margibi	186
Maryland	154
Montserrado	1,663
Nimba	105
Rivercess	30
Rivergee	34
Sinoe	27

In Liberia a human settlement is considered urban when its population is 2,000 or more. An urban area is considered a ***major urban center*** when its population is 5,000 or more; which threshold tells of the dominance of Monrovia whose population is more than four times greater than the combined population of all the county capitals. However, the 15 county capitals form the bulk of the country's major urban centers; and out of the 19 settlements that have a population of more than 5,000 persons, only four are not county headquarters.

Table 2: 2008 Census Results (LISGIS, 2011)

Age structure:	0-14 years: 41.9 %, 15-64 years: 50.6 %, 65 years and over: 7.5 % (2008)
Growth rate:	2.1% (1984 – 2008)
Infant mortality:	73 deaths/1,000 live births (2009)
Life expectancy:	Total population: 52.7 years (2008)
Total fertility rate:	5.9 children born/woman (2009)

Ethnic groups:	Indigenous African tribes 95% (including Kpelle, Bassa, Gio, Kru, Grebo, Mano, Krahn, Gola, Gbandi, Lorma, Kissi, Vai, Dey, Belle, Mandingo, and Mende), Americo-Liberians 2.5% (descendants of immigrants from the US who had been slaves), Congo People 2.5% (descendants of immigrants from the Caribbean who had been slaves)
Religions:	Indigenous beliefs 40%, Christian 40%, Muslim 20%
Languages:	English 20% (official), some 20 ethnic group languages, of which a few can be written and are used in correspondence
Literacy:	Definition: age 15 and over can read and write Male: 74.8 %, female: 68.2% (2008)

The population of Liberia is very young. The age-group 0 - 18 years accounts for about 54% of the population. Nearly 15% are under 5 years of age while approximately 3% of the population is over the age of 65.

2.5 Mortality and Morbidity

Malaria, Acute Respiratory Tract Infections (ARTI), diarrhea, tuberculosis, sexually transmitted diseases (STDs), worms, skin diseases, malnutrition and anemia are the most common causes of ill health. Malaria accounts for over 40% of OPD attendance and up to 18% per cent of inpatient deaths. Diarrhea diseases in Liberia are the second leading cause of morbidity and mortality. HIV prevalence rate estimates vary widely, but the Interim Poverty Reduction Strategy (IPRS, 2007) suggests a figure of 5.2%. All agree, however, that HIV/AIDS is a problem of mounting severity.

Due to the widespread destruction of infrastructure that occurred during the civil crisis, and the current derelict state of existing facilities, there is presently limited access to electricity, water, energy, and communication; which has become an impediment to economic recovery. As per the PRS, the official government (2008) figures for access to water and sanitation in Liberia are 25% for water and 15% for sanitation. As a result of limited access to safe water and sanitation facilities, and poor hygiene practices, Liberians are highly vulnerable to preventable waterborne and vector-borne diseases. Diarrhea is an acute problem in both urban and rural areas, and it accounts for 19% of Liberia's high child mortality rates; while cholera remains endemic in the country, and affects more than one thousand people every year. Based on the local history of cholera and diarrhea outbreaks, Monrovia (Montserrado County), Bong County, Margibi County, Grand Bassa, Grand Gedeh and Nimba County are considered to define the country's 'Cholera Hotspot belt'.

Access to health services is skewed in favor of urban areas. For example, while about 90% of people in Monrovia, and some urban centers, can reach health care facilities within one hour or less, only 48% of people in rural areas can do the same. Infant mortality rate stands at 72 deaths per 1,000 live births while the mortality rate for children under-five years old stands at 111 deaths per 1,000 live births. The major causes of death in children under five are malaria, diarrhea diseases, malnutrition and ARTI.

2.6 Poverty

The Liberia economy has been in decline since the 1980s due to extreme social and political upheaval and mismanagement. The war destroyed productive capacity and physical infrastructure on a massive scale. The result has been a precipitous economic decline and the deepening of national poverty. The country currently survives mainly on humanitarian aid and the robustness of a vibrant informal sector, centered around urban areas. The economy operates at about one-third of its pre-war level, with a current GDP of US$ 0.99 billion, a GNI per capita of 200 US$ and 64% of the population living below the poverty line (World Bank, 2010). Poverty is particularly acute in rural areas and the most remote corners of the country. Poverty has many dimensions, including low levels of income and consumption, poor nutrition and food security, low health and education indicators, and inappropriate infrastructure. It is reinforced by inequities, especially in access to justice and economic opportunities.

Food Security

Liberia achieved food security in the 1970's, but in the aftermath of the conflict, Liberia is now one of the most foods insecure countries in the world, with more than one third of its population being undernourished.

The principal food crops of Liberia are rice and cassava (manioc). Due to the insecurity caused by the conflict, many fields were left unplanted and food production plummeted. Production has not yet recovered to pre-war levels and the county must import rice to meet its needs. According to estimations by FAO from 2003, less than 10 percent of the 4,6 million consumption include sugarcane, bananas, plantains, citrus, pineapple, sweet potatoes, corn and vegetables.

2.7 Economy (PEI, April 2010)

Largely as a result of its colonial history and the recent civil conflict, Liberia is the second poorest country in the World, with an estimated GDP of US$ 839, and a per capita GDP of US$ 205 in 2009 (IMF). Looting and war profiteering destroyed nearly the entire infrastructure of the country.

Richly endowed with water, mineral resources, forests, and a climate favorable to agriculture, Liberia had been a producer and exporter of basic products, while local manufacturing, mainly foreign owned, has been small in scope. The Government of Liberia believes there may be sizable deposits of crude oil along its Atlantic Coast. The formal Liberian economy is based on natural resource extraction. The economy remains predominantly agrarian, producing rubber, coffee, cocoa, rice, cassava (tapioca), palm oil, sugarcane, bananas, plantains, sheep, goats, sweet potatoes, corn, citrus, pineapple, vegetables and timber. Agriculture, including forestry, is critical to the economic development of Liberia and is the source of livelihood for 70 percent of the population. In addition to rubber exports, the economy also historically depended heavily on iron ore and foreign direct investment.

Mining in Liberia has virtually ground to a standstill. Initially destroyed during the civil war, the sector also suffered badly as a result of the financial meltdown since 2008, resulting in the suspension of many formal mining activities in the country as the prices of ores and metals declined. Although the country has abundant water resources, little use is made of available water resources. There is only limited hydro electricity generation, and because the manufacturing sector is small, the demand for water from that sector is also tiny. While domestic demand for water is large, there is little infrastructure available for water reticulation, and only about 25% of the population has access to pipe borne water. Hence agriculture remains the largest economic sector in the country.

Table 3: Commodity Composition of Exports (2003-2008) (LISGIS, 2011)

	2003	2004	2005	2006	2007	2008	2009	2010
Commodity composition of Exports (US$ millions)								
Rubber	43.9	93.4	126.7	172.3	183.9	205.6	93.1	167
Logs	54.6	n/a	n/a	n/a	n/a	0.2	1.1	3.1
Cocoa beans and coffee	0.9	3.4	0.3	0.2	2.2	3.4	3.7	5.9
Others	9.5	7.0	4.3	6.4	14.1	29.6	50.9	47.5
TOTAL	**108.9**	**103.8**	**131.3**	**178.9**	**200.2**	**238.8**	**148.8**	**223.5**

Access to natural resources is highly skewed. The poorer hinterland populations have little formal control or legal access to natural resources, while most of the formal sector natural resource exploitation is controlled by the small urban elite. Unequal access to natural resources and the inability to generate natural resource based livelihoods contributed to the Liberian conflict. It has been noted that Liberia illustrates how 'grievances caused by inequitable wealth sharing can contribute to the outbreak of violence' (UNEP, 2009).

The country's main industries are rubber processing, palm oil processing, timber, diamonds and construction. Export commodities are rubber, timber, iron, diamonds, cocoa, and coffee. Timber and rubber are Liberia's main export items since the end of the war. Liberia earns more than US$ 100 million and more than US$ 70 million annually from timber and rubber exports, respectively. Alluvial diamond and gold mining activities also account for some economic activity. Being the second-largest maritime licenser in the world with more than 1,700 vessels registered under its flag due to its status as 'flag of convenience', including 35% of the world's tanker fleet, Liberia earned more than US$ 18 million from its maritime program in 2000 (US State Department, 2010).

Currently, Liberia's revenues come primarily from rubber exports and revenues from its maritime registry program. Export earnings in 2009 were estimated at US$ 184 million (of which rubber US$ 171 million). The country's import bill in 2009 was estimated at US$ 500 million (petroleum US$ 125 million, rice US$ 65 million) (LISGIS 2010).

Table 4: Sectoral Composition of GDP at Current Prices (US$ millions) (LISGIS, 2011)

SECTOR	2001	2002	2003	2004	2005	2006	2007	2008
Agriculture	***240.8***	***275.3***	***236.2***	***275.6***	***298.5***	***329.1***	***348.9***	***382.5***
Rubber	*54*	*59.1*	*43.9*	*71*	*89.6*	*99.4*	*114.4*	*118.9*
Cocoa	*1*	*0.4*	*0.9*	*3*	*3.8*	*4*	*4.2*	*4.3*
Coffee	*0.1*	*0.2*	*0*	*n/a*	*0.1*	*0.2*	*0.2*	*0.3*
Rice	*66.8*	*73.3*	*53.6*	*85*	*85.7*	*94.3*	*96.2*	*110.6*
Cassava	*39.6*	*48.3*	*49.9*	*32.3*	*33.3*	*36.6*	*37.4*	*38.9*
Others	*79.3*	*93.3*	*87.9*	*84.3*	*86*	*94.6*	*96.5*	*109.5*
Forestry, Hunting, Gathering & Fishing	***152.3***	***154.4***	***95***	***101.5***	***105.8***	***115.5***	***125***	***128.8***
Logs and timber	*108*	*106.7*	*59.7*	*61.1*	*64*	*70*	*77.7*	*79.3*
Charcoal and wood fuel	*39.2*	*40.7*	*31.5*	*34.4*	*35.5*	*38.6*	*39.9*	*41.9*
Fishing	*1.7*	*2.7*	*2.1*	*2.7*	*2.9*	*3.2*	*3.3*	*3.4*

Hunting	*3.4*	*4.1*	*2*	*3.3*	*3.4*	*3.7*	*4.1*	*4.2*
Mining and Quarrying	***0.4***	***0.3***	***0.3***	***0.3***	***0.3***	***0.3***	***1.5***	***4.7***
Iron ore	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
Gold	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.1*	*1.2*	*1.3*
Diamonds	*0.1*	*n/a*	*n/a*	*n/a*	*n/a*	*0.2*	*0.3*	*3.4*
Manufacturing	***24.8***	***26.5***	***15.2***	***26***	***32.9***	***43.7***	***48.9***	***51.4***
Cement	*9.3*	*9.9*	*5.7*	*15*	*20.7*	*27.5*	*31.3*	*32*
Beverages & others	15.5	16.5	9.5	11	12.2	16.2	17.6	19.4
Tertiary	**106.6**	**109.7**	**88.7**	**126.1**	**143.2**	**157**	**175.4**	**187.1**
Transport & telecommunication	*28.4*	*30.1*	*28.1*	*33.2*	*39*	*40.5*	*43.5*	*48.3*
Trade, hotels, etc	*20.1*	*21.4*	*20.7*	*22.9*	*29.2*	*36*	*43.4*	*45*
Construction	*9*	*11*	*8.4*	*17*	*18.8*	*20.2*	*21.7*	*23.1*
Financial institutions	*15.4*	*11.6*	*9*	*11*	*13.4*	*14.4*	*15.8*	*16.2*
Energy (water, electricity, gas, etc)	*2*	*2.1*	*2*	*3.9*	*4.5*	*4.8*	*5.4*	*5.6*
Government	*19.8*	*21.2*	*13*	*24.4*	*24.3*	*26.1*	*28.9*	*31.3*
Other services	*11.9*	*12.3*	*7.5*	*13.7*	*14*	*15*	*16.7*	*17.6*

The consequences of 14 years of brutal conflict constitute huge challenges to the recovery, reform, and rebuilding process (USAID, 2010). The restoration of the infrastructure and the raising of incomes in this ravaged economy is the major challenge faced by this nation. Environment and natural resources are an important part of this restoration effort. While much of Liberia's infrastructure remains in ruins, some progress in economic recovery is occurring, supported by a substantial infusion of international development assistance. The Liberian National Investment Commission reported US$ 130 million in new investment in 2008 and has set a target of at least US$ 100 million a year for future years. Investors are finding opportunities in mining, rubber, agro-forestry, light industry, and other sectors. Arcelor Mittal Steel has negotiated an agreement to invest over US$ 1.5 billion in the mining sector, and the Liberian Government is engaged in negotiations with several other large foreign investors (US State Department 2010).

Clearly, natural resource exploitation in agriculture as well as direct exploitation in the forestry and related sectors are the main sources of GDP in Liberia. In part this explains the role of natural resources in precipitating the civil conflict, financing it as well as in prolonging it. The role of natural resources in generating and sustaining conflicts has been dealt with in other contexts. Peace building efforts are increasingly focusing on improving the quality and effectiveness of natural resources management as a way of guaranteeing long-term stability in post conflict nations. It is thus imperative that natural resource governance as well as equitable access and benefit sharing arrangements be developed as part of the overall effort to build sustainable peace in Liberia.

It is also significant that charcoal and fuel wood generate more revenues and employ more people than mining. It is estimated that deforestation is occurring at a rate of 42,000 ha (104,000 acres) a year as a direct result of logging, slash and burn agriculture, a growing population, as well as charcoal and fuel wood harvesting. Deforestation is a major source of atmospheric carbon. This fact also means that

sustainable energy and adaptation to climate change have to be key aspects of sustainable natural resource management programmes.

3. STATUS OF THE SOUND MANAGEMENT OF CHEMICALS IN LIBERIA

This National Situation Report is predominantly based on a desk review of relevant documents, reports and assessments that have a link to or contain information relevant to the status of the management of chemicals and wastes in Liberia, such as the *Draft National Chemicals Management Profile* (UNITAR, 2010), *Liberia National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants"* (UNIDO, 2006), the "*Liberia Environmental Threats and Opportunities Assessment (ETOA)"* (USAID, 2008), the "*State of the Environment Report for Liberia*" (EPA/UNDP, 2006) as well as assessments and analysis prepared as part of the *UNDP-UNEP Poverty and Environment Initiative* (PEI) (for a full list of the documentation that was consulted for the preparation of the NSR please refer to Chapter 10: References).

This information has been supplemented with the baseline information which was gathered through research undertaken by 5 teams of national consultants (consisting each of two consultants), who focused on the following 5 sectoral and cross-sectoral themes: Education & Awareness; Health; Research and Contamination; Social, Gender & Economic; and Legal.

Unfortunately, a realistic analysis on the status of the sound management of chemicals in Liberia was hard to conduct. Mostly because it was very challenging to obtain up-to-date and accurate data on the import, export, use, production and disposal of chemicals in the country, and if data was available, it was often outdated. Another complicating matter was the fact that the National Chemicals Profile (UNITAR/EPA/SAICM QSP TF) had not yet been finalized, and as such the team did not have access to its data.

It is for this reason that this NSR is taking a sometimes theoretical approach in determining the challenges and opportunities that are facing Liberia in this area and establishing potential links between the sound management of chemicals and human health and the environment. In particular the NSR focuses on socio-economic sectors, which are of significant importance to Liberia's Poverty Reduction Strategy-II (PRS-II) and those in which chemicals and their management play a critical role or their mismanagement can have serious human and environmental health as well as economic consequences. These sectors are: agriculture (subsistence & commercial), forestry, mining, fishery, health, energy generation, transportation, waste management and water and sanitation.

The following sections describe the potential environmental and health implications as a result of unsound chemicals management practices in the most significant socio-economic sectors in Liberia. It goes beyond saying that activities carried out in these sector can have many environmental and health impacts, however considering this report tries to focus on the health and environmental implications related to the management of chemicals, non-chemicals related effects are not described in detail.

3.1 Mining & Quarrying

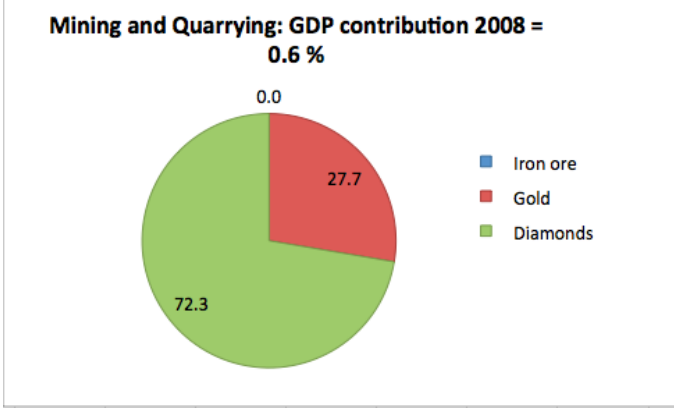
Liberia is richly endowed with mineral resources, which include diamonds, gold, limestone, bauxite, high-grade iron ore and barite, and is highly prospective for platinum, palladium, nickel, manganese, and uranium. The mineral deposits spread across the entire nation, and remain largely unexplored. Viable diamond trends have been discovered in the NE and W of the country, and several kimberlites have been discovered within this diamond trend. Although Liberia has been known for some time to have vast mineral resources and to be a producer of gold and diamonds, recent discoveries of considerable gold deposits in the Weaju prospect have raised interest in the region to a new high, also because most ridges

are capped with iron formation. International exploration increased in 2000 as companies came to Liberia to examine what has been described as one of the last areas of virtually un-explored geological systems in the world (PEI 2010; USAID 2008).

The GOL expected industrial and artisanal mining activities to grow rapidly during the Poverty Reduction Strategy-I period (2007-2012), from near zero production in 2005/06 to 12 percent of GDP by 2010, Counting on such growth as a means of contributing significantly to employment, income generation and infrastructure development. The major contributor to this growth was assumed to be the resumption of the mining and exporting of iron ore (see section 3.1.1).

LISGIS (2011) data indicated that in 2008 the contribution of Mining and Quarrying to GDP was 0.6 %, with 28% contributed by gold mining and 72% resulting from diamond mining, most mining being undertaken on an artisanal scale. In 2008 the exploration of Iron ore has not yet resumed.

Figure 3: Mining and Quarrying - Contribution to GDP in 2008 (LISGIS, 2011)



3.1.1 Industrial Mining

Plans are underway for development of a discovery of approximately 1.5 million ounces of gold by Mano River Resources in Grand Cape Mount County. This mine, which will be Liberia's first mechanized gold mine is expected to be established within two years. In 2008, there were 26 exploration companies holding 53 licenses, and the Ministry of Lands, Mines and Energy (MLME) expected to issue about an additional 44 licenses over the next few years (USAID, 2008).

The major contributor to the growth in this sector is expected to be the resumption of the mining and exporting of iron ore. Iron ore was the mainstay of the Liberian economy between 1960 and 1980, contributing more than 60 percent of export earnings and about 25 percent of GDP. The ArcelorMittal mining operations—located on the northern tip of West Nimba National Forest, are expected to initiate the revival of iron ore production when it makes its first projected shipment of 2-4 million tons in 2010. Production at other mines currently out for bid, such as the Western Cluster and Bong Mines, is expected to commence production in four to five years. The current status of mining concessions is presented in Table 5 below.

Table 5: Status of Iron Ore Concessions in Liberia Source: MLME (USAID, 2008)

Deposit	Location	Company	Reserve (Million tons)	Ore Grade %Fe	Type of Ore	Status

Mt. Nimba	342 Km ENE of Monrovia	LAMCO; LIMINCO (1989 – present)	417	65-69 59.1 52.2	Nimba Hematite Western-Area-Magnetite	STEEL
Bomi Hills	80 km NW of Monrovia	Liberian Mining Co. (LMC)	45	68	Magnetite	Exploration permit to BHP
Mano River	Mano river Hills near Sierra Leone border	National Iron Ore Co. (NICO)	136	51.4	Limonite	Open to negotiation
Bong Mine	80 km NE of Monrovia	DELIMCO Bong mining Co. (BMC)	290	35-45	Magnetite	Open to negotiation
Putu Range	Grand Gedeh County, ESE of Monrovia	BMC	455	45	Itabirite	Exploration permit to MARIO
Bea Mt	Grand Cape Mount County	LMC	382	35-45	Magnetite, Hematite, Goethite	Open to negotiation
Wologizi Range	Lofa County	LISCO	1000	35-40	Hematite	Exploration permit to BHP
Goe Fantro	60 km NE of Monrovia	LAMCO (LIMINCO)	NA	35-40	Hematite	Exploration permit to BHP

As Figure 2 indicates, there is a high degree of geographic overlap between mineral deposits and the protected area/forest reserve network. If exploitation occurs within these areas as expected, the potential to significantly affect biodiversity and forest cover should be considered very high. Forest destruction will be locally extensive and permanent.

Although the GOL states in the PRS-I that it intends to harmonize the Minerals and Mining Law (NMML) Act of 2000 and the Forestry Law with respect to mining concession rights and protected zones, little progress was achieved during the PRS-I. At the time of the writing of this report (2012), the GoL indicated that one of the key constraints the country if facing in achieving its ambitions with respect to national mineral resources is inadequacy of the legal and regulatory framework – governing the mining sector of which the minerals and Mining Law of 2000 is a central part. The GoL expect to draft a new mineral law, expected to be finalized by 2013 which will be better adapted to the global and domestic minerals industry, including the way minerals are traded (see also Section 7: Institutional, Policy and Regulatory Frameworks).

Figure 4: Overlap Between Mineral Reserves and Liberia's Forests and Protected Areas (Source: FDA)

3.1.2 Artisanal & Small Scale Mining

Despite the apparent abundance of mineral deposits, most mining is currently undertaken on an artisanal scale. Small-scale mining for gold and diamonds is a major economic activity in many parts of the country. MLME estimates that there are over 100,000 artisanal miners operating in Liberia. FDA estimates that in Sapo National Park alone, there are over 6,000 illegal artisanal miners and reports that illegal artisanal mining is taking place in nearly all of Liberia's protected areas. The procedures for the application and renewal for artisanal mining licenses remains burdensome and there are currently 48 legal ASM miners operating in Liberia.[2] The impact of over 100,000 artisanal miners may have individually insignificant effects on biodiversity and tropical forests but cumulatively significant effects (USAID, 2008).

The method of production for small-scale diamond mining ranges from very basic methods of digging, washing and sifting to the use of equipment such as water pumps and excavators. The most common method is the highly labor intensive process where small-scale artisanal operations typically involves the digging of pits within alluvial river channels and excavating for black sands that are associated with diamond-bearing gravels. Up to 100 individuals work on a one-acre site. The diggers use shovels to extract the target gravel, which is most often carried off in pans or sacks to an area where the gravels are washed using a sieve (PEI, 2010).

[2] MLME Deputy Inspector of Mines report verification meeting with R Sambolah May 2012

The lack of environmental considerations in artisanal mining is clearly visible (Green advocates, 2009), including vegetation clearing, removal of soil, stocking of mining tailings and sedimentation and siltation of rivers, streams, and creeks. Artisanal and small-scale miners do not undertake land filling and land reclamation in the various mining claims in which they operate. These claims, as a result, are left bare and allowed to erode as torrential rain falls.

During visits and interviews conducted as part of a three-county workshop effort with Artisanal and Small-Scale Miners undertaken by Green Advocates in partnership with the Gold and Diamond Workers Union of Liberia – GODIMWUL (Green Advocates, 2009), it was concluded that there has not been limited awareness raising or sensitization on land reclamation or land filling strategies related to artisanal mining (in the counties Weasua, Sackie and Zingbeku). According to WWF (2012) there is some awareness of environmental stewardship in Sapo National Park as miners indicated that the Ministry of Lands, Mines and Energy (MLME) agents informs them they are required to backfill, by a process referred to as "*dig hole, cover hole*." However, in practice this procedure is not commonly applied.

Worldwide, among the most important environmental issues related to small-scale mining are the use of mercury for gold amalgamation and the use of cyanide, sometimes in combination with mercury[6]. The ASM sector is the world's largest source of mercury pollution from intentional uses (the second largest emission source after coal-fired power plants)[7] as Mercury is simple to use, cheap and easily available.

According to Green Advocates (2009) miners, despite their knowledge of Mercury, indicated that they have never used chemicals in their community to extract gold because it is too expensive. They also noted their dislike for mercury as it reduces the weight of gold after burning. It is said though that in some ASGM communities, such as Weaju, Grand Cape Mount County, Mercury is being used to recover gold. If such practices are being used in Weaju they might also hold for other mining communities across Liberia, and further research in this respect would is needed.

According to the EPA[3] Mercury has been widely used in the past to mine gold in Liberia. But in the in last few years the used of mercury have drastically reduce in part due to the hike in price of the chemical and the unavailability of Mercury on the local market. The availability of cheaper technologies (carpeting, panning and jigging respectively) has also contributed to the reduction in the use of mercury.

A case study report prepared by WWF (2012) on historical and contemporary artisanal and small-scale mining (ASM) in and around Sapo National Park (SNP) also concluded that Mercury is currently not used by mining communities to the north of the Sapo National Park. According to WWF, m3-3204aintaining this situation will become increasingly difficult especially if, as suspected, legal ASM will continue to grow north of the Park. Furthermore, given the prevalence of mercury use in artisanal gold operations in West Africa generally and the high cross-border flows of people and labour within the region, a '*technology transfer'* and the adoption of mercury or other hazardous chemicals in Liberia may happen soon.

The artisanal mining sector facing numerous challenges, some of these are related to the law enforcement (payment of taxes, licensing processes) and the role of Mining Agents; Security implications and hold ups; Abandoned gravel or pit; Child labor; Land reclamation; Chemical applications; Lack of access to health facilities and education; Deplorable roads conditions; Poor shelter, among else. Regarding

[3] http://www.google.com/url?sa=t&rct=j&q=artisanal%20mining%20liberia&source=web&cd=1&ved=0CDkQFjAA&url=http%3A%2F%2Fwww.unep.org%2Fhazardoussubstances%2FPortals%2F9%2FMercury%2FDocuments%2FASGM%2FNigeria%2FPresentations%2FAn%2520overview%2520of%2520Artisanal%2520Mining%2520in%2520Liberia.pptx&ei=PgfbUJm_KZLr0QHs4IDYBw&usg=AFQjCNHUGC0raOX1xLVFjNTZIZUC5Rcl3g&sig2=wy2S7YT9R9Ehl983p6eoQQ&bvm=bv.1355534169,d.dmQ

environment and health implications related to management of chemicals the following challenges can be highlighted (WWF, 2012):

- Siltation affecting drinking water, sedimentation and siltation of rivers, streams, and creeks.
- Impacts on the integrity of natural resources and protected areas, whether through hunting, water siltation, decreased habitat for species, increased erosion or encouraging in-migration and associated population pressures on natural resources.
- Potential use of chemicals in certain mining communities (e.g. Mercury). Even though the use of Mercury in ASGM is currently not widespread, the prevalence of mercury use in artisanal gold operations in West Africa and the high cross-border flows of people and labour within the region, a 'technology transfer' and the adoption of mercury or other hazardous chemicals in Liberia may happen soon.

3.1.3 Potential Environment and Health Implications from Chemicals used in Mining

Potential environmental impacts from artisanal mining related to the management of chemicals are similar to those of industrial mining and could include (among else):

1. Ground and surface water pollution & siltation of rivers:

- Acidic mine drainage and heavy metal pollution (from disposal and leaching of mine tailings) from copper, lead, arsenic, mercury, or cyanide, if the excavation is in highly mineralized zones
- Oil pollution resulting from vehicle and machinery leaks and their maintenance
- Non-availability of suitable storage/disposal sites for mining tailing or chemical products (resulting in spills and leakages)
- Releases of Mercury and Cyanide used from the extraction of gold
- Degradation of water resources due to settlement patterns of miners as new populations are introduced into the mining and concession area

2. Soil pollution, as a result of:
    - Oil pollution resulting from vehicle and machinery leaks and their maintenance
    - Due to mines often producing their own power, the existence of (non-operational) PCB-containing transformers and PCB containing oils on mine sites is likely and has very likely lead to soil contamination
    - Releases of Mercury from gold extraction
    - Non-availability of suitable storage/disposal sites for chemicals and wastes
    - Lack of good chemicals and waste management practices

3. Air pollution, as a result of:
    - Car and transportation vehicle exhaust emissions (use of leaded petrol, poor car maintenance in combination with limited or no enforcement)
    - Electricity generation (generators) using diesel
    - Burning of wastes resulting in emissions of dioxins and furans
    - Releases of Mercury from gold extraction
    - Dust pollution

Mining activities could potentially expose communities to a wide range of health problems. Heavy rains cause dug-out areas to become stagnant pools that become breeding grounds for mosquitoes and increase the incidence of malaria. People who come in contact with water sources contaminated by mine wastes are exposed to disease and negative health effects of toxic chemicals contained in the water. Toxic wastes in the water sources contaminate marine life making them unfit for human consumption. Health effects from occupational exposure are also significant, due to lack of adequate labor protection regulations and

their enforcement, lack of training/awareness on the safe use of chemicals and wastes, inappropriate personal protection and hygiene and the use of extremely toxic and hazardous substances in (artisanal) gold mining (e.g. Mercury Cyanide), etc.

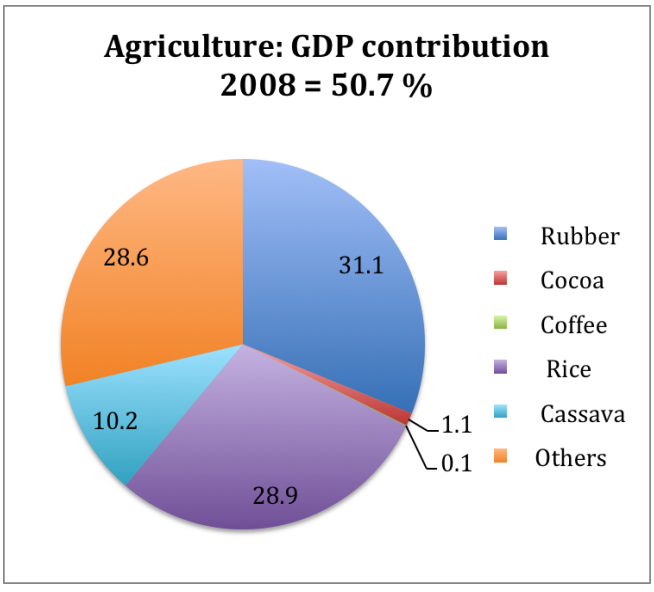
Indirect impacts from industrial mineral extraction include both positive and negative changes to the local communities‘ economic base and increased pressures to social structure. Industrial mining operations for diamonds, gold and iron ore can include the clearance, excavation, and flooding of farmlands. Surrounding communities are generally either displaced or relocated, which can disrupt their livelihoods and impact their cultural heritage. Changes in livelihoods can also have indirect effects on biodiversity, when new areas must be cleared for agriculture. At the rural level, there are numerous conflicting land use issues—agro-industrial plantations, mining concessions, absence of information on deeded lands, tribal lands, and any other preexisting land encumbrances, locations of mineral deposits and occurrences, and relevance of boundaries for parks, national forests and concessions (USAID, 2008), which all potentially can lead to conflict.

3.2 Agriculture

The formal Liberian economy is based on natural resource extraction. The economy remains predominantly agrarian, producing rubber, coffee, cocoa, rice, cassava (tapioca), palm oil, sugarcane, bananas, plantains, sheep, goats, sweet potatoes, corn, citrus, pineapple, vegetables and timber (see figure 5). Agriculture is critical to the economic development of Liberia and is the source of livelihood for 70 percent of the population. Agriculture remains the largest economic sector in the country and contributed 50.7 % to the national GDP in 2008 (LISGIS, 2011).

Due to the insecurity caused by the conflict, many fields were left unplanted and food production plummeted. Production has not yet recovered to pre-war levels and the county must import rice to meet its needs. In the aftermath of the conflict, Liberia is now one of the most foods insecure countries in the world, with more than one third of its population undernourished.

Figure 5: Agriculture - Contribution to GDP in 2008 (LISGIS, 2011)



3.2.1 Subsistence farming

The majority of Liberia's country's population depends on agriculture with shifting cultivation, low input/low output and mixed crops as the principal farming system. It is thought by the editors of the draft UNITAR National Chemicals Profile (2010) that the use of chemical inputs such as pesticides and fertilizers is not widespread among traditional farms, mainly because of poverty and customary practices. Modern vegetable gardeners, using small plots of land, usually employ pesticides (UNITAR, 2010). Unfortunately, Liberia has never conducted an inventory of agro-chemical stocks, import, usage and export and thus the degree of potential environmental and health risks posed by these agrochemicals is unknown.

Some information on chemicals use by category exists for agricultural chemicals, but records differ between departments/databases and are not up to date. Information that was gathered by the national consultant teams in preparation of this National Situation Report is presented in Annex A and has mostly been obtained through a large distributor. It was beyond the scope of this NSR to collected detailed data on imports, exports, production and use of chemicals and considering that at the time the NSR was prepared the National Chemicals Profile was not available, unfortunately little data has been available to the team working on the preparation of the NSR to draw informed conclusions.

The MoA[4] imported in 2010 pesticides with a total value of 154,000 US$ (according to the MoA all pesticides are imported into the country as no manufacturing of agrochemicals is taking place in Liberia). It has to be noted that all of these pesticides are for distribution by the MoA's extension officers located in each of the 14 MoA District Offices and are intended for small-scale farmers. Commercial farmers and plantations import their agro-chemicals themselves through distributors. Detailed information might be available through BIVAC, agro-chemical distributors or the commercial plantations. Considering the porous border, the MoA also believes that (illegal) pesticides might also be entering the country without any controls.

The MoA does have a list of banned chemicals, but the MoA also indicated that it currently does not have any guidelines or rules governing the use, storage, and application of agrochemicals. The MoA also indicated that it does not have much control over the use and/or management of pesticides as these are most often distributed to farmers without the necessary training/information. Liberia has 14 countries, and each county has its own local MoA district office – which has agricultural officers, extension officers, planning, etc. The provision of services and the distribution of tools, fertilizers and pesticides has been decentralized. When farmers come to a MoA district office and ask for assistance, an assessment is carried out (type of crops, area coverage, etc.) based on which the district office calculates the type and amount of tools needed, the quantity of fertilizers and pesticides needed, etc. These requests are centrally procured and subsequently distributed to the 14 counties, which have their own warehouses/storage facilities and undertake their own dissemination.

3.2.2 Commercial farming

Although the environmental and health threats from agro-industrial plantations and their expansion might currently be low, in the past, the conversion of huge areas of Liberia's forests into monocultures of rubber and oil palm accounted for the vast majority of forest loss. The development of large commercial plantations poses a threat to biodiversity and the environment. For example the establishment of rubber

[4] MoA June 2011

plantations involves clearing and excavation of large tracts of natural vegetation. During the process many species are destroyed to make way for a monoculture. There are also issues of soil erosion and waste management (EPA, 2006). As tree crops[5] are an important component of the Liberian economy, accounting for 22 percent of the GDP in 2005, with rubber alone employing 18,500 workers and accounting for 90 percent of total exports[6], there may be economic pressure to expand the area under tree crops (USAID, 2008).

Prior to the civil conflict there were seven large-scale rubber plantations in Liberia:

- Firestone Plantations Company in Harbel, Margibi County
- Liberian Agriculture Company (LAC) in Grand Bassa County
- Cavalla Rubber Corporation in Maryland County
- Cocopa Rubber Plantation in Nimba County
- Sinoe Rubber Corporation in Sinoe County
- B.F. Goodrich (now Guthrie Rubber Plantation) in Bomi County
- Salala Rubber Corporation (Bong County)

Currently only the Firestone and LAC plantations are functional. In addition, SOCFIN, the parent company for LAC, operates the Weala Rubber Company, which has a rubber mill in Bong County and buys rubber from smallholders operating on 14,000 hectares, much of which may have been part of the previous Salala Rubber plantation (USAID, 2008).

The Firestone rubber plantation has a concession of one million acres (approximately 416,670 hectares). It is the largest rubber plantation in Liberia, and the world‘s largest contiguous industrial rubber plantation. LAC has a concession for 125,000 hectares. But the area of the concession in both cases does not represent the area planted to rubber; indeed, the planted area is much smaller than the concession area. For instance, LAC has rubber on only 14,060 hectares of its concession area. It estimates that it needs to have 16,000 hectares of rubber to optimally supply its rubber mill, but has had trouble expanding the area planted to rubber due to tenure concerns within the larger concession area (USAID, 2008).

Liberia‘s National Biodiversity Strategy and Action Plan[7] state that the area planted to rubber on plantations is 57,000 hectares. This is much less than the nearly one million hectares covered by current and previous concessions. The years of civil conflict greatly reduced the management of rubber plantations, so that many of the trees are beyond their productive age. Currently the plantations are engaged in removing old trees and replanting areas, rather than opening up new areas (USAID, 2008).

There are estimated to be about 27,000 hectares of industrial palm plantations owned by parastatals and the private sector[8]. All of the factories on the palm oil plantations were destroyed during the civil conflict. At the time of writing, none of the palm oil plantations were functional. In some cases, small operators are managing groups of trees in the plantations for oil production. However, the MoA is currently negotiating new leases for these plantations and the potential environmental impact assessments (USAID, 2008).

Government‘s increased interest in the potential introduction of oil palm biofuel plantations may see this threat increase significantly in the future. For example, Equatorial Biofuels has expressed interest in

[5] Tree crops include rubber, oil palm, coffee and cocoa, but coffee and cocoa, as well as smallholder palm oil are usually grown with food crops interspersed among the trees or under secondary forests.
[6] MoA 2007
[7] GoL 2003
[8] MoA 2007

securing a 500,000 ha tract of land in River Gee County for biofuel plantations, an area that falls within the proposed protected area in Grebo National Forest. The Ministry of Agriculture is also discussing a number of other biofuel proposals with private companies. At this point, it is unclear how Liberia's forest policy and management would deal with these proposals particularly if they were to involve the clearing of existing forestlands for plantation purposes (USAID, 2008).

3.2.3 Persistent Organic Pollutants (POPs) (EPA, 2006)

POPs pesticides have never been produced in the country, and since 1999 the use of POPs pesticides has been restricted and the ban on importation has been in effect since 2000. The ban is also in effect for the use of DDT for vector control. There are no official records available on the past or current importation of POPs pesticides.

Nevertheless, DDT and Dieldrin are still in use in Liberia. Chlordane is reportedly being used but has not been confirmed. The POPs pesticides are offered for sale in local general markets (e.g. Duala Market and Paynesville Red Light Market) where pesticides are sold in small quantities in often-unlabeled containers.

As part of the NIP (2006) detailed surveys for stocks of obsolete pesticides and site contamination by POPs-containing products have not been carried out and were considered an important priority for the Government and as such included in the National Implementation Plan.

3.2.4 Potential Environment and Health Implications from Chemicals used in Agriculture

Potential environmental impacts from the unsound management, use and disposal of chemicals in the agricultural sector could be (among else), water, soil and air pollution. The causes of pollution are relatively similar for each media:

- Water- (ground and surface), Soil- and Air- Pollution resulting from:
  - Inappropriate application and over-use of pesticides/fertilizers resulting in run-off due to over-application, contaminating fish-stocks and causing nitrification (among else).
  - Runoff from farmlands to streams resulting from e.g. the coagulating of latex on trees (the main cause of acidity in rural streams and nitrification); production of palm oil on water banks (effluent containing phospholipids, run-off into the water killing fish, and promoting parasitic life forms).
  - Lack of awareness on Good Agricultural Practices (GAP).
  - Inappropriate storage and disposal of (obsolete) agrochemicals (including POPs).
  - Lack of good waste management practices in combination with the unavailability of suitable temporary storage/disposal sites.
  - Unsafe storage, disposal and re-use of old containers.

Human health effects from exposure to agrochemicals can occur through various way, for example from drinking contaminated water, eating contaminated food, occupational exposure, or living in areas that are contaminated with hazardous or toxic agro-chemicals. The unsound management of agrochemicals can result in health expose and ill health as a result of (among else):

- Chemical residues in foodstuffs for consumption, as a result of:
  - Inappropriate application of agricultural chemicals.
  - Insufficient monitoring of food quality.
  - Use of illegal pesticides (e.g. POPs) from obsolete stocks or from illegal import.

- Inappropriate (re) packaging of agricultural chemicals resulting in chemicals that are often not labeled and don't contain information on handling, storage, disposal, etc.

- Pesticide poisonings, as a result of:
  - Inappropriate labeling – often as a result of (re) packaging of agricultural chemicals, resulting in chemicals that are often not labeled and don't contain information on handling, storage, disposal, etc.
  - Inappropriate use and application.
  - Suicides.

- Human health effects from occupational exposure to agro-chemicals, as a result of:
  - Lack of adequate labor protection regulations and their enforcement.
  - Lack of training/awareness on safe use.
  - Inappropriate personal protection and hygiene of pest control operators and agricultural workers.
  - Growers making their own formulations.
  - Use of illegal/hazardous substances.
  - Inappropriate labeling.

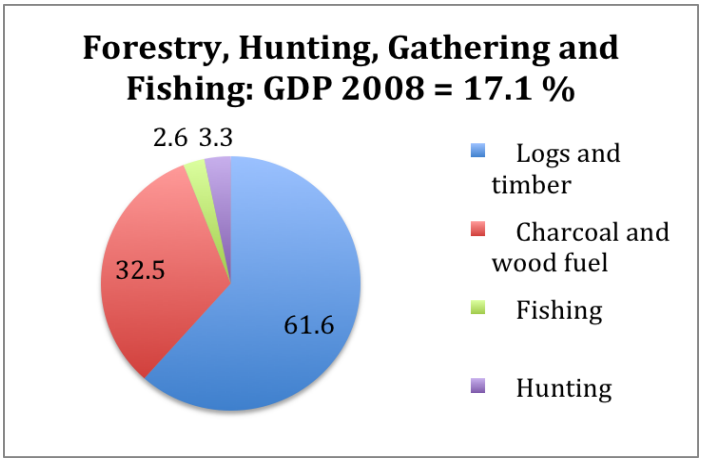
3.3 Forestry

Forestry resources remain one of the most important economic assets of Liberia (see figure 5). Liberia's forests provide a wide range of benefits to the Liberian people and the international community. Forest areas provide habitat for globally important biodiversity and maintain ecological services (such as oxygen production and soil stabilization), enable harvesting of non-timber forest products that many local people depend upon for daily subsistence, and provide a significant input to the national budget through commercial forestry development. Natural products from plant and animal species (other than commercial timber) are an important part of Liberia's domestic and subsistence economy, and are especially important to rural people. Fish and bush meat have the highest values, but in addition to these, many species, especially plants, provide food, medicine, construction materials and have cultural importance. The sustainable management of forests and wetlands are crucial to ensuring that these natural products continue to play an important role in Liberia's future (USAID, 2008).

In the past, timber was Liberia's main export item. In 2002 timber contributed more than US$ 85 million to Liberia's foreign exchange earnings. Besides sawn timber, round logs and charcoal were and still are valued forest products. In 1998 round log exports totaled US$ 12.3 million and rose to US$ 23.4 million in 1999 and to US$ 59.5 million in 2000 (UNITAR, 2010).

During Liberia's period of civil conflict forest resources were mismanaged and revenue generated from the sector was misappropriated. As a result, the United Nations Security Council imposed sanctions on Liberia's timber exports in 2003. Liberia then instituted sweeping reforms of the sector during the National Transitional Government of Liberia and the administration of President Ellen Johnson-Sirleaf. The then government consolidated these reforms by adopting a new National Forest Policy and passing the National Forest Reform Law in 2006. These reform efforts eventually led to the lifting of sanctions in 2006 and created the enabling conditions for the Forestry Development Authority (FDA) to improve forest management. As can be seen from table 3, log exports resumed again, although marginally, in 2008 (USAID, 2008).

Figure 6: Forestry, Hunting, Gathering and Fishing - Contribution to GDP in 2008 (LISGIS, 2011)



3.3.1 Potential Environment and Health Implications from Chemicals in the Forestry Sector

The most significant threats to Liberia's forest include illegal and quasi-legal logging, shifting cultivation, industrial and artisanal mining, potential threats from agro-industrial plantation expansion and loss of mangrove forests due to over exploitation and landfills. The absence of publicly distributed electrical power in the country for more than a decade has made wood and charcoal the major source of energy, putting addition strains on forestry resources (USAID, 2008).

Considering environmental and health threats related to the management of chemicals in mining (industrial & artisanal) and agriculture (subsistence & commercial), have been discussed in the previous sections, this section will exclusively focus on the potential environmental and health implications of the use of chemicals in the forestry sector, while the impact of waste management practices on mangrove forest are discussed in Section 6.1: Waste Management.

According to the Forestry Department Authority (FDA)[9], the most significant use of chemicals is thought to be found in the following activities:

- The application of pesticides and fungicides in the *Logging/Timber Extraction & Harvesting* sector to ensure that harvested wood does not attack pests[10].
- Pesticides, Fungicides, Fertilizers etc. applied in nurseries and plantations for seedling germination.
- Application of chemicals in wood processing factories (mills).

The FDA also indicated that the best-placed focal points for the Management of Chemicals are the Focal Points managing the nurseries (in the reforestation department) who are also involved in the EIAs conducted for any new forestry businesses.

The unsound management of forestry chemicals can result in health expose and ill health as a result of (among else):

[9] FDA – July 2011
[10] In July 2011, this subsector counted: 7 Forest Management Contracts (of which 4 are active); 9 Timber Sale Contracts (of which 4 were operational: BNB, BNC, Sonion, ThaboTimbo) as well as 2 Private Use Permits.

- Water- (ground and surface) and soil pollution, as a result of:
    - Chemical run-off resulting in pollution of surface waters (inland water ways & marine pollution) in turn causing nitrification and impacting fish stocks.
    - Leakage and inappropriate disposal and storage of oil and gas products (e.g. gasoline, diesel for transportation and electricity generation, oil products for fleet maintenance).
    - Non-availability of suitable storage/disposal sites for agro-forestry chemical products (resulting in spills and leakages).
    - Due to logging companies often producing their own power, the existence of (non-operational) PCB-containing transformers and PCB containing oils on forestry sites which has very likely lead to soil, water and air contamination .
    - Application of illegal agro-forestry chemicals.
    - Degradation of water and soil resources due to settlement patterns of loggers as new populations are introduced into the concession area.
    - Lack of good chemicals and waste management practices, due to low awareness and lack of training.
    - Unsafe storage, disposal and re-use of empty chemical containers.
    - Inappropriate (re) packaging of forestry chemicals resulting in chemicals that are often not labeled and don't contain information on handling, storage, disposal, etc.
    - Use of obsolete stocks (often not labeled or label unreadable).

- Air pollution, as a result of:
    - Exhaust emissions from the companies car and vehicle fleet (use of leaded petrol, poor car maintenance in combination with limited or no enforcement).
    - Electricity generation (generators) using diesel.
    - Burning of biomass containing agroforestry chemicals can result in emissions of dioxins and furans.
    - Application of hazardous and toxic Ozone Depleting Substances (ODS) for Quarantine and Pre-Shipment (QPS) of wood shipments.

- Human health effects from occupational exposure (poisoning/over-exposure) to agro-forestry chemicals, as a result of:
    - Lack of adequate labor protection regulations and their enforcement.
    - Lack of training/awareness on the safe use and application of agro-forestry chemicals.
    - Inappropriate personal protection and hygiene of pest control operators and forestry workers
    - Growers making their own formulations.
    - Use of illegal or hazardous substances, or obsolete stocks.
    - Inappropriate labeling due to (re) packaging of forestry chemicals resulting in containers that do not depict information on handling, storage, disposal, etc.

3.4 Fishing (PEI, 2010)

Liberia is situated within the East Central Atlantic region of the Gulf of Guinea, the continental shelf along the 579 km long Atlantic coastline averages 34 km in width, the fishing grounds cover 186 322.2 km² within the exclusive economic zone (EEZ). The fishing area extends from the shrimp rich shebro grounds bordering Sierra Leone in the west, to the Cavalla River Basin bordering Côte d'Ivoire. There are also 1,800 km of rivers endowed with a rich aquatic fauna (EPA/UNEP, 2007). FAO estimated Liberia's fisheries GDP at 12% of total agricultural GDP in 2005 (FAO, 2007).

Liberia fisheries are made up of marine fisheries, involving industrial and artisanal activities; inland fisheries which are mainly artisanal; and aquaculture through subsistence fish farming. The fisheries are important for several reasons:

- They provide a means of employment and livelihood for about 11,250 people who are engaged on a full-time basis, and perhaps hundreds of thousands more on a part-time basis.
- They provide a cheap source of animal protein for the population.
- They are a potential source of foreign exchange and revenue, as tuna, lobsters, shrimp, etc., abound in both fresh and marine waters.
- The sector provides about 65 percent of the animal protein needs of the country and contributes about 3.2 percent to the GDP (FAO, 2007).

Table 6: Annual fisheries production of Liberia, 1995–2004 (tonnes) (Sources: Regulatory and Statistics section, Bureau of Fisheries, 2004; FAO, 2006; FAO, 2007)

Year	Artisanal	Industrial	Inland	Aquaculture	Total
1995	3460	1675	n.a.	n.a.	5135
1996	2036	1104	n.a.	n.a.	3140
1997	2519	2061	n.a.	n.a.	4580
1998	3537	3071	n.a.	n.a.	6830
1999	7078	4394	n.a.	n.a.	11471
2000	6995	4731	n.a.	22	11748
2001	8089	3197	n.a.	14	11300
2002	6890	4110	n.a.	14	11014
2003	6721	3979	n.a.	14	10714
2004	5646	4713	n.a.	38	10397

Artisanal fishing (Coastal & Inland)

Approximately 60% of the total domestic catch is landed by artisanal fisher folk, using various types of canoes and fishing gear, including 200-800m long beach seines. About 13,000 fisherfolk and 18,000 fish processors (mongers) and their families live in 139 communities in coastal counties. Together they operate about 3,500 canoes of which 8% are motorized and the largest numbers of canoes are operating in Montserrado and Grand Bassa County.

The artisanal fleet comprises the indigenous *Kru* canoe (1–3 person crews), operated by Kru fishermen using oars or sail. These are small dugout canoes of about 7 m, some of which are also powered by 7 hp outboard engines, deploying mainly hook and long lines and gillnets. The *Fanti* canoes are larger (12–15 m) and powered by 25–45 hp engines, with a crew of 15. Their gears are ring and purse nets used for small pelagic species, with larger gillnets specifically adapted for different species and seasons. These account for about 40 percent of the artisanal landings. The *Popo* operate beach seines (200–800 m long) using dugout canoes (5–7 m), usually with a 1- or 2-person crew (EPA/UNEP, 2007).

Inland fishery is underdeveloped and traditional in the methods of exploitation, and not monitored. As such, there is no information on its level of production (FAO, 2007). However, inland fisheries are a significant source of livelihood and protein for most households. Moreover, most of the fishing is undertaken by women using baskets and other local technologies. It is significant that these fisheries be

managed properly in order to give rural women sustained access and control over a key livelihood resource (PEI, 2010).

The Bureau of National Fisheries (BNF) estimates that that there are an estimated 8000 boats on Liberia's inland river system with only about 200 registered. Of the total number of boats there is a high percentage of migrant fisher folk using bigger boats and motors and more advanced technologies and generally out competing resident fisher folk. According to BNF, there is little control over net mesh size (sometimes impregnated mosquito bed nets) and there is wide use of organic and chemical pesticides, and dynamite. BNF has little capacity to monitor inland fisheries as their only one BNF agent in the field (on the St. Paul River), and he has no means of transport to either control boats on the water or at landing sites (USAID, 2008)

Commercial Fisheries

Currently there are 14 fishing companies operating legally in Liberia; 6 companies are solely engaged in the importation of frozen fish from the high seas, and 8 companies are engaged in industrial fishing activities operating 30-40 licensed fishing vessels—including eight Chinese paired trawlers—with a combined Gross Registered Tonnage (GRT) of about 5,000 tons.

Industrial fishing vessels land their catches at the fishing pier in the Free Port of Monrovia. Currently, fish landed locally by all licensed trawlers is estimated at 2,000-3,000 tons. However, BNF believes that these figures are grossly misreported, and has a strong suspicion that a number of licensed industrial fishing vessels are engaged in illegal transshipments in the high seas and are repacking catches in Liberian waters and declaring these catches as imports. BNF estimates that Liberia loses approximately US$ 10-12 million through illegal fishing each year. BNF further estimates that the annual catch within the EEZ of Liberia is much higher as poaching (pirate fishing) is rampant due to the lack of any monitoring, control and surveillance system. BNF conservatively estimates that there may be upwards of 250 "pirate" boats operating in Liberian waters, the majority of which are using illegal fishing techniques such as long lines and gear (nets with mesh sizes below the required size of 25mm for shrimp and 70mm for fish). Often these boats operate within the three-mile limit reserved for artisanal fisheries and compete for the same demersal species.

3.4.1 Potential Environment and Health Implications from Chemicals in the Fishery Sector

The most significant environmental and economic threat to the fishery sector is over-fishing (USAID, 2008). Nevertheless, there are significant environmental and health threats related to the use of chemicals in the fishery sector as well as the implications of the unsound management of chemicals in other economic sectors that negatively impact the fishery sector.

- Surface water pollution impacting fish stocks and contaminating food sources, resulting from:
    - Lack of awareness and training in Good Agricultural Practices, resulting in run-off contaminating and killing fish-stocks, causing nitrification and promoting parasitic life forms, due to e.g. the inappropriate application and over-use of pesticides/fertilizers; the coagulating of latex on the trees (the main cause of acidity in rural streams and nitrification); production of palm oil on water banks (effluent containing phosphor-lipids).
    - Lack of municipal, hospital, hazardous and toxic waste management practices in combination with the un-availability of suitable disposal sites, resulting in dumping of waste in water streams, mangrove forests and waste leachate ending up in water bodies.

The biggest threat to mangroves is urban expansion and accompanying landfills, particularly in Monrovia. The Mangroves are vital coastal system, and among else they provide spawning grounds for many fish species, crabs, shrimps, mollusks and other forms of sea life (UNITAR, 2010).
    - Inappropriate storage and disposal of chemicals and their containers resulting in leakage and seepage into water bodies (agro/forestry chemicals, petrochemicals, POPs, etc.).
    - Oil spills and chemical discharges at sea resulting from and oil and gas exploration.

- Impact of chemicals used in the fishing sector (artisanal and commercial) leading to environmental and health impacts:
    - Use of organic and chemicals pesticides and dynamite for in-land fishing
    - Unsound management of cooling gas (HCFCs) and cooling equipment at cold storage facilities (on commercial vessels and on-shore) resulting in leakage of coolant gases to the atmosphere and contributing to climate change and ozone depletion.
    - Dumping of (chemicals) wastes including oil spills from commercial fishing vessels pollution the ocean.

- Health implication from the unsound management of chemicals in the fishing sector:
    - Human health effects from consuming contaminated fish or fish killed with pesticides
    - Human health effects from occupational exposure to chemicals using in the fishing sector, as a result of lack of adequate labor protection regulations and their enforcement; use of illegal or hazardous substances in artisanal fishing, or obsolete stocks.

3.5 Energy & Transportation

3.5.1 Energy

Before the war, Liberia's energy supply relied heavily on the hydropower plant at Mount Coffee, 30 km north-east of Monrovia. It was destroyed in the fighting, and what little remained was looted (cables, conductors, transformers, substations, meters, etc.) along with the country's entire transmission and distribution equipment. The operations of the Liberia Electricity Corporation (LEC) ceased completely. By 2006, modest efforts to rebuild basic services had begun. But it wasn't until July 2010 that LEC - which is run by Manitoba Hydro International, a Canadian company - started work on the major reconstruction programme that is continuing today.

Huge diesel generators - using high-speed diesel oil - currently supply the public grid with 22 MW of electricity, up from nine when LEC took over. Twelve large government buildings are connected, and other public facilities such as hospitals and some schools are also receiving public power. LEC's customer base has grown from fewer than 2,000 consumers in 2010 to more than 6,000. And there is now a push under way to connect an additional 16,500 households in 21 low-income neighborhoods around Monrovia by 2015. Those who do have access to the Liberian capital's electrical grid pay $0.43 per kilowatt-hour (kWh), likely the highest rate in sub-Saharan Africa. The majority of businesses and some private homes run on diesel generators that carry a price of $3.96/kWh[11]. It is estimated that an approximate 45,000 generators are being operated on a daily basis, which are a source of air emissions (particulates, sulphur oxides, and nitrogen oxides) as well as noise pollution. Often generators are not in excellent working conditions, further aggravating air pollution.

Only 0.58 % of the residents have access to public electricity, according to a 2011 World Bank report.

[11] Aljazeera (June, 2012) "Liberia's long wait to turn on the lights"
http://www.aljazeera.com/indepth/features/2012/06/201261912122040806.html

Outside the capital city, public power is practically unheard of. The connectivity rate is on the rise, and ambitious targets have been set. The 2009 Liberia National Energy Policy states that by 2015, the government expects 30 per cent of the country's urban population and 15 per cent of those living in rural areas to have "reliable modern energy services".

Hopes rest on plans to rehabilitate the Mount Coffee Hydropower Plant, which sits on the St Paul River less than 35km from Monrovia. If restored to pre-war conditions by the government's stated goal of 2015, Mount Coffee's expected 64 megawatts of electricity would significantly reduce the price of electricity in Liberia. The governments of Norway and Germany and the European Investment Bank (EIB) have announced plans to finance the project. But, even if the money were to arrive tomorrow, several officials interviewed said that a 2015 completion date is unrealistic.

When it has run its course, the project, which is financed by the Global Partnership on Output-Based Aid (GPOBA) and administered by the World Bank, is expected to benefit 80,000 people. But with more than one million people estimated to live in Monrovia, that's an access rate of only eight per cent - still far below the 2011 West African regional average of 28.5 per cent, according to World Bank figures.

According to Liberia's 2009 national energy policy, nine out of 10 Liberians rely on biomass, wood and charcoal for their daily energy needs, resulting in significant deforestation for fuel wood and charcoal, leading to greenhouse gas emissions and indoor air pollution. The government's energy targets propose a rapid shift away from biomass. The aim is to have 40% of traditional-energy-using households to have access to modern cooking facilities by 2015. However, the cost of cooking with kerosene, LPG or electricity is up to six times more than charcoal, of which Liberia has one of the lowest prices in Africa[12].

Imports

Transportation (private and commercial), vehicle maintenance and energy generation (through diesel generators) relies on fuel and lubricants. Two entities, Total (Liberia) and the Liberian Petroleum Refining Corporation (LPRC) are the primary importers of petroleum products into the country. Although no data on fuel import was obtained from LRPC, the authors of the R&C sector group estimated the total amount of fuels that were imported into Liberia in 2010 to be around 100,000 metric tons. This estimate was based on the assumption that LRPC's share of the market is larger than Total's (which in 2010 imported 46,000 metric tons of fuel) as it has a larger storage capacity as well as more trucks in operation. Unfortunately, due to the inappropriate units used for lubricants (e.g. no. of drums – see also Section 4.1) it was impossible for the R&C sector group to estimate the quantity of lubricants consumed (J. Acolatse, J. Toe & J. Gobeh, 2011).

Vehicle transportation and maintenance

In the city of Monrovia, it is estimated that there are approximately 13,000 privately owned cars registered and licensed. The number of other vehicles – buses, taxis, business cars, pick-ups, etc – approximately doubles that number. The R&C sector group assumed that it was a safe to assume that most of these vehicles are not routinely maintained and as such are a cause of air pollution, resulting in emissions of NO_x, VOCs, CO, particulates, CO_2, hazardous air pollutants (e.g. benzene), among else. As there are no options for waste disposal of waste motor oils/fuels, these inevitable get dumped. Often such wastes are even used on unpaved roadways to retard dust kicking up from moving vehicles.

[12] The Guardian (Feb, 2006) "Liberia's battle to put the lights back on" http://www.guardian.co.uk/global-development/poverty-matters/2012/feb/06/liberia-battle-with-electricity

Bulk Storage, Distribution & Transportation

Reportedly, fuel storage and handling is poor across the country with little or no safeguards to contain surface spillages (USAID, 2008). When fuel arrives at the Freeport, it is transferred from ships to Product Storage Tanks (PST). Initially, seawater was pumped to a certain level in each tank, and then fuel was pumped in to float atop the water, allowing, relatively, complete evacuation of hydrocarbon products. Through time, fuel mixes to some extent with water and the liquid rises above the desired level, necessitating that some of the mixture be pumped out. Moreover, if tanks need to be emptied for maintenance, this polluted seawater is pumped back into the ocean, as liquid-liquid separators for recovering most of the fuel before returning water to the ocean, are blocked and inoperable. It is unclear, whether this situation applies for both Total and LPRC operations. Apparently, a PST rehabilitation project is underway, that should – in four years time – address this issue (J. Acolatse, J. Toe & J. Gobeh, 2011).

Transfer of gasoline into tanker trucks is considered an environmental, health and safety hazard, as fuels are pumped into tankers with their manholes open. The majorities of the tankers that load up at LPRC are faulty or are considered obsolete, and tankers are filled holding the transfer hose over the manhole, resulting in air pollution (due to evaporation, in particular during the hottest hours of the day), fire hazards and soil and water pollution due to serious spillage. An EPA evaluation indicated that the site was contaminated with gas, diesel fuel, kerosene and oil. The problem seems more severe at LPRC, as Total (Lib) follows international HSE corporate standards in the filling of their trucks and has purchased new trucks that meet international standards. Although LPRC indicated that it would start filling tanks with proper equipment by February 2011, it is not known at the time of writing this report, whether his has become a reality (J. Acolatse, J. Toe & J. Gobeh, 2011).

A final concern with respect to "Storage, distribution and transportation" is the road-worthiness of tanker trucks – currently no minimum requirements are in place, which a truck should meet in order to be allowed to transport dangerous substances. Except for the majority of the Total trucks, most trucks are not meeting international standards regarding markings and road-worthiness, nor are drivers properly trained in how to act in case of an accident (e.g. how to handle a spill). Although research was restricted to the Freeport and the LPRC and Total transfer sites, it is assumed that the management, storage, transfer and disposal of hydrocarbons is similar or worse at other sites.

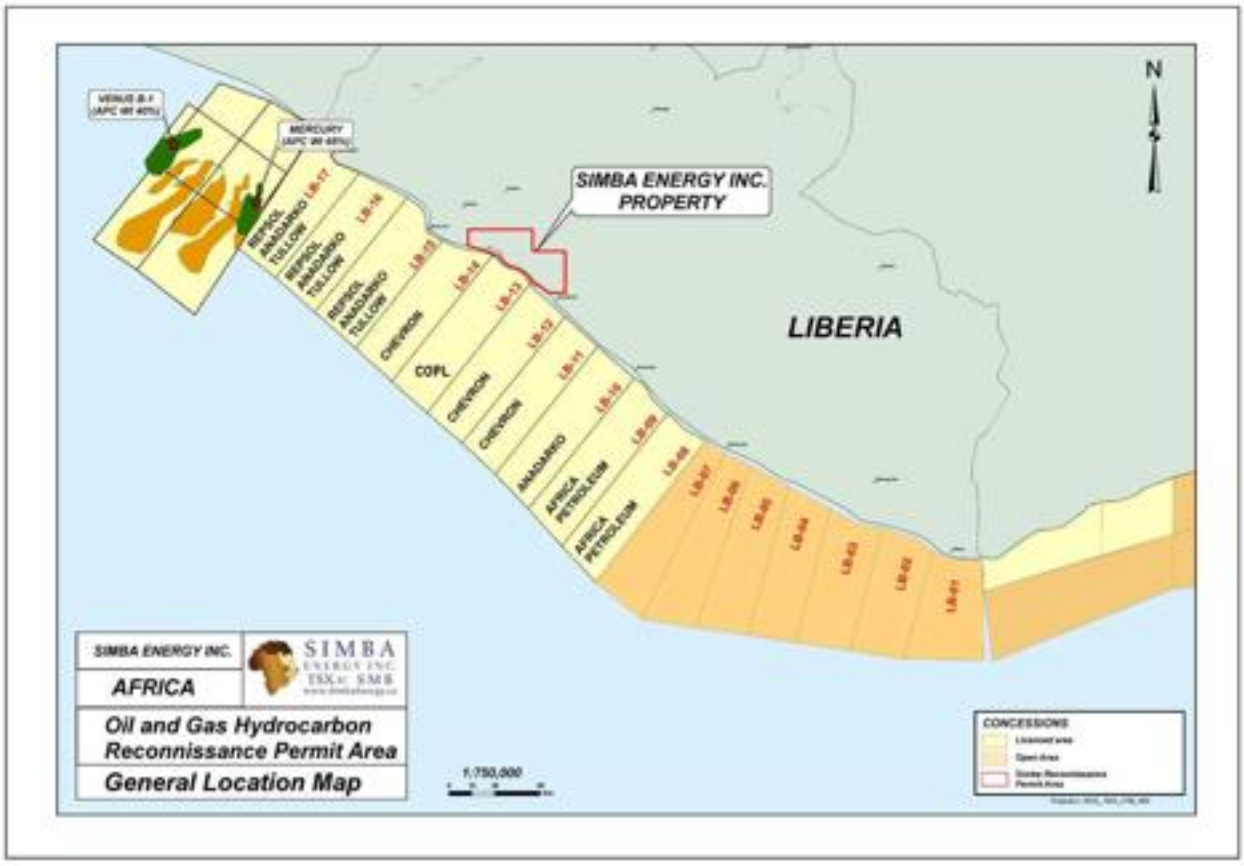
Oil & Gas Exploration

Recent discoveries of oil and gas reserves of as yet undetermined but considerable magnitude (Blore, 2007) are expected to enhance the country's rich natural resource endowment. No commercial deposits have so far been found in Liberia and therefore there is no current production or field development.

The National Oil Company of Liberia (NOCAL) was established in 2000 with the sole intent to explore, make attractive, and managed Liberia hydrocarbon potential (e.g. begin reforming the country's oil and gas sector by offering licenses to oil blocks, negotiating oil contracts, exploring for oil and attracting international partners to invest in the sector). NOCAL divided Liberia offshore waters into 17 blocks commencing from the coastline to approximately 50km offshore (see figure 7). International Oil and Gas Companies (IOCs) immediately began the process to explore for hydrocarbons. To date, two IOCs have recommenced the once inoperative oil and gas sector after completing two separate wells in Blocks LB-9 by African Petroleum and LB-15 by Anadarko. While these companies did not found commercially viable

quantity of oil, consequentially, they traced a working petroleum system, which can depict potential existence of a reservoir[13].

Figure 7: Map showing location of Liberian Blocks along with their operators (Source: Modified from Simba Energy).



Refineries

The Gardnersville oil refinery and associated pipeline and the fuel storage facilities at Buchanan, Ganta and Greenville were destroyed during the conflict and are still causing environmental degradation (USAID, 2008). It is expected that at some point operation at the oil refinery will resume, but exactly when is not clear.

PCBs

There has been a restriction on the import of PCBs since 1996. In Liberia PCBs are thought to be used by the oxygen industry as well as contained in old (non-operational) transformers and capacitors. According

[13] Strengthening Liberia's Oil & Gas Sector
http://www.publicagendanews.com/index.php?option=com_content&view=article&id=3434:strengthening-liberias-oil-a-gas-sector&catid=35:commentary&Itemid=53

to the NIP (2006) most of the remaining transformers are in the procession of the Liberia Electricity Corporation, and some might be in the possession of larger mining corporations that generally generate their own power. According to the NIP (UNEP, 2006) "significant stocks" can be found at certain sites of the Liberia Electricity Corporation (LEC). However, statements from LEC contradict that there are still old transformers/capacitors present, as according to them "cables, conductors, transformers, substations and meters have been destroyed or looted, sold for their scrap metal value."

Before the onset of the Liberian civil war in December 1989, power companies and concessions, including LEC, BMC, FPCO and LAMCO/LIMINCO, had a total installed capacity of 412,700 kW (or 515, 900 kVA). To transmit and distribute the power generated, these establishments purchased and installed more than 40 unit (large step-up) transformers. Between 3,000 and 4,000 distribution transformers, consisting of pole-mounted, pad-mounted and pier stations, were installed. The R.E. outstations had 15 unit and 762 distribution transformers in service.

According to LEC, none of the PCB-containing transformers/capacitors in operation before the conflict are in operation today or will ever be, due to destruction of the grid as a result of the conflict, which for the most part has not yet been rehabilitated. In certain cases the destruction of transformers was deliberate for their scrap metal value (e.g. all of the 16 major LEC-owned substations were completely destroyed).

The NIP estimates that approximately 28-35% of the estimated 3,000-4,000 transformers (~840-1,400 transformers) installed nationwide before the war are still around (please refer to the NIP, 2006 - Table 8: "approximate number of transformers installed at various substations and outstations before the war"). The NIP assumes that environmental contamination due to PCB pollution has occurred, and although no assessment of contaminated sites has been conducted, those areas suspected of containing and emitting POPs are approximately 150 (including sites polluted by POPs pesticides).

For the rehabilitation of the grid, the LEC has indicated that it will, put in place new transformers/capacitors, which are PCB-free. If indeed, there is still PCB contaminated equipment around, its sound temporary storage and disposal would be one of the major priorities for Liberia under the Stockholm Convention, if not, it can safely been assumed that all PCB containing oil has been inappropriately disposed of and the identification and management of contaminated sites would be one of the most pressing issues.

3.5.1 Potential H&E Implications from Chemicals in the Energy and Transportation Sector

From an environmental perspective, impacts of the unsound management of chemicals in the Energy and Transportation sector results in:

- Air pollution, resulting from:
    - POPs emissions as well as emissions originating from electricity generation using diesel generators as well as electricity generation from non-renewable resources.
    - Vehicle exhaust in particular from old and unmaintained vehicles.
    - PCB contaminated sites.
- Soil pollution, resulting from:

    - Leakage and spills as a result of inappropriate storage, transfer and disposal practices of petrochemical products (e.g. gasoline, kerosene, diesel for transportation and generators, oil products for vehicle and fleet maintenance).
    - Spills caused by road accidents involving trucks carrying hydrocarbons.
    - Inappropriate storage, maintenance and safekeeping of destroyed/decommissioned or non-operational electrical transformers/capacitors containing PCBs (at mining, military and LEC sites).

- Water pollution:

    - Oil spills (oil tankers, fishing vessels, oil and gas exploration accidents)
    - Leakage and spills as a result of inappropriate storage, transference and disposal practices of petrochemical products.

The unsound management of wastes can result in health exposure and ill health as a result of (among else):

- Exposure to drinking water contamination resulting from dumping and spills of PCBs and petrochemical products.
- Exposure to air pollution from vehicle exhaust and electricity generation.
- Being exposed to soil polluted with PCBs and/or petrochemicals.
- Occupational exposure, in particular workers dealing with and handling petrochemicals on a daily level.

4. DATA ACCESS & PUBLIC AWARENESS

Considering that this was a first among this type of exercises (after NIP preparation in 2006 that is), the challenges faced by the national consultants in obtaining and accessing data, and being able to use that particular data for analysis, is a very good starting point for making assumptions with respect to the challenges that might be faced by the general population, private and government entities and the like in gaining access to information and data related to chemicals and their management. In addition, this exercise also provided a good opportunity for assessing gaps and needs and suggesting recommendations for improvement.

It has to be acknowledged, that this project was developed in such a manner that it would be able to fully build on the results and outcomes of the SAICM QSP TF funded project, implemented with the support of UNITAR, which had as objectives to i) *Develop a National Chemicals Management Profile*; ii) *Develop a National Capacity Assessment*; and, iii) *Hold a National SAICM Priority Setting workshop*. Unfortunately, considering the UNITAR supported project was facing similar challenges as the "*UNDP-UNEP Partnership Initiative*", at the time this draft version of the National Situation Report was prepared, only a preliminary draft National Profile was available to help constitute the baseline for the National Situation Report, however no data on the import, export, use, disposal, etc. was included in the draft.

Therefore, the national consultants had to undertake some data collection in order to substantiate their findings and views. However, it has to be kept in mind that the obtained data cannot be considered complete and conclusive. In order to paint a holistic picture on the import, export, use, manufacturing, disposal, etc. of chemicals in Liberia it's necessary for the GoL/EPA to relaunch its efforts to finalize the National Chemicals Profile as it was beyond the scope of this NSR to collect complete detailed data on imports, exports, production, use and disposal of chemicals.

4.1 Collection of Data for Preparation of the Baseline

The 5 sector teams involved in the development of this national situation report developed a questionnaire, which was to be circulated among, and completed by stakeholders. In the case of the Research and Contamination (R&C) sector team the questionnaire consisted of four parts 1) entity identity; 2) handling; 3) inventory list; and 4) disposal and contamination. The R&C team was the only of the 5 teams, which set out to obtain data and information related to the import and use of chemicals (see Annex A).

The Ministry of Commerce (MoC) has begun keeping computerized records since 2008 pertaining to the importation of chemicals into Liberia, and as such the R&C sector team was therefore able to obtain import data for 2010 covering 31 importers.

The R&C team intended to obtain data from chemical users and distributers through the questionnaires and interviews, using the data obtained from the MoC in situations were data was non-existent or scarce; as supplementary data where the MoC's records were more comprehensive; and for comparison between the MoC data and the data obtained through questionnaires and interviews.

MoC Data

Data provided by the MoC originates from import procedures. Any entity with an up-to-date business license can import chemicals into the country; no special permit is required. The procedure below must be followed to import chemicals. A company representative must (J. Acolatse, J. Toe & J. Gobeh, 2011):

1. Open an IPD (Import Permit Declaration) with the Ministry of Commerce (MoC)
2. MoC liaises with EPA for clearance to import the listed chemicals
3. The IPD is then returned to MoC and the importer for final processing
4. Copy of the IPD is submitted to BIVAC (Bureau of Inspection, Valuation, Assessment and Control) and processed for pre-shipping inspection
5. BIVAC must conduct inspection either prior to shipping or upon arrival of goods if pre-shipping inspection could not be arranged
6. BIVAC then submits a report of the shipment contents to the MoC

The responsibility to inspect and control the standard of imported goods and assess their true value has been assigned to BIVAC, which is a private entity. It is mandated to perform inspections of all "ready for shipment" goods value at/or above US$ 3,500 at various points around the world that are destined for entry into Liberia. After inspection, the goods are placed into a container, locked, and sealed. If the container arrives at the Freeport of Monrovia with the seal intact, it will not require re-inspection. In the event that the container did not undergo pre-inspection before arriving in Monrovia, it must then be inspected. BIVAC will assess the value of the goods and submit a bill. Customs then submits a total bill inclusive of all duty and port charges, which must be paid in full at the Ministry of Finance in order to obtain a flag receipt if the goods will be cleared from the port.

The 2010 data provided by the MoC, indicated that the MoC groups chemicals in categories such as (J. Acolatse, J. Toe & J. Gobeh, 2011):

- "Assorted Chemicals"
- "TDI Chemicals"
- "Wood Chemicals"
- "Agro Chemicals"
- "Paint Chemicals"
- "Chemicals for Mattress"
- (and 17 more of such categories)

Units mostly follow the metric system (e.g. quantities described in liters and metric tons, etc.) but are often also highly descriptive (e.g. packages, cans, pieces, bags, boxes, containers, drums, etc).

In examining the 2010 import records for chemicals, it was observed that MoC employees, instead of listing a single chemical as a line item, habitually group different chemicals under one category, such as "agro-chemicals". Then because some of these agro-chemicals are packaged in bags, drums, bottles and cans, the clerk finds it impossible to determine how many tons or liters of the whole group of chemicals was brought in. So he/she must continue by entering, for example, 4347 pkgs. of "agro chemicals." Hence, the record he/she has entered is not useful in identifying exactly what chemicals entered the country, not their quantities. It was observed, that in a few cases some of the main importers are not listed in the MoC records.

It has to be noted that the classification used by the MoC from a chemicals management and safety perspective is not adequate, considering the classification used does not indicate the risks and hazardous associated with the imported chemicals. The reason for this is probably because the sole purpose of the registration of imported goods (including chemical products) is to determine its value and thus duties and

port to be charged to the importer. Record keeping of chemical products is not in any way aimed to obtain a sense of what type of chemicals are imported/exported, or what their potential hazards might be. It is unknown whether BIVAC or customs, uses a list of "banned chemicals" that are not allowed to be imported or whether it is the responsibility of EPA/MoA to check proposed imports versus a listed of banned/prohibited/restricted chemicals.

Data from questionnaires & interviews

The R&C team did not survey all 31 importers indicated by the MoC data registry, instead it surveyed 26 entities (22 importers and 4 government agencies), as such their data does not cover 9 of the importers. Secondly, information and data gathering was only successful for 21 respondents out of 26, of which only 19 entities were able and willing to report on their use and stocks of chemicals.

The questionnaires and interviews resulted in more information that the information from the MoC – therefore MoC data was only used for verification purposes – except in the case where data was lacking. Often it was even impossible to use MoC data for comparison purposes as units used by the MoC were sometimes descriptive (e.g. packages, cans, pieces, bags, boxes, containers, drums, etc), and could not be compared to the numbers obtained through the questionnaires/interviews which were using the metric system.

The sector team produced a table (See Annex A), which lists all the chemicals that came up in the research for 19 of the entities. The R&C group organized the results/data in 8 categories:

- Agriculture, Mining and Latex harvesting
- Paints, Foam, Plastics (incl PVC pipes), etc.
- Water & Sewer, chlorine bleach industry
- Transport: Fuel and Lubricants
- Welding, Metal fabrication
- Drinks & Beverages
- Public Health, Medical and Funeral Services
- Education & Q/C labs

For purposes of confidentiality the table, which includes detailed information per stakeholder, has not been included in the report.

The sector teams faced many challenges in obtaining the data, which was often because of a lack of interest of importing entities, the fact that certain entities classified chemicals and chemical mixtures as "products, not chemicals", and certain entities were not willing to disclose certain information – sometime because of perceived advantage vis-à-vis their competitors.

Other sources of data

Although the sector teams did not obtain chemicals related data from other institutions besides the entities interviewed and the MoC, it is thought that more information is available through the following channels:

- Ministry of Agriculture: the MoA keeps records on agro-chemicals – organized by categories, however it is thought that records differ between departments and databases and are not up to date (UNITAR, 2010), although the project's sector teams did not have an opportunity review MoA's

records. In 2010, the MoA[14] imported in pesticides with a total value of 154,000 US$ (according to the MoA all pesticides are imported into the country as no manufacturing of agrochemicals is taking place in Liberia). It has to be noted that all of these pesticides are for distribution by the MoA's extension officers located in each of the 14 MoA District Offices and are intended for small-scale farmers. Commercial farmers and plantations import their agro-chemicals themselves or through distributors. Considering the porous border, the MoA also believes that (illegal) pesticides might be entering the country without any controls.

- Environmental Management Plans (EMP): Based on the 2002 Environmental Protection and Management – (private) entities are required to conduct Environmental Impact Assessments (EIAs) prior to starting operation. As part of the Environmental Impact Assessment – entities have to prepare an EMP, which is reviewed by EPA and subsequently approved if deemed appropriate. The EMP contains lists of the chemicals expected to be imported, exported, used, manufactured and disposed of by the entity. As such, a wealth of information on the import, export, use, manufacturing and disposal should be available through the EMPs and the EPA department responsible for their review and approval (it was outside the scope of this report to review/obtain this type of information)
- BIFAC
- Distributors
- Private sector entities (on a voluntary basis)
- Other government entities (e.g. MoH - pharmaceuticals)

Reporting of chemical imports and stocks throughout the preparation of this national situation report, was on a voluntary basis. It is thought that besides the compulsory Environmental Management Plans (EMPs), which by certain companies have not yet been prepared, and the import records, entities are not required to report on the import, export, use and disposal of chemicals nor on their hazardous or toxic properties.

Conclusions regarding data access

It is truly important, in order to achieve the sound management of chemicals in Liberia, to capture all critical information pertaining to the import, export, use, storage, manufacturing and disposal of chemicals. At this point in time, it seems that the agencies that have access to most of the data are MoC (BIVAC), Customs, MoA and EPA, however no coordination on data collection or data sharing is taking place. It is critical to establish a central unit for data collection and maintenance related to chemicals within the agency that it best equipped to do so, most likely either the MoC/BIVAC or EPA, and subsequently set-up a data collection system for continuous data logging, reporting and monitoring, providing easy access to it by all relevant entities, and the general public.

Secondly, the way in which data is collected, maintained and kept up to date (or not), varies widely among the different agencies, mostly because the purpose for data collection is different for each one of them. In order to advance towards achieving SMC, it is critical to establish a classification system for chemicals to be applied in the same way for all entities (government and private sector), that uses a common metric system and is based on the properties of the chemicals, not its value.

[14] MoA June 2011

4.2 Public Awareness & Education

Overall, public awareness related to the sound management of chemicals can be considered extremely low. To a large extent this is the result of 10 years of conflict, throughout which the general population did not have the opportunity to benefit from elementary, secondary and tertiary education as well as vocational training. In the aftermath of the conflict, emphasis has been on recovery and to a lesser extent on environmental management, although that trend is now slowly starting to change.

In most countries, public awareness on the handling of hazardous chemicals is most often gained through schooling, on-the-job training, extension services and public awareness raising through newspaper articles, environmental publications, radio and TV coverage, drama plays, posters, etc. However, not much awareness raising has been conducted in the area of the management of chemicals, except for workshops and training conducted as part of internationally funded chemicals management programmes. Such activities however are not specifically targeted towards the general population but often do result in published newspaper articles and tv coverage that reaches a larger audience.

Another way to inform the general public on the handling of chemicals is through adequate labeling of products, clearly describing how the product should be handled, stored and disposed. Unfortunately, in Liberia – as in many other countries – chemicals and chemicals containing products with hazardous properties, are often repackaged into smaller containers for resale and do not contain labels describing what is in the package or how to use it (often the case for agro-chemicals used on small farms and for subsistence farming, as well as for household products, e.g. cleaning products). According to WHO (2002) the improper labeling, storage, and use of chemicals is a significant cause of poisoning in developing countries. Unintentional poisonings account for an estimated 50,000 deaths of children aged 0-14 years and about 5 percent of all deaths by injury of children in developing countries (Edwards et al. 1997).

Entities that do have an understanding of the benefits and negative implications of the use of chemicals in various sectors, are those directly involved in the management of chemicals, referring in particular to departments of governments ministries and agencies (e.g. those involved in the review of Environmental Impact Assessments, Environmental Management Plans, development of environmental legislation, conducting inspections, providing training to farmers, etc.) as well as university departments and private sector entities dealing with (bulk) chemicals and concerned environmental NGOs. That said, in essence this can be considered a small group of actors, who more often than not do not have not many resources (human and financial) at their disposal to really improve the current chemicals management situation. Their knowledge has been mostly build up through "*on-the-job*" training as well as participation in lectures, workshops and training provided through internationally funded development programmes related to the environment and the management of chemicals.

An exception is personnel working for Health, Safety and Environmental departments of international companies (e.g. Firestone, Total, BHP Billiton, ArcelorMittal, etc.). Such companies often have stringent internal auditing procedures and international Corporate Social Responsibility (CSR) targets, resulting in the fact that these companies often apply more stringent measures than have been put in place through law and regulations in Liberia. In order to do so they have trained personnel that adapts best international practices related to the management of chemicals and wastes, although they do have to operate within the limitation of national infrastructure (e.g. absence of sound municipal and hazardous storage and disposal options).

Materials Safety Data Sheets (MSDS)

With respect to locally owned private sector entities in Liberia, throughout the preparation of this National Situation Report, many of the distributers, users and manufacturers interviewed by the different sector groups were not aware of the existence of Materials Safety Data Sheets (MSDS), nor do they know how to use them. The entities also admitted that they didn't provide training to their personnel on the sound management of chemicals and wastes, or provided personal protection gear to their staff. As a result their employees also are not aware of safety measures and precautions when it comes to the handling of chemicals, and can - on a daily level – be exposed to the negative health effects of the chemicals they handle. Among the questionnaires received by the R&D group, 14 entities claimed to know how to use MSDS, of those only 9 received them with their order, and only 1 entity had the capacity to provide them to its customers.

4.2.1 Universities

All project stakeholders identified lack of capacity as the major underlying cause of environmental degradation and the poor management of chemicals and their wastes. Building capacity in the environment management and natural resources sector in Liberia depends a great deal on the University of Liberia's College of Agriculture and Forestry and its College of Science and Technology.

The University of Liberia

The University of Liberia was established in 1862 as Liberia College and became a university through a charter granted by the legislature in 1951. It is the oldest degree-granting institution in West Africa and has colleges in the areas of science and technology, agriculture and forestry, and business and public administration. The College of Science and Technology offers bachelor's degrees in biology, zoology, engineering, chemistry, geology, physics and mathematics. Although poorly equipped and poorly staffed the College has been making efforts to revise the curricula to include new national priorities related to environmental science and natural resource management. The College of Environmental Science has very recently been established, and it's said that several students have recently started studies in environmental science as well as natural resource management.

Cuttington University (CU)

The Cuttington University College in Central Liberia offers bachelor's degrees in general science, biology, chemistry, physics and mathematics. Other relevant courses offered in the area of biodiversity are agriculture and rural development.

Recommendations

However, bringing the colleges up to any recognized standard of education will require longer-term donor and GOL commitment, not only for infrastructure but for elements such as (USAID, 2008):

- Assessing the extent of the environment job markets and manpower requirements.
- Preparing national level human resources development plans for the larger environmental sector to ensure a match between the job market and graduates.
- Revising curricula to be continuous, institutionalized and research based—and producing professionals who are able to take up emerging issues from environmental planning; ensure curriculum responsiveness to changes - scope, content and delivery processes.
- Developing capacities to apply knowledge in the larger field of natural resource management.
- Including courses on environmental management ethics.

- Implementing institutional reforms needed to develop environmental educational programs.
- Enhancing the quality of teaching (e.g. by developing staff exchange programs).
- Strengthening linkages between research, education and development.

5. MINISTRIES, AGENCIES & OTHER INSTITUTIONS MANAGING CHEMICALS

5.1 Independent Agencies

Environmental Protection Agency (EPA)

The EPA Act of 2003 established the EPA as an autonomous body under the Executive Branch of Government with the principal authority in Liberia for management of the environment, although it did not become functional until late in 2006. It is charged with implementing the Environment Protection and Management Law. EPA serves as the principal authority for managing environmental quality, and it is directed to coordinate all activities relating to environmental protection and the sustainable use of natural resources. It also promotes environmental awareness and oversees the implementation of Multi-lateral Environment Agreements (MEAs), including chemicals management related MEAs. The focal points of the Stockholm Convention on Persistent Organic Pollutants (POPs), the Strategic Approach to International Chemicals Management (SAICM), the Montreal Protocol on Substances that deplete the Ozone Layer, and the Basel Convention on the control of the trans-boundary movement of Hazardous Wastes and their disposal are all located in EPA's "MEA department" (for an overview of the Conventions to which Liberia is a signatory, please refer to table 7, Chapter 7). Due to the cross-cutting nature of environmental management, the EPA Act defines the powers of EPA as coordinating, monitoring, supervising and consulting with relevant stakeholders on all activities in the protection of the environment and sustainable use of natural resources. EPA also hosts an EIA department, which is in charge of reviewing and approving the EIA and EMPs of private entities expecting to start their operation in Liberia.

Forestry Development Authority (FDA)

The FDA is responsible to sustainably manage the forests and its related resources. The agency provides long and medium-range planning in the forest sector as well as preparing forestry policy, law and administration; supervises forest legislations and concession agreements; calculates and determines forestry fees; evaluates investment proposals; executes reforestation and forest research and training, monitors activities of timber companies, executes protected area programs and administers wildlife and national parks.

LISGIS

The Liberia institute of Statistics and Geo-Information Services (LISGIS) became an autonomous agency of Government by an Act of the NTLA on July 22, 2004, and was subsequently signed into Law by former Chairman Charles Gyude Bryant. LISGIS is responsible for compilation, analysis, publication and dissemination of all data from individuals, establishments and Geo-spatial Information in the country.

5.2 Ministries

Ministry of Agriculture (MOA)

The Ministry of Agriculture—established in 1910—plans, administers, and supervises agricultural programs and provides extension services. It also trains local farmers in improved agricultural practices and provides farm inputs to increase food security. The Ministry conducts inspections and enforces rules and regulations governing the agriculture sector. The Ministry also implements agricultural programs, protects farmers' interests, encourages investment in the agricultural sector, and monitors overall

activities including the movement of agricultural commodities into and out of the country. It focuses on trans-boundary commodity movements that are intended for the consumption of the public, or use on farms, large plantations and the agribusiness sector in Liberia in collaboration with neighboring countries such as Sierra Leone, Guinea, Ivory Coast and other countries in the region. The Ministry also regulates the harvesting of botanical species by herbalists and other farmers as a part of shifting cultivation practices.

The Department of Technical Services works in food security, crops and animal production, and agrochemical sectors, as well as international trade in these commodities. Its mandate is to protect or prevent the introduction of insect pests and animal diseases and monitor activities with an ecological impact, including in the areas of agriculture, land use and human settlement, site selection, domestic energy use, use of fuel wood, deforestation, and sustainable ecological livelihoods. The National Quarantine and Environmental Services Bureau within the Department is responsible for regulating the importation and use of agricultural chemicals, including fertilizers and pesticides. It issues permits for the importation of agricultural chemicals and implements international conventions governing pesticides and chemicals. Unfortunately, it has no scientific testing facility and limited capacity to conduct field monitoring of agricultural chemical use.

Bureau of National Fisheries The institutional framework for the management of fisheries and aquaculture is within the purview of the Ministry of Agriculture (MOA) through the Bureau of National Fisheries (BNF). The BNF was created by an Act of the National Legislature under the Natural Resources Laws of 1956 and charged with the responsibility of managing and developing fisheries and aquaculture in Liberia. The role of the BNF is to implement fisheries policy; formulate guidelines, rules and regulations to govern national fisheries and aquaculture for its planning, development and management.

Ministry of Land, Mines and Energy (MLME)

The Ministry of Lands, Mines, and Energy – established in 1972 – is responsible for developing Liberia‘s mineral, water, and energy resources. It coordinates and regulates all mining activities, including iron, gold and diamonds and is responsible for issuing mining licenses. The Ministry is responsible for administering and regulating public and private lands. This includes land tenure, land policy, land reform, land use, planning and all other aspects of land administration. Prior to the civil crisis, the National Energy Committee, housed in the Ministry, administered the energy sector. Currently, the energy sector is administered by the Department of Energy, which consists of the Bureau of Hydrocarbons and the Bureau of Energy Technology and Policy Development.

Liberian Hydrological Services formerly housed at the Ministry of Public Works is now located in the Ministry of Lands, Mines, and Energy, under the direction of the Assistant Minister for Mineral Exploration and Environmental Research. Its mandate is to serve as a research organization in water management, environmental management and air quality. The Division is charged with conducting hydrometric measurements and publishing hydrological data for Liberia (i.e., the flow and concentration of water within a given area and how it affects species within that area). It provides technical support to other agencies, giving advice on the design and location of water works and the availability of water for hydropower development. It served as the focal point for the development of the National Integrated Water Resources Management Policy.

Ministry of Planning and Economic Affairs (MPEA)

The Ministry of Planning and Economic Affairs leads the process for the country's developing planning, including the development of the country's Poverty Reduction Strategy I (2007 – 2012) and the Poverty Reduction Strategy II (2013 – 2017) "Agenda for Transformation & Action - ATA", all within the framework of ""*Liberia Rising 2030*". The Ministry serves as a direct link among Liberian government institutions, private and non-profit organizations, and international organizations. It is responsible for providing guidance to government institutions in preparing development programs and projects; reviewing proposals for new development programs and projects; and reviewing progress made on development programs and projects. It also certifies all qualifying NGOs. The Division of Environmental Planning's mandate is to assist all institutions involved with the protection of the environment by helping to ensure that all national policies and guidelines concerning environment, natural resources and biodiversity remain within national boundaries. It also helps collect and analyze biodiversity data, especially those collected by EPA. For this particular project, MPEA functioned as the chair of the project board (for an overview of project board members, please refer to Annex B).

Bureau of Maritime Affairs

This agency is in charge of Liberia's maritime program, with much of its work directed at the ship registry. The agency also is responsible for handling issues related to pollution at sea, including oil spills and chemical discharges at sea from vessels or resulting from oil and gas exploration.

Ministry of Health and Social Welfare (MHSW)

The Ministry of Health and Social Welfare coordinates and administers all general health services in Liberia, including preventive services; collects health statistics; ensures drug availability; and monitors events and conditions affecting public health. It also maintains statistics from birth and death registrations. Through its Division of Environmental and Occupational Health, the Ministry has the mandate to assess the "environmental health of the population" and to regulate and monitor environmental impacts resulting from pollution of air, water, food/feed, and soil, all categories of wastes, sewage, occupational health and chemical safety. The Division had a water quality laboratory prior to the war, but it does not exist anymore. The Ministry is also the designated national authority and focal point for the Rotterdam Convention on the Prior Informed Consent Procedure (PIC) for certain hazardous Chemicals and Pesticides in international trade.

Ministry of Public Works (MPW)

The Ministry of Public Works is responsible for the installation of infrastructure required for waste management delivery services, including solid waste collection and disposal and storm sewers.

Ministry of Commerce (MoC)

The Ministry of Commerce and Industry was established by an Act of Legislature in 1987. The Ministry was originally established in 1948 as the Department of Agriculture and Commerce. On June 1, 1962 it became the Department of Commerce and Industry. On December 31, 1971 the name was changed to Ministry of Commerce, Industry and Transportation. An Act detaching the Bureau of Transport from the Ministry of Commerce, Trade and Transportation, resulted in the current Ministry of Commerce and Industry.

5.3 Corporations, Companies and Boards

Liberia Water and Sewer Corporation

The Liberia Water and Sewer Corporation oversees the generation and distribution of water to the public and maintaining a supply of safe drinking water. It is also responsible for providing for wastewater collection and disposal and as such constructed and maintained sewers and wastewater treatment facilities prior to the civil disturbance. At the time of the USAID ETOA Report (2008) no sewers or wastewater treatment facilities were functional in Liberia.

Municipalities

The Public Health Law of 1975 granted municipalities the responsibility of ensuring clean and sanitary environmental conditions on the territory under their respective jurisdictions. They are thus responsible for sanitation activities including wastewater collection and disposal and the cleaning, collection and disposal of generated solid waste.

Monrovia City Corporation

The Monrovia City Corporation was first created as Commonwealth District in 1833. A legislative Act of 1973 abolished the Commonwealth District and created the Monrovia City Corporation, giving it all municipal rights including the management of municipal waste, and the provision of environmental health and sanitation.

Liberia Electricity Corporation

The Liberia Electricity Corporation was created in 1973 to generate, transmit, distribute, and sell electricity throughout the country at reasonable rates. In July 2006, electricity was restored to parts of Monrovia for the first time in fifteen years.

Bureau of Inspection, Valuation, Assessment and Control (BIFAC)

The responsibility to inspect and control the standard of imported good and assess their true value has been assigned to BIVAC, which is a private entity (French). It is mandated to perform inspections of all "ready for shipment" goods value at/or above US$ 3,500 at various points around the world that are destined for entry into Liberia. BIVAC assesses the value of the goods and submit a bill. Customs then submits a total bill inclusive of all duty and port charges, which must be paid in full at the Ministry of Finance in order to obtain a flag receipt if the goods will be cleared from the port.

6. TECHNICAL INFRASTRUCTURE & CAPACITY

6.1 Waste Management

During the years of conflict, Liberia's infrastructure was nearly completely destroyed and public services ceased to operate, including piped water, drainage, wastewater and solid waste management systems. As a result, residents in urban areas are exposed to contaminated drinking water and untreated wastes. During the rainy season, the lack of adequate drainage also results in ponds of stagnant water in urban areas. These conditions contribute to two of the primary causes of mortality and morbidity in Liberia, malaria and diarrhea (USAID, 2008).

Municipal waste disposal (UPOPs)

Prior to the conflict, solid waste management systems existed in Monrovia and in some other urban areas such as Buchanan, Gbarnga, Greenville, Harper, Kakata and Robertsport. Today, none of these systems are fully functional, and only Monrovia has begun the reinstallation of a collection and disposal system. As a result, solid waste and its associated vectors (rodents and flies) collect in public areas, abandoned buildings, drainages, and on beaches, where it may be burned or sporadically hauled away by municipalities. These methods of disposal present risks to the environment and human health, through air pollution, potential contamination of surface and ground water, as well as direct exposure to disease vectors and toxic substances (USAID, 2008).

Prior to the war, domestic and commercial solid waste in central Monrovia was collected and hauled for disposal by the Monrovia City Corporation in cooperation with a private service provider named "Betty Garbage System". It was reported that prior to 1990, municipal solid waste was collected from 85 per cent of the city (USAID, 2008).

During the civil conflict many displaced people – having very limited land space to carry out business activities – established landfills in Mesurado and Marshall Mangrove wetlands, causing large areas of mangroves to be destroyed (and to be used as dumps or for sewage disposal). The process continues today; Liberia's burgeoning post conflict economy and increased population have overwhelmed the original planned land area for Monrovia and other beach cities. Urban expansion and accompanying landfills, in particular Monrovia, is currently the biggest threat to Liberia's mangroves (USAID, 2008).

However, a partial waste management system began operating in Monrovia. With assistance from the World Bank, the Monrovia City Corporation (MCC) began to provide waste bins, collect waste, and dispose of it in a dump. Initially, the officially designated waste dump was on the edge of a swamp located at Fiamah, a residential area, about 4 km from the city center. It was not an ideal site, in that it is was open dump, not an engineered landfill, and it was located on the edge of a wetland (although drainage structures were been built to direct off-site runoff around the dump site) (USAID, 2008).

In June 2008, the Fiamah dump was closed and the MCC began to use a landfill as the disposal site, located in an agricultural area in Weintown, several kilometers away from municipal Monrovia. This is the first landfill to be constructed in Liberia. It is still regarded as an interim solution, as it is not a fully engineered landfill (lacking a leachate collection and treatment system), but it is a move in the right direction. A fully engineered landfill has been proposed, and should be developed during the next two to three years (USAIDS, 2008).

The MCC is operating the system with its own equipment as well as a subcontract with two private contractors. To date MCC is still incapable of collecting all of the garbage generated in Monrovia (estimated at 221,000 kilograms/day), but it is working towards that goal. The MCC, with World Bank financial assistance, has also made a concerted effort to remove waste accumulations in the city and various international donors have initiated programs related to solid waste management in Liberia (see box 3).

Box 3: Solid Waste Management Programmes in Liberia

DFID/UNICEF: The first significant contribution after the conflict dates back to 2003-2004 when UNICEF, with a DFID contribution, undertook a comprehensive review of the waste management sector and produced an improved strategy and recommendations for a "*Waste Management Plan for Monrovia*". This study also covered a technical review of ten possible sites for selecting a new landfill facility site for Monrovia, and recommended the upgrading of Fiamah disposal site, seen as a temporary solution, until the engineering and construction of a new proper landfill site could be finalized.

ILO/MoL/MCC: ILO in partnership with the Ministry of Labor and MCC, has implemented a two-component project that comprises:

- The Liberian Emergency Employment Programme, which was an 18-month program aimed at maximizing local employment for the short-term cleanup of markets within Monrovia.
- The Liberian Employment Action Plan focusing on empowering community-based organizations in order to enhance the sustainability of the previously mentioned cleanup activities. This project ran for an approximate 2.5 years. Activities included moving waste from households to collection points and discouraging the dumping of waste into drainage channels and rivers.

WB/UNDP/MCC: In October 2006, the World Bank approved a grant (within the Emergency Infrastructure Supplemental Component—EIPSC project) for US$ 16.5 million to address the most urgent infrastructure rehabilitation needs, including solid waste management. The solid waste component of the project has three facets:

- Cleanup of solid waste accumulations
- Design and implementation of a basic solid waste collection system
- Upgrade and management of the existing disposal site at Fiamah

All of these activities are being executed by UNDP, and an independent engineering firm, Poyry, is providing on-the-ground construction and delivery of services supervision. The Monrovia City Corporation (MCC) is the agency in charge of solid waste activities. The World Bank project has recently been expanded, so that now it is funding the development of an interim landfill to replace the Fiamah dump.

JICA/MCC: JICA started the implementation of a programme to assist the MCC in the preparation of a city plan, including planning for the rehabilitation of the water and wastewater systems.

Health Care Waste Management

The disposal of hospital waste represents another potential source of environmental degradation as well as a risk to human health. There is no inventory of medical facilities and their waste disposal practices (USAID, 2008). Overall, it can be assumed that limited to no segregation of hospital waste is taking place at facility level and that in the majority of the cases, hospital waste is disposed of along with regular municipal waste and either is burned in the open or disposed of in open dumps. Inappropriate handling and treatment of (infectious) Healthcare Care Waste (HCW) is a serious threat to human health and can result in the spread of disease, in particular Hepatitis B and C as well as HIV. In addition, the inappropriate disposal of HCW results in water and soil pollution due to leachate from open dumps as well as air, soil and water pollution if the waste is burned in the open and dioxins and furans are being released.

It is known that some facilities in Monrovia are making an effort to effectively treat and dispose of hospital waste. For instance, the St. Joseph's Catholic Hospital has a modern incinerator to deal with medical waste and the Redemption Hospital, operated by Médecins sans Frontières of Belgium, has a functioning incinerator for burning the combustible waste fraction and two separate aboveground filter-bed tanks used for placenta and bottles disposal, respectively. At the John F. Kennedy Hospital, however, the medical waste incinerator has not worked for many years, so medical and domestic wastes are disposed of in the compound and burnt periodically in the open. Medicals wastes from the Monrovia Hospital are also thought to cause pollution in the wetlands surrounding Monrovia (USAID, 2008).

At the time the NIP (2006) was developed, incineration of medical waste in small and poorly controlled incinerators was identified in 6 places. Kiln incinerators (see picture on cover), are semi-continuous (batch-type), uncontrolled, poorly built systems, without any air pollution control. Such incinerators are a major source of dioxins and furans (Unintentional Persistent Organic Pollutants – UPOPs) and typically generate 40,000 µg TEQ/t to air and 200 µg TEQ/t to residues. It was assumed that at the time of writing of this report that most if not all of these kiln incinerators are no longer operational. Assuming that either healthcare from these facilities is either burned in the open, or disposed of along with municipal waste.

Hazardous and Toxic Waste Disposal

Pre-treatment of most forms of wastes is non-existent for Liberian industries, especially the mining, agriculture and forestry sector. Engineered landfills permitted to accept hazardous waste have never been constructed within the country.

According to USAID (2008) potential risks from hazardous and industrial solid wastes are presumed to be minimal in Monrovia City given the low level of activity in these sectors. The number of companies operating in Monrovia dropped from 850 in the mid-1980s to 350 in 1990. Current numbers are unknown. Facilities are mostly located in and around Monrovia and are mainly restricted to textile/clothing, furniture, brewing, and non-metallic mineral products. However, some toxic wastes are likely to be produced in workshops and garages and co-disposed with domestic waste (USAID, 2008).

Hazardous and toxic wastes that are of most concern are generated by the mining, forestry and agricultural sector. Considering there are no suitable storage and landfill waste disposal solutions in the

rural areas where the majority of companies operating in these sectors are located, this poses serious threats.

However, when companies are part of international consortia or chains, they might have to adhere to corporate- guidelines and standards with respect to (hazardous) waste disposal, which often leads them to implement their own international standards as approved in the EMPs. For example, Firestone indicated that is started the construction of a sanitary landfill, as well as development of an internal waste management plan, in order to improve its waste management practices.

However, acidic mine drainage and heavy metal pollution (from disposal and leaching of mine tailings), remains a major concern. So is the inappropriate storage/disposal for hazardous and toxic chemical products used in the mining, agricultural and forestry sector, considering that, with a few exceptions there, there are no solutions for hazardous/toxic waste disposal (e.g. petrochemicals, obsolete agro-chemicals products and their containers, including POPs pesticides and PCBs).

Contaminated Site Remediation (POPs)

The NIP (2006) estimated that there are approximately as many contaminated sites as there are communities. However, the primary ones, especially those suspected of containing and emitting POPs, are approximately 150. Unfortunately, dedicated or specialized facilities, such as biological soil treatment, transportable treatment technology and specialized thermal, physical or chemical soil decontamination, are not available in Liberia.

To date, no remediation of any contaminated site has taken place. Certain sites, assumed to be POPs "hot spots", are presently being used for domestic purposes. For example, former substations of the Liberia Electricity Corporation (LEC) are being used as living quarters by displaced people posing serious threats to their health. Finally, as previously indicated, most PCB containing transformers/capacitors have been sold for their scrap metal value and PCB containing oils have been disposed into the environment.

6.1.1 Potential Environment and Health Implications from Unsound Waste Management Practices

Human health effects from the unsound management of wastes are numerous and significant. The main causes of death in Liberia are directly linked to the management of wastes and waste-water (malaria and diarrhea). Efforts to improve the sound management of wastes (chemicals, healthcare, municipal, etc.) will make a significant impact to the improvement of human health.

The unsound management of wastes can result in exposure to human health and ill health as a result of (among else):

- Drinking water contamination, resulting from inappropriate disposal/dumping of agricultural, municipal, healthcare (infectious, pharmaceutical, Mercury) and industrial wastes in waterways; as well as leachate from open dumps and inappropriate landfills and leaching of tailings.
- Air pollution, originating from the burning of wastes (in open air or using low-tech incinerators) which cause emissions of dioxins and furans (UPOPs).
- Soil pollution, which in particular exposes communities living close to POPs contaminated sites; open dumps and landfills, industrial and mining operations.

- Occupational exposure, in particular people dealing with and handling wastes on a daily basis (healthcare staff, waste-collectors and recyclers, waste pickers, etc).

From an environmental perspective, impacts of the unsound management of wastes and chemicals results in:

- Water- (ground and surface) and soil pollution, as a result of:
  - Leakage and inappropriate disposal and storage of oil and gas products (e.g. gasoline, diesel for transportation and electricity generation, oil products for vehicle and fleet maintenance).
  - Non-availability of suitable storage/disposal sites for (obsolete) agro/forestry chemical products and their containers (resulting in spills and leakages).
  - Unsafe storage/disposal of PCB-containing transformers and PCB containing oils on LEC and mining sites.
  - Degradation of water and soil resources due to settlement patterns of populations (e.g. use of mangrove forest for waste dumping in Monrovia as well as inappropriate waste disposal practices by populations moving to concession area for job opportunities.

- Air pollution, as a result of:
  - The burning of wastes (in open air or using low-tech incinerators) which cause emissions of dioxins and furans (UPOPs).
  - Emissions from contaminated sites and dumping grounds.

6.2 Analytical & Monitoring Capacity

6.2.1 Government Laboratories

Management of the environment and implementation of the requirements in EIAs, EMPs, and other environmental quality programs is largely dependent upon being able to produce and analyze environmental quality data. Liberia currently lacks a monitoring system necessary for providing good quality information that can be used for decision-making and planning. Designing and setting up of a national environmental monitoring system will require considerable time, effort, and resource investment.

Absence of baselines for most environmental indicators, the absence of monitoring stations or field equipment, poorly equipped and staffed laboratories, combined with the lack of effective collaboration mechanisms between monitoring jurisdictions makes the development of an environmental monitoring system extremely challenging.

EPA

EPA is required by law (EPML section 34, see Chapter 7) to set up an environmental monitoring system and also to designate reference laboratories for environmental analyses (EPML section 96). It also is supposed to receive data from projects and activities that have EIAs. EPA has established a laboratory, but it is only capable of doing basic water quality analyses.

Establishing a "benchmark" laboratory in EPA and a program to certify private laboratories is necessary if valid environmental quality data is to be generated. EPA has begun the process of establishing an

environmental laboratory, but it is far from having a high-quality, benchmark laboratory that will allow it to certify private laboratories for analysis of various environmental media (e.g., water, air, waste, and soil). In order to do so EPA will need physical support as well as support in the development of the capabilities of its personnel.

Ministry of Health and Social Welfare

Through its Division of Environmental and Occupational Health, the Ministry has the mandate to assess "the environmental health of the population" and to regulate and monitor environmental impacts resulting from pollution of air, water, food/feed, soil, all categories of wastes, sewage, occupational health and chemical safety. The Division had a water quality laboratory prior to the war, but it does not exist anymore.

University Laboratories

The University of Liberia, in particular its chemistry department, does have a basic laboratory. However it's capacity is only for teaching purposes. Infrastructure for research and environmental monitoring is not available. Chemicals and biological substances available in the university laboratory (see Annex A) are rudimentary materials necessary for simple syntheses and analytical procedures that are undertaken in educational facilities.

Private Sector Laboratories

Private sector entities, such as BIFAC, Total, Firestone, Cemenco, etc, do have laboratories set-up within their structures, which are well equipped but for the sole purpose of conducting quality control. BIFAC also disposes of a laboratory for petrochemical analysis.

7. INSTITUTIONAL, POLICY AND REGULATORY FRAMEWORKS (USAID, 2008)

Liberia has five existing or draft policies and several international commitments which impact environment, natural resources and ecosystems management and conservation.

In 1999 the Government of Liberia established the National Environmental Commission of Liberia (NECOLIB). One of NECOLIB's immediate mandates was to formulate a national environmental policy and draft a national environmental law. With assistance from UNDP, NECOLIB prepared and submitted to the legislature three legislative instruments:

- The National Environmental Policy (NEP) of Liberia
- The Environmental Protection Agency Act
- The Environment Protection and Management Law (EPML)

All three were approved by the Liberian National Assembly on November 26, 2002 and went into effect when they were officially published on April 30, 2003. The National Environmental Policy (NEP) provides the policy objectives for environmental protection in Liberia. The other two pieces of legislation are tiered off of the NEP, with the Environmental Protection Agency Act (EPA Act) providing the institutional framework and the Environment Protection and Management Law (EPML) providing the legal framework to implement the policy objectives (USAID, 2008).

7.1 National Environmental Policy

The National Environmental Policy (NEP) sets the policy framework for environmental management in Liberia. The policy goal of NEP is to ensure long-term economic prosperity of Liberia through sustainable social and economic development, which enhances environmental quality and resource productivity on a long-term basis that meets the requirements of the present generation without endangering the potential of future generations to meet their own needs. Specifically, the NEP states that the Government of Liberia will:

- Commit itself to the sound scientific and sustainable use of natural resources
- Create environment awareness among all sections of the community
- Develop procedures for the utilization of land resources so as to ensure the maximum degree of economic value
- Require prior environmental impact assessments for all investments that may impact the environment
- Institute appropriate measures to control pollution and the importation and use of potentially toxic chemicals
- Take appropriate measures to protect critical ecosystems against harmful effects, or destructive practices
- Develop and maintain a professional agency to supervise, coordinate, implement and enforce procedures and legislation essential for safeguarding the environment
- Oblige all concerned to provide the relevant information needed for environmental protection and for the enforcement of environmental regulations and legislation
- Promote and support environmental research programs
- Establish an adequate legislative and institutional framework for monitoring, coordinating and enforcing environmental programs and issues.

The NEP states that these commitments will be accomplished by the harmonization and enforcement of Environmental Protection and Management Law (EPML). It also directs all ministries and agencies of the Government to review their statutory authority, administrative regulations and current policies and procedures and correct any deficiencies or inconsistencies with the policy. The policy specifically calls for the creation of the Environmental Protection Agency (EPA) as an independent authority for the management of the environment. It also calls for the adoption of the Environmental Protection and Management Law as a tool for implementation of the NEP, and states that the law should provide for:

- Improved access to information on the environment:
- Harmonization of the appropriate legal instruments
- Monitoring and evaluating the impact of policy decisions on the environment
- Improvement of the scientific base of environmental decisions through appropriate research programs
- Assessment of potential impacts of public and private projects on the environment, and environmental mainstreaming into the national planning process
- Establishment and implementation of appropriate standards and guidelines so as to ensure an acceptable level of public health and environmental protection.

The bulk of the NEP (Sections 3.0 through 6.1 encompassing 24 pages of the 38 page document) contains recommendations for incorporating environmental concerns into various facets of development ranging from development of human settlements to the involvement of youth and women in environmental protection. This section of the NEP, however, contains only recommendations for actions in each of these areas. As such, it is not binding on any institution or activity.

Among the recommendations for action, there are a number that have a bearing on the sound management of chemicals, these are:

- Occupational Health and Safety
- Environmental Impact Assessment (EIA)
- Environmental Information
- Energy Production and Use
- Toxic and Hazardous Substances
- Agricultural/Forestry Chemicals
- Waste Management & Sanitation
- Mining and Mineral Resources
- Noise and Air Pollution
- Capacity Building and Technology Transfer
- Public Education & Awareness

7.2 The Environmental Protection Agency Act of 2003 (EPA Act)

The Environmental Protection Agency Act of 2003 (EPA Act) authorized the establishment of an overall institutional framework for sustainable management of the environment in Liberia, including creation of:

- National Environmental Policy Council
- Environmental Protection Agency (established)
- Board of Directors (established)
- Executive Director (established)

- Environmental Units in Line Ministries (at the time of the writing of this National Situation Report about 18 EUs had been established)
- Decentralized Environmental Committees
- County Environment Committees (not yet established)
- District Environment Committees (not yet established)
- Environmental Courts (not yet established)
- Environmental Inspectors
- Environmental Administrative Court (not yet established)
- Environmental Court of Appeals (not yet established)
- Environmental Funds (not yet established)
- National Environmental Fund (not yet established)
- Trust Fund (not yet established)

Environmental Protection Agency

The EPA Act establishes EPA as "*the principal authority in Liberia for the management of the environment*." The EPA is an autonomous body under the Executive Branch of Government overseen by a nine-member Board of Directors appointed by the President from specific government agencies and the private sector. To assist it in its oversight responsibilities and advise the EPA, the Board of Directors is authorized to establish Technical Committees.

The EPA is empowered to:

- Work with Line Ministries to implement environmental policy, including recommending necessary changes in sectoral laws and regulations; establish sectoral specific criteria, guidelines, specifications and standards for environmental management; and build their capacity for environmental management;
- Establish and implement an environmental impact assessment program;
- Collect and analyze data and undertake research necessary to develop indicators for environmental changes and prepare and disseminate state of the environment reports and national environmental action plans;
- Promote public awareness of environmental issues and public participation in decision making;
- Investigate reports of pollution and other related matters;
- Initiate and co-ordinate actions required in a state of environmental emergency or any other situation which may pose serious threat to the environment and public health; and
- Function as the national clearinghouse for all activities relating to regional and international environmental conventions, treaties and agreements, and donor-sponsored environmental projects.

7.3 The Environment Protection and Management Law (EPML) (USAID, 2008)

The Environmental Protection and Management Law (EPML) forms the legal framework for the sustainable development, management and protection of the environment by the Environmental Protection Agency in partnership with relevant ministries, autonomous agencies and organizations. The Law stresses intersectoral coordination and authorizes EPA, in consultation with the relevant Line Ministries, agencies and/or authorities, to promulgate several procedures, measures, guidelines, plans, registries, criteria, licenses/permits, standards and regulations to protect the environment.

*Part I: P*resents the title and short title of the Law as well at the definitions of terms used in the Law.

*Part II: C*ontains the general principles and objectives under which the EPML is to be administered.

These include:

- The principle of sustainable development
- The pre-cautionary principle
- The polluter-pays principle
- The principle of inter-generational equity
- The principle of public participation
- The principle of international cooperation in the management of environmental resources shared by two or more states

In addition to these basic principles, the EPML directs that the Law be implemented so as to:

- Facilitate the restoration, protection, and conservation of biological diversity
- Ensure respect, preservation, promotion and management of historic, cultural and spiritual resources
- Comply with international environmental treaties that Liberia has ratified
- Enable and encourage environmental education and awareness

Part II also contains Section 5, which grants the right to a clean and healthy environment to the people of Liberia and establishes legal procedures for securing those rights.

Part III: Contains detailed procedures for the implementation of an Environmental Impact Assessment (EIA) program for Liberia. This Part, along with Annex I that pertains to Part III, takes up a full one quarter of the text of the Law and provides enough detail and specific legislative language for EPA to implementation of an EIA program with minimal subsequent development of procedures.

The proposed EIA process (UNDP, 2012)[15]:

- Provides for a transparent participatory approach that allows all stakeholders to have input into and be informed of all decisions that will lead to activities that are likely to have a negative effect on their health and communities
- Is intended to provide a balance between environmental, economic, social and cultural values for sustainable development of the country
- Requires an assessment of the impact of projects, activities and policies and plans likely to lead to projects and activities that will or are likely to degrade the environment. See Annex I for matters requiring an EIA
- Identify the anticipated impacts of a proposed policy, project or activity--both adverse and beneficial impacts, and predict the extent and scale of the impact
- Determine whether the adverse impacts can be mitigated
- Recommend preventive and/or mitigation measures including alternatives
- Identify a monitoring and evaluation plan
- Recommends whether or not the proposed policy or project should be implemented or modified.

Part IV: Concerns the establishment of environmental quality standards. The Law requires EPA, in

[15] http://mirror.undp.org/liberia/protect.htm

consultation with relevant Line Ministries, to establish a national environmental quality monitoring system. It also requires that the EPA work with relevant Line Ministries to establish environmental quality standards and/or guidelines for:

- Water Quality
    - Ambient Standards
    - Use Standards
    - Effluent Standards
- Air Quality
    - Ambient Standards
    - Occupational Standards
    - Emissions Standards
- Hazardous Wastes and Materials
    - Classification System
    - Guidelines for Handling, Storage, Transport, and Disposal
- Solid Waste Management Guidelines
- Soil Quality
    - Standards
    - Management Guidelines
- Noise and Vibration Standards and Guidelines
- Ionization and other Radiation Standards
- Noxious Odors Standards
- Other Environmental Standards for:
    - Labor and Work Places
    - Industrial Products
    - Materials Used in Industry, Agriculture and for Domestic Uses;
    - Consumer Products
- Guidelines for Environmental Disasters

In addition to requiring the promulgation of standards and guidelines, many of these sections also include provisions for implementing a management or regulatory program for implementing those standards or guidelines.

Part V: Covers pollution control and licensing. This part, in conjunction with many of the requirements in Part IV, provides for the development of programs to manage:

- Pesticides
- Toxic and Hazardous Materials
- Leaded Gasoline and Paint
- Hazardous Waste
- Wastewater Effluents
- Solid Waste Management
- Air Pollution

Parts VI and VII: Authorize programs to manage natural resources and biodiversity. These parts include requirements for the establishment of programs to protect and sustainably manage rivers, lakes, wetlands, coastal zones, marine environments, forests, natural heritage sites wildlife, and genetic resources. Also included in these parts are programs for land use planning, energy management, and *protection of the ozone layer*.

All of the programs identified in these parts require consultation with the relevant Line Ministry. However, the wording is always that the "*Agency shall promulgate*", leaving some confusion as to who should take the lead for some activities such as management of forests and protected areas and *pesticide management* where other government agencies (the FDA and the Ministry of Agriculture respectively) have been given responsibility by their authorizing laws.

Parts VIII, IX and XII : Deal with enforcement of the requirements of the EPML, including Restoration Orders, the roles and responsibilities of Environmental Inspectors and offences of the requirements of the EPML. Part IX also includes requirements for the designation of analytical and reference laboratories to conduct the analyses necessary for enforcement of the Law.

The remaining parts of the EPML deal with international and regional environmental treaties, conventions, and agreements (Part X), environmental education and awareness (Part XI), and miscellaneous provisions (Part XII). One of the miscellaneous provisions charges EPA to recommend to the legislature regulations that are "*required or permitted*" by the EPML. This provision is somewhat confusing, in that Law repeatedly states that EPA shall promulgate regulations, guidelines, procedures, measures, standards and licenses.

Generally, in Liberia, regulations are initiated by a technical Line Ministry or agency and Ministers or Heads of agencies can sign regulations into law. UNEP's 2007 review of Liberia's environmental policies, acts and laws concluded that: "*It is not clear whether these references to the Legislature in the context of subordinate legislation are erroneous, although it appears they may be. If they are, legislative amendment will be required. However, it is the view of UNEP-PCDMB that references to the Legislature as subordinate law-maker do not preclude the EPA from having subordinate law-making powers under the EPA Act and EPM Law is supported. The view is bolstered by precedent and accepted practice in Liberia, and by the evidence of the drafters' intention in specific and mandatory regulation-making obligations imposed on the EPA in relation to certain sectoral areas under the EPM Law*".

7.4 International Chemicals-Related Multilateral Environmental Agreements (MEAs)

Liberia is signatory to a number of international conventions and treaties. These Multilateral Environmental Agreements related to the Sound Management of Chemicals are presented in Table 7 below:

Table 7: Chemicals Related MEAs to which Liberia has become a party.

Name of Treaty	Adoption Date	Ratification Date	Objectives
The Vienna Convention on Protection of Ozone Layer and Montreal Protocol on Substances that Deplete the Ozone Layer		January 15, 1996	1. Protect human health and the environment against adverse effects resulting from modifications of the ozone layer from anthropogenic emissions of substances proved scientifically to have high ozone depleting potential
The Basel Convention on the Control of Transboundary Movements of	Entered into force May 5,	September 22, 2004	1. To reduce trans- boundary movements of hazardous and other wastes to a minimum consistent to their environmentally sound management

Hazardous Wastes and their Disposal	1992		2. To treat hazardous wastes and other wastes 3. To minimize the generation of hazardous wastes
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	Acceded August 20, 2002		
Bamako Convention on the ban of the import into Africa and the control of trans- boundary movements of hazardous wastes within Africa (Bamako convention)	January 30, 1991	September 16, 2005	1. To protect by strict control the human health of African population against adverse effects which may result from hazardous waste by reducing their generation to a minimum in terms of quantity and or hazard potential 2. To adopt precautionary measures ensure proper disposal of hazardous waste and to prevent dumping of hazardous wastes in Africa.
Stockholm Convention on Persistent Organic Pollutants (POPs)	Acceded January 16, 2002		1. To strengthen National Capacity and to enhance knowledge and understanding Amongst decision makers, managers, industry and the public at large on POPs 2. To develop a National implementation Plan (NIP) to manage the elimination of POPs.
Strategic Approach to International Chemicals Management (SAICM)		2006	1. Achievement of the sound management of chemicals throughout their life cycle so that, by 2020, chemicals are produced and used in ways that minimize significant adverse impacts on human health and the environment.

Of the Chemicals Related MEAs listed in the table above, Liberia's compliance and efforts related to its international commitments in the area of chemicals management have been most significant under the Montreal Protocol. The EPA and the Ministry of Commerce and Industry has been collaborating to meeting Liberia's obligation to the protocol since 2006, two years after the country's program was established at the EPA to oversee all activities in Liberia related to the protection of the ozone layer.

The Ministry of Commerce and Industry and the EPA, have signed a Memorandum of Understanding (MoU) aimed at strengthening the implementation of international conventions on banned substances and hazardous chemical to ensure effective and successful control mechanism for not only import or export of products but also the control of banned substances and hazardous chemicals which include ozone depleting substances (ODS).

In line with this MoU and the Montreal Protocol, the EPA and the Ministry of Commerce have established a licensing system that requires all importers to obtain a permit from the EPA as a pre-requisite for approval of the import permit declaration (IPD) for the import of all refrigeration products

and equipment that use ODS. The joint efforts were successful in completing the phase out of CFCs in accordance with the 2010 deadline set by the Montreal Protocol.

In support of the Stockholm Convention on Persistent Organic Pollutants, an importation ban on POPs pesticides (the initial nine) has been in place since 2000, while the importation of PCBs was already banned in 1996. According to the NIP (EPA, 2006) the legislation at the time did not specifically address POPs, except for placing a ban on their importation. No regulatory control mechanisms for POPs were in place, such as legislation pertaining to the monitoring, handling, storage and disposal of POPs substances and their wastes.

There seem to be no standards in place for reporting to chemicals-related conventions (an exception being the Montreal Protocol), enforcement practices or the monitoring of pollutants. Although the Environmental Protection Agency (EPA) is aware of the challenges posed by hazardous and toxic chemicals covered under these convention, there seems to be limited regulation in place for enforcement.

Public Health Act & Draft Water Law

The Public Health Act contains provisions for the protection of sources of drinking water and the inspection of potential sources of pollution, but it has been limited in terms of its enforcement. The act does not address the total management aspect of water resources. In 1981, with the assistance of UNDP, the Government of Liberia, through the Liberian Hydrological services and the Ministry of Lands, Mines and Energy, prepared a draft water law. The law lays down a complete framework for water resources management in Liberia, but the law has not been enacted and by most is still considered a draft. Nevertheless, attached to the guidelines for the preparation of an Environmental Management Plan (as part of EIA procedures), are the draft water and the draft air act. Although both acts have not yet been approved or enacted, the simple fact that they have been attached to the EMP guidelines, which have been approved – does put expectations on applying project to abide by the water and air act.

Minerals and Mining Law (NMML)

Although the GOL stated in the PRS-I that it intended to harmonize the Minerals and Mining Law (NMML) Act of 2000 and the Forestry Law with respect to mining concession rights and protected zones, little progress was achieved during the PRS-I. At the time of the writing of this report, the GoL has indicated that one of the key constraints the country is facing in achieving its ambitions with respect to national mineral resources is inadequacy of the legal and regulatory framework – governing the mining sector of which the minerals and Mining Law of 2000 is a central part. Therefore, the GoL expects to draft a new mineral law, to be finalized by 2013, which will be better adapted to the global and domestic minerals industry, including the way minerals are traded.

7.5 Analysis

In general terms the above policies and legislation are more than sufficient to provide for an adequate enabling environment for the sound management of chemicals in Liberia.

In specific terms, particularly with regard to their implementation, the policy and legislative framework for protecting the environment in Liberia is overly comprehensive, complicated and detailed to facilitate implementation (USAID, 2008). It was observed that the requirements set-out within these frameworks, that would have to be instituted by EPA to implement the law, go far beyond its current human and financial capacity. Therefore, it is imperative for EPA and other institutions to prioritize the

implementation of its mandate, focusing on a few areas – related to the sound management of chemicals - in which they could maximize the protection of the environment.

While the EPML law contains many significant provisions that could be used to protect the environment and human health, its lack of implementing regulations means that these provisions remain largely inoperative. Developing such regulations would go a long way towards increasing the Law's effectiveness.

In several analyses related to the policy and regulatory framework pertaining to environmental management, it was noted that it is of particular importance for the Government of Liberia to continuously improve its EIA guidelines for conducting Environmental Impact Assessment (EIAs). While Liberia's EIA procedures are fairly comprehensive, regulations are needed to flesh out the various requirements and provide more detailed definitions of their terms.

Prior to starting operation, projects are required to conduct an Environmental Impact Assessments (EIA) through a local consultancy firm or a recognized accomplished international firm – as well as develop an Environmental Management Plan (EMP). The guidelines for the preparation of the EMP contain in their annexes the draft water and air act, implying that projects will need to adhere to these acts in order for their EMP to be approved. According to some companies (interviewed as part of the preparation of this report) once their EMPs have been approved, the EMP is – by them - regarded as "the law" and from then on they have to operated in compliance with the EMP. Inspections conducted by different state bodies/entities will verify the project's compliance. With respect to the management of chemicals, the EMP lists in detail the type of chemicals imported/used/produced as well as their management (storage, disposal, handling, etc).

However, it was also noted that even though EMPs are submitted and approved in most cases, not all entities, companies and project do actually submit their EMP in a timely manner. Secondly, it is often observed that after start-up there is little monitoring of the EMP's adequate implementation.

International entities (e.g. Firestone, Total, BHP Billiton, ArcelorMittal, to name a few) often have stringent internal auditing procedures and international Corporate Social Responsibility (CSR) targets, resulting in the fact that these companies often apply more stringent measures and rules than have been put in place through law and regulations in Liberia. In order to do so they have personnel in place that adapts best international practices related to the management of chemicals and wastes (implementing waste and oil spills management plans), although they do have to operate within the limitations and boundaries set by local infrastructure (e.g. absence of municipal and hazardous storage and disposal options).

8. INTERAGENCY COORDINATING MECHANISMS

In compiling this report, as well as pointed out during the preparation of the Draft National Chemicals Profile (UNITAR, 2010), the authors came to realize the poor communication and coordination among administrative agencies in the area of chemicals management in Liberia. Although persons or sections in various administrative agencies could be named which had considerable interests and activities related to various aspects of chemical management, it seemed very little was being done, except in the EPA, the Ministry of Agriculture and at the level of internationally owned corporations in sectors such as agriculture, mining and oil and gas exploration.

Moreover, the EPA would appear to need further strengthened links and increased communication with other administrative agencies involved in chemical management, as currently it appears chemicals management related activities and EPA implementation of projects are being carried out in "isolation" of other government institutions and relevant departments. Unfortunately, few persons in other administrative agencies were able to contribute to this National Situation Report, either because they were not actively invited to do so, did not find the time to participate in the workshops organized within the context of this project and the preparation of the NSR, or simply didn't feel the subject was of interest/priority.

Expertise and information on chemical management outside of government is covered in Chapter 5. It merely resides in industry and amongst a few academic and professional staff. Trade organizations, trade unions and non-government groups are at present not very active in these areas, and to date have been rarely involved in such endeavors (except when it involves matters related to large plantations, logging and mining).

A well organized inter-ministerial coordinating mechanism can help to increase transparency and collaboration among ministries, clarify the respective mandates and competencies of the various agencies, facilitate a sharing of information and resources (e.g. databases, equipment), and foster a comprehensive approach to the management of chemicals that addresses all stages of the chemical life cycle (UNITAR, 2001). At present, there are a few inter-agency/ministerial mechanisms in place in Liberia that have a bearing on the sound management of chemicals:

National Environmental Policy Council

The National Environmental Policy Council is responsible for formulating national environmental policy; setting environmental protection priorities, goals and objectives; and promoting inter-sectoral, private-public cooperation in the achievement of environmental policy. The 33-member council is inter-sectoral, is chaired by a Minister and composed of members from governmental institutions and private sector organizations appointed by the President. It is not very clear to the authors of the report, to what extent chemicals management considerations are taking into account when the Policy council formulates national environmental policy, and sets environmental protection priorities, goals and objectives, and if so, in which ways such issues are brought to the attention of the Policy Council.

EPA – Technical Committees

To assist it in its oversight responsibilities and advise the EPA, the Board of Directors is authorized to establish Technical Committees. The EPA Act specifically directs the Board to establish seven standing committees, each on: i) Lands and Mines; ii) Pollution; iii) Health and Sanitation; iv) Environmental

Impact Assessment; v) Biotechnology; vi) Forestry/Agriculture/Wildlife; and vii) Marine and Coastal Ecosystems. Each Technical Committees is to advise the EPA in its area of expertise. The Executive Director is required to assign an EPA staff person as Secretary to each Committee. It is unclear to the authors of the report, whether the "Chemicals Focal Points" of EPA are actively taking part in these technical committees, in particular the ones on "*Pollution*" and "*Environmental Impact Assessment*".

Project Board

Although often referred to as the "*Inter-ministerial Committee on the Sound Management of Chemicals*" the Project Board (see Annex B) that oversees the implementation of the "*UNDP/UNEP Partnership Initiative*", is more of a Steering Committee that once a year reviews project progress and approves the project's Annual Work Plan. The Ministry of Planning & Economic Affairs functions as the chair of the project board meeting during which other EPA/UNDP implemented projects are also being reviewed. As such the Project Board cannot be considered as an *Inter-ministerial Committee on the Sound Management of Chemicals* as it does not provide particular expertise/guidance related to the area of chemicals Management.

Recommendations

Chemicals management encompasses a broad range of issues, each of which may be addressed by any of a number of governmental ministries, agencies or units, as well as parties outside of government. In order to achieve a more integrated national approach to chemicals management, a coordinating mechanism is desirable through which the various actors can exchange information, coordinate activities that are complementary or inter-related, and, in certain instances, make joint decisions or, in the longer-term, develop national policy (UNITAR, 2001).

Developing a formalized Charter for the inter-ministerial body can be a key tool for clarifying the role of the subcommittee of coordination and its functions, as well as its relationship to other bodies or institutions (See box 3). A presidential decree or codification of the mechanism through legislation can also help to ensure that its role in the field of chemicals management will be widely recognized (UNITAR, 2001).

Ministries concerned with, or who have a role in, the management of chemicals can include Ministries of Agriculture, Commerce, Customs, Economics, Environment, Finance, Foreign Affairs, Health, Industry, Justice, Labour, Public Works, Telecommunications or Transportation. Other governmental entities (such as central agencies or councils) could also have an interest, including those responsible for the development and implementation of laws, regulations, policies and activities related to chemicals management throughout their life cycle, and/or aspects of pollution prevention and control (UNITAR, 2001).

As well, participation of non-governmental stakeholders in decision-making can provide valuable inputs into the process, and facilitate understanding of and compliance with the requirements. Therefore, mechanisms should be set up to allow participation of these stakeholders. On the other hand, public authorities should ensure their independence in decision-making, and participation of non-governmental stakeholders should as a result be limited to a consultative role (UNEP, 2011).

Effective coordination among the whole range of those who have responsibility for or a stake in chemicals issues means that all those involved (UNITAR, 2001):

- Are familiar with each others'chemicals-related activities, priorities and positions, and the

underlying reasons for each.
- Use that information to make better quality and more strategic decisions on chemicals issues.

Benefits of such coordination can include:

- ⇨ Common positions on issues are identified and reinforced.
- ⇨ Synergies are created - work can take place in collaboration instead of in isolation, resulting in additional benefits to both parties.
- ⇨ Duplication of efforts is avoided where possible, freeing up scarce resources for other priority issues.
- ⇨ Gaps in chemicals management are identified.
- ⇨ Understanding of divergent issues is increased, and thus the potential for misunderstanding is decreased.

Challenges to sound inter- and intra-ministerial coordination and co-operation may include:

1 Conflicting or competing mandates
2 Poor inter- and intra-ministerial communication
3 Gaps in expertise
4 A lack of resources
5 Low priority given to chemicals issues within (a) particular ministry(ies).

Various types of coordination bodies can be established; depending on their powers, mandate and functions. Essentially, inter-sectoral coordination mechanisms can be either advisory or have executive powers. They can have broad policy mandates, or take the form of technical committees, task forces or working groups can be set up to deal with specific technical issues (UNEP, 2011).

Box 4: Legal basis for inter-sectoral coordination mechanisms

Key provisions to be included in legislation regarding the establishment of coordination mechanisms include:

2 Clarification of the powers, mandate and functions of the mechanism;

3 Designation of the authority to appoint members;

4 Definition of the membership, especially with regard to the qualifications of the members;

5 Definition of conditions for appointment and removal;

6 Delineation of rules of procedure;

7 Authority and provisions for setting detailed procedures;

8 Permission to establish working groups/ task forces/ sub-committees.

Adapted from FAO (2007); p. 39

9. PRIORITY SETTING

Following the drafting of a preliminary National Situation Report, the priorities that had been identified throughout the research undertaken by the national consultant teams as well as those priorities that had emerged from the sectoral analysis conducted based on national development priorities and projections presented in the Poverty Reduction Strategy-II (PRS-II) were complemented by input from the project stakeholders at the inception workshop as well as the awareness raising workshop.

In a comprehensive manner these priorities were presented to all project stakeholders for their validation at the "*National Priority Setting Workshop*" which was held in Monrovia on November 12, 2012. Each of the 5 sector teams presented the sector-specific priorities that had been identified and subsequently proposed potential actions and activities in order to address these priorities.

After the presentation, participants were divided into 5 different working groups: 1) Agriculture; 2) Forestry and Fishing; 3) Mining, Oil and Gas exploration and Energy; 4) Health; and, 5) Education and Awareness. In each of the working groups participants reached group decisions on the "urgency" of the priority, by ranking them from 1 (=high) to 5 (=low), and agreed actions/interventions in order to address these priorities.

The approach towards the selection of national priorities in Liberia has also been slightly adapted as compared to the selection of national chemicals management related priorities in other countries implementing the UNDP-UNEP Partnership Initiative. In addition to "ranking" priorities, the participants were asked to keep in mind the following criteria and considerations throughout the ranking process:

- Achievable within the short (2-3 years) to medium term (4 – 6 years)
- Achievable with minimal financial/human resources
- Favoring priorities closely related to the (socio) – economic sectors considered key in the implementation of the PRS-I and PRS-II.
- Favoring efforts/priorities targeting capacity building as well as opportunities for livelihoods creation.
- Targeting efforts/priorities focusing on the safeguarding of public health, in particular health effects that are major causes of disease and death in Liberia (diarrhea, malaria, respiratory infections) – in particular those that are linked to the management of chemicals and wastes.
- Targeting efforts/priorities focusing on the sustainable management and protection of natural resources, upon which most livelihoods in Liberia depend, to ensure that livelihoods, critical to the recovery of the Liberian economy, are not negatively impacted by the unsound management of chemicals.
- Targeting efforts/priorities related to the unsound management of chemicals and wastes, which might fuel future tensions or conflicts.

The results of the priority ranking has been presented in Table 8. In summary, these priorities encompass (in no particular order of importance):

Table 8: Validated National Priorities and Proposed Actions for their Achievement

Validated National Priorities & Proposed Actions for their Achievement	
1. Improve Inter-Agency Coordination on SMC	
Summary of Findings: In compiling this report it became clear that there is very poor communication and coordination between and within Ministries, Institutions and the private sector operating in the area of chemicals management in Liberia. Although persons or sections in various administrative agencies could be pointed out to have considerable interests and activities related to various aspects of chemical management, it seemed very little was being done to ensure collaboration and cooperation. This lack of coordination and collaboration severely impedes any advances in the area of chemicals management in Liberia. Strengthened links and increased communication between actors and agencies involved in chemical management are therefore urgently needed.	*Proposed Actions*: 1.1 Developing Draft Terms of Reference, Work plan and Budget for a Task Force responsible to establish an Inter-Agency Coordinating Mechanism on the Sound Management of Chemicals. 1.2 Conduct a Situation Analysis (including Characteristics of ministries/agencies; Communication; Areas of opportunity). 1.3 Considering the Role of the Coordinating Mechanism for Information Exchange. 1.4 Considering Options for the Status of the Coordinating Mechanism. 1.5 Identifying Resource Requirements. 1.6 Establish a legal basis for an Inter-Ministerial Coordinating Mechanism on the Sound Management of Chemicals (Key provisions to be included in legislation regarding the establishment of coordination mechanisms could include): - Clarification of the powers, mandate and functions of the mechanism. - Designation of the authority to appoint members. - Definition of the membership, especially with regard to the qualifications of the members; - Definition of conditions for appointment and removal. - Delineation of rules of procedure; - Authority and provisions for setting detailed procedures. - Permission to establish working groups/ task forces/ sub-committees.
2. Develop and Adopt a Classification System for Chemicals	
Summary of Findings: (See also Priority no. 3) Several entities (mostly governmental agencies and departments but also private sector entities) keep records and collect data on the importation and use of chemicals. However, in most cases the reasons for doing so are financial (payment of import taxes, meeting EMP requirements). Data collection is not undertaken with the purpose of sharing Health and Safety Information with chemical users. This translates itself in available data that is grouped in random categories (e.g. as "Assorted Chemicals"), that are not recorded using a metric unit system (e.g. packages, cans, pieces, bags, boxes, containers, drums, etc.), is not consistent among agencies collecting data and doesn't provide any information on the Health and Safety hazards related to the handling of chemical. With	*Proposed Actions:* 2.1 Implementation of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS): - Identify sufficient financial and technical resources to support national GHS capacity building. - Establish roles and responsibilities of employers, employees, chemical suppliers and Governments in the implementation of GHS. - Undertake GHS awareness raising and capacity building (incl. training in hazard classification). regarding and develop a GHS Action Plan. - Establish information management systems for hazard information. - Prepare safety data sheets and labels.

the exception of the registry kept by the MoA, it has to be noted that the classification used by other entities from a chemicals management and safety perspective is inappropriate, considering the classification used does not indicate the risks and hazardous properties associated with imported chemicals, putting human and environmental health at serious risk. In addition, in order to take decisions at national level related to SMC issues, it is key for decision makers to form an opinion related to the Safety, Health and Environment hazards posed by chemicals, which currently is not possible. Therefore, it is critical that the GoL adopts and implements a chemicals classification system conform international MEA and WTO commitments.	- Complete GHS awareness-raising and capacity-building guidance and training materials. - Review national legislation and align it with GHS requirements. - Establish accredited testing facilities to undertake testing of hazard characteristics of chemicals for classification and verification of label information.
3. Improve Centralized Data Collection & Dissemination for Decision Making	
Summary of Findings: Several entities (MoC, BIVAC, EPA: EIA unit, MoA: NQESB, distributors, private sector entities, MoH: DEOH) keep records and collect data, or have relatively easy access to information related to the importation and use of chemicals. However, none of this data is easily accessible for the general public or made accessible to other entities operating in the area of SMC. Data is not periodically collected in a central database to provide an overview of the chemicals management situation in Liberia. Each of these entities records data in a different manner and with varying intervals, and when data is compared it is often conflicting. Responsibilities regarding the centralized collection of chemicals data are not regulated, except in the case of the MoA. In order to achieve the sound management of chemicals in Liberia and in particular for decision making processes, it will be critical to establish a central unit for data collection and maintenance within the agency that it best equipped to do so, most likely either the MoC/BIVAC or EPA in coordination with MoA, and subsequently set-up a data collection system for continuous data logging, reporting and monitoring, providing easy access to it by all relevant entities, and the general public.	*Proposed Actions:* (In close coordination with activities carried out in support of priority no. 2): 3.1 Finalize the preparation of the UNITAR Draft National Chemicals Profile (incl. data on import, export, production, disposal and use of chemicals). 3.2 The implementation of GHS (see 2.1) will improve centralized data collection and dissemination for decision-making. 3.3 Conduct a capacity assessment of the agencies involved in data monitoring, based on the information contained in the National Chemicals Profile and decide based on its findings which agency/entity is best suited to establish a central unit for Chemical data collection and monitoring. 3.4 Promote the establishment of guidelines on the respective roles, responsibilities and accountabilities of institutions, producing and importing enterprises and suppliers/distributors of chemicals concerning the generation and assessment of (hazard) information. 3.5 Set-up a data collection system for continuous data logging, monitoring and reporting. 3.6 Build technical capacity for data collection and monitoring. 3.7 Develop tools to assist industry to provide simplified chemicals information to Government and individual users. 3.8 Collect data on the use patterns of chemicals for which there is a reasonable basis of concern to support risk assessment characterization and communication.
4. Improve the Capacity of Institutions and Entities on SMC	
Summary of Findings: Throughout the preparation of the National Situation Report, as well as based on observations made by other	*Proposed Actions:* 4.1 Mainstream priorities related to the capacity needs of institutions operating in the area of chemicals

assessments (UNITAR, 2010; USAID, 2008) it was observed that there is a limited number of staff in institutions/entities who are dealing with the management of chemicals (EPA, MoH, MoC, MoA, etc,). If such units/sections exist, they are poorly staffed and weakly funded (most often by means of international development programmes related to chemicals or waste management – but in their absence little funding is available to ensure continuity). The few staff who act as the focal points for chemicals-related MEAs, spent a considerable amount of their time participating in international meetings and training, leaving little time and dedicated staff capacity to implementation of activities at national level that aim to improve the management of chemicals. The absence of an approved National SMC Action Plan, which would stipulate the ToRs and time-bound objectives of such units, does not help. As pointed out by EPA itself, capacity remains a major constraint to the Agency – in 2011, of the 146 staff 98 had only a high school diploma. Private sector entities (exception are internationally owned corporations such as Firestone, Total, etc.) generally do not have trained personnel available who are able to properly handle the chemicals that are used, manufactured, stored and disposed of by the entity. The fact that there is almost no laboratory capacity in place to support monitoring activities jeopardizes the enforcement capacity of inspectorates (see also priority no. 8). The low capacity of institutions and entities that are involved in the Management of Chemicals, has an immediate impact on the success of any initiatives carried out in this area, but on a day-to-day level, puts at risk human and environmental health.

management into the national development planning processes, and include capacity related priorities in the "business plans" of institutions dealing with SMC.

4.2 Require public and private entities to appoint chemicals management focal points and provide them with training on international best practices.

4.3 Develop and conduct staff training needed to develop institutional capacity in legislative approaches, policy formulation, analysis, management and monitoring pertaining to SMC.

4.4 Develop and conduct staff training programmes in risk assessment and management-related health techniques and communication.

4.5 Develop and conduct staff training in international best available technologies (BAT) and best environmental practices (BEP) as well as best practices adapted and implemented by international companies operating in Liberia.

4.6 Establish programmes for scientific and technical training of personnel, including customs/inspectorate personnel.

4.7 Establish national laboratory facilities, complete with modern instruments and equipment, including those necessary for testing emissions and operating according to national standards (long-term).

4.8 Develop and conduct laboratory staff training on "Good Laboratory Practices".

5. Improve Opportunities for Education & Training in the area of SMC

Summary of Findings:

All project stakeholders identified lack of capacity as the major underlying cause of environmental degradation and the poor management of chemicals and their wastes. Building capacity in the environment management and natural resources sector in Liberia depends a great deal on the University of Liberia's College of Agriculture and Forestry and its College of Science and Technology. Although poorly equipped and poorly staffed the College has been making efforts to revise the curricula to include new national priorities related to environmental science and natural resource management. However, bringing the colleges up to any recognized standard of education will require longer-term donor and GOL commitment.

Other reasons cited for the lack of capacity are the lack of "on-the-job" training opportunities related to safety measures and handling of chemicals (e.g. for private

Proposed Actions:

5.1 Improve the standard of education in the area of chemicals management:

- Incorporate chemical safety and especially understanding of the labeling system of GHS into school and university curricula.
- Revise curricula to be continuous, institutionalized and research based—and producing professionals who are able to take up emerging issues from chemicals management planning; ensure curriculum responsiveness to changes - scope, content and delivery processes.
- Implement institutional reforms needed to develop fitting SMC educational programs.
- Enhance the quality of teaching (e.g. by developing staff exchange programs).
- Strengthening linkages between research,

sector entities but also for MoA extension officers. Finally, the absence of a knowledge management system containing research findings and reports produced in Liberia that have a bearing on the SMC is also cited by many project stakeholders as impeding training and education opportunities.

education and development.
- Facilitate obtaining scholarships/bursaries for Liberian nationals

5.2 Develop and conduct tailor-made "on-the-job" training modules for implementation by public and private sector entities (including the development of procedural manuals), among else:
- Develop/Conduct tailor made on-the-job training for employees involved in various aspects of the management of chemicals (incl. use of Personal Protection Gear and personal hygiene)
- Provide appropriate training and sensitization on chemical safety for those exposed to chemicals at each stage from manufacture to disposal (crop growers, industries, enforcement agents, etc.).
- Improve the capacity of extension officers providing training to farmers and farming cooperations on the use and application of pesticides & agricultural products to prevent overuse of chemicals

5.3 Empower LISGIS to collect, receive, store and share data collected by all researchers in Liberia:
- Strengthen the exchange of technical information among the academic, industrial, governmental and intergovernmental sectors.

6. Create Awareness on SMC

Summary of Findings:

Overall, public awareness related to the sound management of chemicals can be considered extremely low. Too a large extent this is the result of the years of conflict, throughout which the general population did not have the opportunity to benefit from elementary, secondary and tertiary education as well as vocational training. In the aftermath of the conflict, emphasis has been on recovery and to a lesser extent on environmental management, although that trend is now slowly starting to change. Public knowledge on the handling of hazardous chemicals is most often gained through schooling, on-the-job training, extension services and public awareness raising through newspaper articles, environmental publications, radio and TV coverage, drama plays, posters, etc. However, not much awareness raising has been conducted in the area of chemicals management, except for workshops and training conducted as part of internationally funded chemicals management programmes which are not specifically targeted towards the general population. Although this doesn't apply to such a large extent to internationally owned corporations, many of the distributers, users and manufacturers interviewed by

Priority Actions:

6.1 Undertake awareness raising for consumers, in particular by educating them on best practices for chemical use, about the risks that the chemicals they use pose to themselves and their environment and the pathways by which exposures occur.

6.2 Establish arrangements for the timely exchange of information on chemicals, including what is necessary to overcome barriers to information exchange (e.g., providing information in local languages).

6.3 Improve the information base, including via radio and TV media, billboards, drama plays, brochures as well as electronic media such as the Internet and CD ROMs, ensuring that information reaches appropriate target groups to enable their empowerment and ensure their right to know.

6.4 Include a range of preventive strategies, education and awareness-raising and capacity-building in risk communication.

6.5 Establish procedures to ensure that any hazardous material put into circulation is accompanied, at a minimum, by appropriate and reliable safety data sheets which provide information that is easy to

the different sector groups throughout the preparation of the NSR were not aware of the existence of Materials Safety Data Sheets (MSDS), nor do they know how to use them. The entities also admitted that they didn't provide training to their personnel on the sound management of chemicals and wastes, or provided personal protection gear to their staff. As a result their employees also are not aware of safety measures and precautions when it comes to the handling of chemicals, and can - on a daily level – are exposed to the negative health effects of the chemicals they handle. Another compounding factor to low SMC awareness is that in Liberia – as in many other countries – chemicals and chemicals containing products with hazardous properties, are often repackaged into smaller containers for resale and do not contain labels describing what is in the package or how to use it. All these factors combined result in significant risks to the general population as well as workers that on a daily level are in contact with hazardous/toxic chemicals.

access, read and understand, taking into account GHS.

6.6 Articles and products containing hazardous substances should all be accompanied by relevant information for users, workplaces and at disposal sites.

6.7 For all chemicals in commerce, appropriate information detailing their inherent hazards should be made available to the public at no charge and generated where needed with essential health, safety and environmental information made available. Other information should be available according to a balance know and the need to protect valid confidential business information and legitimate proprietary interests.

7. Improve the Regulatory and Policy Framework for SMC

Argumentation:

As highlighted in Chapter 7, policies and legislation pertaining to environmental management are more than adequate to provide for a proper enabling environment for the sound management of chemicals in Liberia. However, particularly with regard to their implementation, the policy and legislative framework for protecting the environment in Liberia is overly comprehensive, complicated and detailed to facilitate implementation (USAID, 2008).

It was observed that the requirements setout within these frameworks that would have to be instituted by EPA to implement the law, go far beyond its current human and financial capacity. Therefore, it is imperative for EPA and other institutions to prioritize the implementation of its mandate, focusing on a few areas - in this case related to the sound management of chemicals - in which the protection of the environment and human health could be maximized.

While the EPML law contains many significant provisions that could be used to protect the environment and human health, its lack of implementing regulations means that these provisions remain largely inoperative. Developing such regulations would go a long way towards increasing the Law's effectiveness.

Finally, it was observed that considering the importance of EIAs and the preparation of EMPs, it is critical to ensure that guidelines for their preparation are supported by regulations fleshing out the various requirements and provide more detailed definitions of

Proposed Actions:

7.1 Develop a National Action on the Sound Management of Chemicals.

7.2 Establish a legal basis for an Inter-Ministerial Coordinating Mechanism on the Sound Management of Chemicals (see also action 1.6).

7.3 Review national legislation and align it with GHS requirements (see also action 2.1).

7.4 Promote the establishment of guidelines on the respective roles, responsibilities and accountabilities of institutions, producing and importing enterprises and suppliers/distributors of chemicals concerning the generation and assessment of (hazard) information (see also action 3.4).

7.5 Establish procedures to ensure that any hazardous material put into circulation is accompanied, at a minimum, by appropriate and reliable safety data sheets which provide information that is easy to access, read and understand, taking into account GHS (see also action 6.5).

7.6 Address gaps at the domestic level in implementation of existing laws and policy instruments promulgated in the context of international environmental management regimes, in particular with respect to meeting obligations under chemicals-related international legally binding instruments (e.g. Stockholm, Rotterdam, Basel, Montreal, etc.) (see also action 9.2).

7.7 Develop, adopt and implement

their terms.	guidelines/regulations on the storage and disposal of obsolete chemicals and chemical containing wastes (including HCW) (see also action 10.2). 7.8 Implement the polluter-pays principles, truly reflecting the costs of pollution. Finances raised through these means can be allocated towards SMC activities, or used to feed the established environmental funds (see also action 11.6). 7.9 Development regulations for the importation, transportation, classification, usage, storage and disposal of hazardous and toxic chemicals of national concern. 7.10 Review national legislation and regulations pertaining to waste management and ensure that hazardous waste management components are aligned with national challenges. 7.11 Improve environmental and occupational standards for labor and work places. 7.12 Ensure that guidelines for EIA preparation, in particular components relevant to the sound management of chemicals and their wastes, are supported by regulations fleshing out the various requirements and provide detailed definitions of their terms.
8. Improve Enforcement of SMC related Regulations	
Argumentation: One of the main constraints to putting in place sound practices for the management of chemicals is the weak law enforcement in the area of environmental management. Considering environmental law enforcement is already weak, enforcement of (future) chemicals management related regulations would, at a minimum, be equally challenging. Remaining realistic, it is for this reason that meager resources of the EPA and inspectorates of various line ministries, would have to be sufficient capacitated and trained to take on additional enforcement responsibilities pertaining to the sound management of chemicals.	*Proposed Actions:* 8.1 Training of Inspectors (EPA, FDA, BNF, MoA, MoH) in the area of chemicals management and their wastes, as well as the detection of illegal, toxic and hazardous chemicals. 8.2 Training of customs officers on import restrictions, bans and detection of illegal, toxic and hazardous chemicals.
9. Improve the Implementation of Chemicals-related MEAs	
Summary of Findings: Liberia is signatory to the most known chemicals-related Multilateral Environmental Agreements (See Table 7). However, due to the years of conflict, not much progress has been made on the implementation of these chemicals-related MEAs (an exception being the Montreal Protocol – of which the implementation has been relatively successful). Besides certain bans on prohibited chemicals (e.g. POPs pesticides, PCBs, certain ODS), the development of a National Implementation	*Proposed Actions:* 9.1 Promote ratification and implementation of all relevant international instruments on chemicals and hazardous waste, encouraging and improving partnerships and coordination among chemicals-related MEAs and ensuring that necessary procedures are put into place. 9.2 Address gaps at the domestic level in implementation of existing laws and policy instruments promulgated in the context of national

Plan (NIP) for the Stockholm Convention, and some preliminary activities undertaken as part of the UNDP/UNEP & UNITAR SAICM projects, not many chemicals related national priorities have been addressed within the framework of these convention (e.g. management of PCB/POPs contaminated sites; sound disposal of hazardous/toxic waste, etc.).	environmental management regimes, including with respect to meeting obligations under chemicals-related international legally binding instruments (e.g. Stockholm, Rotterdam, Basel, Montreal, etc.). 9.3 Establish or strengthen coordination, cooperation and partnerships, including coordination among institutions and processes responsible for the implementation of multilateral environmental agreements at national and local levels, in order to address gaps in policies and institutions, exploit potential synergies and improve coherence. 9.4 Develop pilot projects to pursue implementation of coordination between the national focal points of chemicals-related multilateral environmental agreements (Rotterdam, Stockholm and Basel Conventions and Montreal Protocol) to achieve synergies in their implementation.
10. Improve the Management of Hazardous and Toxic Wastes	
Summary of Findings: The project's stakeholders identified on multiple occasions that the management of hazardous and toxic wastes remains a serious issue, considering the necessary infrastructure (e.g. disposal sites/hazardous landfill sites) to accept such wastes are not available, and best practices and technologies for hazardous and toxic waste disposal are not being applied. The most serious implications of the unsound management of wastes, results in human health effects and water, soil and air pollution from inappropriate storage/disposal/dumping of agro and forestry chemicals, municipal-, healthcare-, industrial- and mining- wastes and the leakage and inappropriate disposal and storage of petroleum products (e.g. gasoline, diesel for transportation and electricity generation, oil and lubricants for fleet maintenance).	*Proposed Actions:* 10.1 Promote the adoption of BEP and BAT related to chemicals waste management (including healthcare waste management). 10.2 Develop, adopt and implement guidelines/regulations on the storage and disposal of obsolete chemicals and chemical containing wastes (including HCW) (see priority no. 7) 10.3 Enforce regulations on waste storage and disposal (see also priority no. 8). 10.4 Develop national and local capacities to monitor, assess and mitigate chemical impacts of dumps, landfills and other waste facilities on human health and the environment. 10.5 Facilitate the identification and disposal of obsolete stocks of pesticides and other chemicals (especially PCBs). 10.6 Create Awareness of surrounding communities and relocate dumping & burial sites if necessary. 10.7 Carry out measures that will inform, educate and protect waste handlers and small-scale recyclers from the hazards of handling and recycling chemical waste. 10.8 Encourage the prevention and minimization of hazardous waste generation through the application of best practices, including the use of alternatives that pose less risk. 10.9 Promote efforts to prevent illegal traffic of waste (incl. training of customs officials to detect illegal trans-boundary movements of waste).
11. Create Funding Opportunities for SMC activities	
Summary of Findings:	*Proposed Actions:*

A major constraint to the advancement of the sound management of chemicals in Liberia, are funding constraints. As an illustration, the EPA budget decreased from 800,000 US$ (2010) to 120,000 US$ in 2011, and it is clear that there are no existing financial opportunities to cover any SMC related activities other than paying the salaries of the chemicals-related MEA focal points. SMC projects that have been carried out in the past, were funded by the GEF (NIP) and the SAICM QSP TF, but these resources do not ensure continuity and projects implemented with this funding have distinctive objectives, mostly focusing on establishing baselines regarding the status of SMC. In order to address in the future any of the selected priorities and undertake any of the proposed actions as included in this National Situation Report, it is critical to mobilize funding (both at national and international level) to implement such actions and address national priorities.

11.1 Conduct an assessment of funding needs based on selected priorities and proposed actions (to be summarized in a National Plan of Action).
11.2 Conduct Cost-Benefit Analyses (CBAs) of the most significant national SMC priorities.
11.3 Mainstream selected national priorities into development and sectoral planning (PRS-III and the review of PRS-II) to obtain national budget commitments to their implementation.
11.4 Making more effective use of and building upon existing sources of relevant global funding (e.g. GEF, MLF) within their mandates to consider whether and how they might support implementation of appropriate and relevant national priorities and proposed actions.
11.5 As stipulated under the EPA Act, authorize the establishment of a:
- Environmental Funds
- National Environmental Fund
- Trust Fund

11.6 Implement the polluter-pays principles, truly reflecting the costs of pollution. Finances raised through these means can be allocated towards SMC activities, or used to feed the established environmental funds.

12. Development of Partnerships with the Private Sector

Summary of Findings:

As has been highlighted throughout the National Situation Report on several occasions, the capacity of certain private sector entities can be considered advanced in the area of Safety, Health and Environmental (SHE), in particular related to practices in the area of chemicals and waste management. This is mostly thanks to international corporations that have to adhere to relatively stringent internal corporate requirements – that more often than not are more rigorous that the regulatory framework currently in place in Liberia. As such, there are many opportunities to learn from the best practices and approaches as implemented by these corporations, and it would be beneficial to the advancement of SMC in Liberia to establish lasting partnerships with private sector entities to facilitate the implementation of a future National Plan of Action on the Sound Management of Chemicals.

Proposed Actions:

12.1 Promote Industry Participation and Responsibility:
- Review experiences and lessons-learned, environmental practices, technologies, etc. tested and implemented by private sector entities in Liberia and use them for the development of national guidelines and dissemination of best practices in the area of SMC.
- Improve coordination at the national level and strengthen policy integration across sectors, including the development of partnerships with the private sector.
- Encourage use of voluntary initiatives (e.g., Responsible Care and FAO Code of Conduct).
- Promote corporate social responsibility for the safe production and use of all products, including through the development of approaches that reduce human and environmental risks for all.
- Encourage continuous improvement of chemicals management across the product chain.
- Encourage within the industrial sector the adoption of PRTRs and cleaner production methods.

Upon these validated national priorities and proposed actions the National Plan of Action and the National Mainstreaming Roadmap will be based and formulated.

10. REFERENCES

Acolatse, J., Toe, J., Gobeh, J. (August, 2011) "*Situation Report on Research and Contamination*"

Blore, S. (2007) "Land Grabbing and Land Reform: Diamonds, Rubber and Forests in the New Liberia". *Occasional Paper #7, The Diamonds and Human Security Project*

Bongers F, Poorter L, Van Rompaey RSAR, Parren MPE (1999) "*Distribution of twelve moist forest canopy tree species in Liberia and Cote d'Ivoire: response curves to a climatic gradient*" J Veg Sci 10:371–382.

BNF (2004) "Annual Report"

EPA (2011) "*Inception Workshop Report, Liberia, UNDP, UNEP Partnership Initiative for the Integration of the Sound Management of Chemicals Considerations into the Development Plans and Processes in Liberia, February 9 – 10, 2011*"

EPA (2011) "*Awareness Raising Workshop Report, December 14 – 15, 2011*"

EPA/UNDP (2006) "*State of the Environment (SOE) Report for Liberia*"
http://www.lr.undp.org/state%20of%20the%20environment%20report%20final.pdf

EPA/UNEP (2007) "*National Report on the Marine and Coastal Environment in Liberia*"

EPA/UNIDO (2006) "*Liberia National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs)"*
http://chm.pops.int/Implementation/NIPs/NIPSubmissions/tabid/253/Default.aspx

EPA/UNITAR (June 2010) "*Draft National Profile for the Management of Chemicals in Liberia*"

FAO (2007) "*Designing National Pesticide Legislation"*, Development Law Service, FAO Legal Office (Rome).

FAO (2007) "*National Fishery Sector Overview*" http://www.fao.org/fishery/countrysector/FI-CP_LR/en

Green Advocates (2009) "*The Case of Poor Regulations, Lack of Investment, Disorganization, Ignorance, Abused Labor and Resources*" A report on three-county PRA Workshops with Artisanal and Small-Scale Miners (ASMs) in Weasua, Sackie and Zingbeku

LISGIS (2008) "*National Population and Housing Census: Preliminary Results*"
http://www.google.com/url?sa=t&rct=j&q=liberia%202008%20census&source=web&cd=2&ved=0CDoQFjAB&url=http%3A%2F%2Funstats.un.org%2Funsd%2Fdnss%2FdocViewer.aspx%3FdocID%3D2075&ei=ogjZUKKBOafh0gGX2oCABg&usg=AFQjCNFt_Y4r2kn4GqP4oflURWH2aA_KfQ&sig2=YpyNxNhfhhUZ2hzBx06xKw&bvm=bv.1355534169,d.dmQ

LISGIS (2011) "*Statistical Bulletin*" Vol. 3., no. 1
http://www.lr.undp.org/Documents/PDF/Statistical_Bulletin.pdf

MPEA/GTZ (1983) "*Republic of Liberia planning and development atlas*"

PEI (2010) "*Framework Programme for Mainstreaming Environment in Development Processes in Liberia*."

Republic of Liberia (Feb 2007) "*Interim Poverty Reduction Strategy*"
http://www.imf.org/external/pubs/ft/scr/2007/cr0760.pdf

Republic of Liberia (April 2008) "*Liberia Poverty Reduction Strategy (April 2008- June 2011*)"
http://www.imf.org/external/pubs/ft/scr/2008/cr08219.pdf

Republic of Liberia (2012) "*Liberia Poverty Reduction Strategy – II (2012-2017)*"

Sawyer, A. (2005) "*Social capital, survival strategies, and their potential for post-conflict governance in Liberia*"

Synue, C., Yankey, E. (Sept. 2011) "*Situation Report on SMC & Education and Awareness*"

Tiah, T., Tarpeh, P. (Sept. 2011) "*Situation Report on SMC and the regulatory framework*"

UNDP (2012) "*Integrating Sound Management of Chemicals into MDG-Based Development Planning"*
http://www.undp.org/content/undp/en/home/librarypage/environment-energy/chemicals_management/Guide_for_integrating_SMC_into_development_planning/

UNEP (March 2011) "*Guidance on the Development of Legal and Institutional Infrastructures and Measures for Recovering Costs of National Administration – LIRA Guidance*"

UNEP (2009) *"From Conflict to Peace Building: The Role of Natural Resources and the Environment"*
http://postconflict.unep.ch/publications/pcdmb_policy_01.pdf

UNITAR (July 2001) "*Inter-ministerial Coordination for Sound Chemicals Management*" Guidance Note
http://www2.unitar.org/cwm/publications/cw/inp/imcgn_2001.pdf

USAID (2008) "*Liberia Environmental Threats and Opportunities Assessment (ETOA)"*
http://pdf.usaid.gov/pdf_docs/PNADN926.pdf

US Department of State (2010) "*2010 Human Rights Report: Liberia*"
http://www.state.gov/documents/organization/160129.pdf

Vanyanbah, O., Stevens, G. (Sept. 2011) "*Situation Report on SMC & Health*"

World Bank (2012) "*Liberia at a glance*" http://devdata.worldbank.org/AAG/lbr_aag.pdf

Yorke, C., Kanda, O. (Sept. 2011) "*Situation Report on SMC and Social, Gender and Economic aspects*"

WWF (2012) "*Artisanal and Small-scale Mining in and around protected areas and critical Ecosystems Project (ASM -PACE): Liberia Case Study Report*"
http://www.profor.info/sites/profor.info/files/docs/ASM%20Liberia%20Final.pdf

ANNEX A: DATA OBTAINED THROUGHOUT THE PREPARATION OF THE NSC

Information gathered by the national "*Research and Contamination*" consultant team is presented in this ANNEX and has mostly been obtained through a large distributor. In order not to lose this data, it is presented in this Annex to provide some sort of a baseline for future activities in the area of the Sound Management of Chemicals.

That said, the purpose of this NSR was not to collect data on imports, exports, production and use of chemicals. Instead the project expected to be able to build upon the findings and inventory to be undertaken as part of the preparation of the National Chemicals Profile, which was unfortunately not available at the time the NSR was being prepared.

For purposes of confidentiality the table, which includes detailed information per stakeholder, has not been included in the report.

Table 9: Chemicals Imported by Economic Sector

	Industry Type and Quantity of Chemicals Purchased in 2010						
Chemicals	Agriculture, Mining, & Latex harvesting	Paints, Foam, Plastics, & PVC pipes, etc	Water & Sewer, Chlorine bleach industry	Transport: Fuels & Lubricants	Drinks Bever ages	Public Health, Medical, Funeral Services	Education & Q/C labs
Agro chemicals	70,000 L 33 mt						
Ammonium Nitrate	30 mt						500 gm
Spri Gone						232406 L	
Spritex						24067 L	
Fertilizer, liq.	250 L						
Herbicides/pesticides	42,981 L						
Carboline	885.7 L						
Fertilizers	200 mt						
Mercury	454 gm						
Acetic Acid	17.6 mt						5 L
Formic Acid	40.16 mt						
Hydrochloric Acid					34.82 mt		17 L
Nitric Acid					4 kg		10 L
Sulfuric Acid	119 L 1016.64 mt				600 kg		11 L
Alkyd Resin/Soya oil		89.4 mt					
Sodium Carbonate							1 kg
Mattress chemicals		18.6 mt					
Aluminum Cilicite		6 mt					
Butyl DiGlycol Acetate		2.8 mt					
Silicones		8.724 mt					

Calcium Carbonate		423.95 mt					14 kg
Polyol polymers		633.84 mt					
Chemicals for paint							
CPW, paraffin wax		6 mt					
Dabco							
Defoamer		4.3 mt					
Dioxitapathser, DOP oil		100 kg					
Dispex		3.9 mt					
Aluminum Sulfate			87 mt				
Calcium Hypochlorite			15 mt				
Chlorine, gaseous Cl_2			86.7 mt				
Hydrated Lime			20 mt				
Hydrocarbon Resin		1 mt					
Linseed Oil		3.1 mt					
Master Batch		1 mt					
Melkyd chemicals		67.2 mt					
Methyl Ethyl Ketoxine		2.5 mt					
Methylene Chloride		107.4 mt					
MonoEthylene Glycol		4.64 mt					
MonoPropylene Glycol		3.5 mt					
Pigments		96.54 mt			10 kg		500 gm
PolyEthylene pellets		179 mt					
Polyproplylene pellets		177 mt					
PVC Resin		74 mt					
Resin		74 mt					
Silicone							
Sodium Hexameta- Phosphate		1 mt					
Soya Lecithin		3.26 mt					
Stearic Acid, powder		2.5 mt					
Styrene Acrylic co-polymer		41.3 mt					
Talc powder		20 mt					
TDI chemicals		1698.75 mt					
Thinner		28 mt					
Titanium Dioxide		60 mt					
White Petroleum Spirit		114.2 mt					
Xylene		4.18 mt					1 L
Zinc Stearate		4 mt					
39 Beverage Flavoring agents					1,960 L		
Ammonium Thiocyanate							500 gm
Sodium Benzoate					20 kg		
Stabilizer					100 kg		
Tartaric Acid					10 kg		
Diesel Fuel/Gas oil				19,000 mt			
Finasol 20L							
Gasoline				17,000 mt			
HBF (12 x 0.5 l)							
Kerosene				10,000 mt			
Multis 2 18							
Multis E12 50							
Quartz 5000 20W50							

Quartz 7000 10W40							
Rubia S 10W							
Rubia S 40							
Rubia S 50							
Transmission oil 55W40							
Transmission oil 80W90							
L-Ascorbic Acid							1,200 gm
Boric Acid							4 kg
Isopropanol			48 mt				2 L
Ammonium metal							
Amyl Alcohol							2 L
Barium Chloride							2.5 kg
Bromocresol Green							520 gm
Bromocresol Purple							
Calcium Hydroxide							
Calcium Nitrate							250 gm
Calcium Sulfate							
Chloroform							8 L
Copper (II) Nitrate							
Copper (II) Sulfate							1 kg
Geno Phosphate					260 kg		
Hydrazin					230 kg		
EDTA							3 kg
Ethanol					720 L		30.5 L
Fehling's Solution							5.5 L
Ferric Sulfate							8 L
Formaldehyde Solution						360 L	24 L
Sodium Hydroxide			60 mt		42 mt		5 kg
Hydrogen Peroxide							2 L
Sodium Carboxylic Acid			140 mt				
Iodine Solution							2.5 L
Magnesium metal							
Methanol							21 L
Ethylene Glycol							12 L
pH buffer							23 L
Silver Chloride							1 L
Potassium Acetate							
Potassium Chlorate							500 gm
Potassium Chromate							2 kg
Potassium Dichromate							500 gm
Potassium Thiocyanate							
Salicylic Acid							2 kg
Silver Nitrate							350 gm
Sodium Sulfate					230 kg		
Tin (II) Chloride							
Toluene		50 kg					
Zinc Nitrate							
Acetone		180 kg					15.5 L
Acticid EPW		300 kg					
Alkyd Resin							
Aluminum Paste		100 kg					
Ammonia Solution		60 kg					
Barium Sulfate		360 kg					

Bentone Powder SDI		400 kg					
Bermocoll		700 kg					
Citric Acid, granular							2.5 kg
Butyl Acetate		150 mt					
Calcium Dryier		600 kg					
Calcium Chloride							4.5 kg
Coatex		400 kg					
Cobalt		300 kg					
Dapron, defoamer							
Dioctyl Phthalate, DOP							
Dispex A 40							
Ecocide		400 kg					
Methyl Ethyl Ketone		180 kg					
Methyl Ethyl Ketoxime							
Microcide GPA		300 kg					
Microdol Extra, filler		150 kg					
Microtalc							
Midium Oil		540 kg					
Manganese Dioxide							2kg
MonoEthyl Glycol							
MonoPhenol HP 10		100 kg					
Cobalt (II) Chloride							800 gm
Norselene Chips		400 kg					
Poly Vinyl Acetate		3 mt					
Quart Sand		200 kg					
Short Oil Alkyd		600 kg					
Skybio							
Sodium Hexametasulfate		250 kg					
Soya Lecithin							
Styrene Acrylic							
Thinner Cellulose		600 kg					
Vinyl Latex Homopolymer900/45		10 mt					
Viocryl ST 500		200 kg					
Coomazie blue, R250							200 gm
Viscotex		100 kg					
Zinc Phosphate		150 kg					
Zirconium 12%		600 kg					
D-Glucose, anhy.							3 kg
Fuchsin							50 g
Gelatine powder							4 kg
Giemsa's stain							625 gm
Glycerol							6 L
Hydrogen Peroxide, 30%							2 L
Lead (II) Nitrate							1 kg
Methyl blue							150 gm
Methyl orange							100 gm
Methyl red, spirit soluble							60 gm
n-Hexane							6 L
Petroleum ether							4 L
Phenol red, solid							60 gm
Phenol, detached crystals							2 kg
Phenolphthalein, solid							800 gm
Potassium bromide							800 gm

Potassium chloride							4 kg
Resazurin tablets							200 ea
Silica gel							4 kg
Sodium Carbonate							8 kg
Starch, soluble							4 kg
Sucrose							4 kg
Urea							2.5 kg
Zinc Oxide							500 gm
Iron fillings							2 kg
Sodium Sulfate							1.5 kg
Sodium metallic sulfate							1.5 kg
Potassium Iodide							200 gm
Potassium Iodate							100 gm
Barium Nitrate							500 gm
Bromonaphthalene							500 ml
Barbitone Sodium							500 gm
Barium Hydroxide							1 L
Benedict's Solution							1 L
Copper (II) Oxide							500 gm
Potassium Hydrogen Carbonate							500 gm
Potassium Ferrocyanide							1.5 kg
Aluminum Sulfate							1 kg
Sodium Oxalate							500 gm
Potassium Permanganate							1 kg
Ammonium Sulfate							1.5 kg
Sodium Nitrate							1 kg
2,4-Dinitrophenyl Hydrazine							1.5 kg
Iron powder							500 gm
Copper turnings							500 gm
Hexanol, 97 – 99%							4.785 L
Acacia gum							100 gm
Methylene blue							50 gm
Iron (II) Oxide							1 kg
Iron Oxide, magnetic							500 gm
Ammonium Oxalate							500 gm
Aluminum Chloride							2 kg
Potassium Hydrogen Tartrate							500 gm
Sodium Carbonate, decahydrate							1 kg
Oxalic Acid							1 kg
Sodium Sulfite							500 gm
Sulfur powder							500 gm
o-Phosphoric Acid							3.785 L
Sodium Potassium tartrate							500 gm
Ammonium Solution							1 L
Magnesium Hydroxide							500 gm
Sodium Stannite							500 gm
Ethyl Acetate							1 L
Potassium Hydrogen Phthalate							250 gm
Sodium Hydrogen Carbonate							1 kg
Ammomium Citrate							1.5 kg
Sodium Chloride							5 kg
Ferric Chloride							500 gm
Diammonium Hydrogen Phosphate							2 kg

Nickel Sulfate							1 kg
Lead (IV) Oxide							1.5 kg
Lead Acetate							250 gm
Ferrous Ammonium Sulfate							500 gm
D-Cinnamic Acid							500 ml
Potassium Carbonate							500 gm
Potassium Hydroxide							250 gm
Potassium Ferricyanide							500 gm
Sodium Borate							500 gm
Sodium Bromide							3.785 L
Chromium Potassium Sulfate							500 gm
Cupric Carbonate							500 gm
Manganese Chloride							500 gm
Ethyl Benzoate							250 ml
Manganese Carbonate							500 gm
D-Glucose, anhydride							250 gm
Calcium Oxide							250 gm
Cobalt Sulfate							500 gm
Nessler's reagent							250 gm
Methyl Benzoate							500 ml
Ammonium Chloride							500 ml
Silver Acetate							50 gm
Nickel Nitrate							500 gm
D-Fructose							500 gm
Magnesium Chloride							1 kg
Copper Sulfate							4 L
Iron (III) Sulfate							5 L

Welding	
Calcium Carbide	88.5 mt

ANNEX B: SAICM PROJECT BOARD

- Ministry of Planning & Economic Affairs (Chair)
- United National Development Programme – UNDP (Co-chair)
- Ministry of Health and Social Welfare
- Ministry of Agriculture
- Ministry of Finance
- Ministry of Commerce
- Ministry of Lands, Mines and Energy
- Ministry of Defense
- University of Liberia
- Pollution Control Association of Liberia (POCAL)
- Association of Liberia Environmental Journalists (ALEJ)
- Chemical Control Association of Liberia (CHEMCAL)
- Environmental Protection Agency (EPA)
- Liberia Electricity Corporation (LEC)
- Ministry of Justice
- Ministry of Internal Affairs
- Ministry of Education
- L.P.R.C.
- FAO