

**Republic of Liberia**  
**Ministry of Public Works /Emergency Infrastructure Project**  
**Supplemental Component (EIP-SC)**  
**Final Report**  
**Urban Works Rehabilitation - Environmental Management**  
**Plan**



**Prepared For:**

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## List of Acronyms

EPA	Environmental Protection Agency
EMP	Environmental Management Plan
LISGIS	Liberian Institute of Statistics and Geo-information Services
LWSC	Liberian Water and Sewer Corporation
MCC	Monrovia City Corporation
MHSW	Ministry of Health and Social Welfare
MLME	Ministry of Lands, Mines and Energy
MPEA	Ministry of Planning and Economic Affairs
MoPW	Ministry of Public Works
NGO	Non Governmental Organisation
SIU	Special Implementation Unit
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Aid and International Development
WASH	Water Sanitation and Hygiene
WB	World Bank

## Executive Summary

During the years of conflict, Liberia's infrastructure was almost completely destroyed by the war and looting leading to collapse in many areas. Key services such as energy production and distribution, provision of safe drinking water and waste management ceased being rendered. Following the conflict, the World Bank resumed its presence in Liberia and took on a leadership role in the areas of infrastructure, economic management, and community-driven development. The Bank approved a grant for US\$16.5 million to address some of the most urgent infrastructure rehabilitation needs in Liberia; US\$7 million out of these funds consist of urban works in Monrovia, with the remainder allocated to rehabilitation of rural roads.

The urban infrastructure works include:

- Rehabilitation of Public Toilets,
- Repair of Markets,
- Drainage and Sewage Networks,
- Small-scale Urban Rehabilitation,
- Water Supply,
- Large scale clean up of Solid Waste

Other project activities include clearing, backfilling, levelling and compacting of the area around buildings for drainage pavement as well as construction of concrete pavement.

The urban infrastructure rehabilitation will re-establish basic economic activities and social services within Monrovia and other towns as well as help create jobs. This EMP is prepared in compliance with the World Bank's Safeguard Policy on environmental assessment (OP/BP/GP 4.01) and the environmental policies and laws of the Government of Liberia and the World Bank. It identifies mitigation, monitoring and institutional measures to be taken for avoiding or minimizing adverse environmental impacts during project implementation and operation.

The project will impact both the surrounding physical and social environment. These impacts can be short-term civil works related impacts and long-term beneficial impacts. The short-term impacts include construction traffic and noise, dust, increased sediment transport from the sites, soil contamination, surface and ground water pollution and disruption of pedestrian traffic. The long-term beneficial impacts include poverty reduction through creation of skilled and unskilled employments, improved living conditions, better infrastructure, improved health conditions and enhanced capacity for Monrovia City Corporation (MCC) to finance urban infrastructure through increased revenue generation.

The Environmental Management Plan (EMP) includes measures to address the potential environmental impacts. Overall potential environmental and safety impacts are readily avoidable and can be easily mitigated by adopting good engineering practice and monitoring project activities.

The implementation of the EMP shall be the joint responsibility of the various institutions responsible for urban infrastructure rehabilitation i.e. the MoPW, MCC, MLME, LSWC, MHSW and the EPA. The Special Implementation Unit (SIU) shall have overall supervision responsibility for the environmental performance of the project.

### Summary of Impacts and Mitigation Measures

**Table 0.1: Summary of Impacts and Mitigation Measures**

S/No	Environmental Attributes	Potential Impact	Mitigation Measures
1	Air Quality	<ul style="list-style-type: none"> <li>– Dust emission from clearing of debris, excavation, stock piling and other construction activities;</li> <li>– Vehicular emissions from construction machinery;</li> <li>– Noise pollution from construction equipment</li> </ul>	<ul style="list-style-type: none"> <li>– Sprinkle water on soil to prevent dust generation;</li> <li>– Vehicles delivering or removing materials and wastes from site shall be covered to reduce spills on roads or around the site;</li> <li>– Maintain construction equipment to good standard;</li> <li>– Reduce site activities to day time operations;</li> <li>– Construction equipment will strictly conform to international noise standards;</li> <li>– Workers shall be equipped with earplugs</li> </ul>

2	Soil	<ul style="list-style-type: none"> <li>- Soil contamination from accidental spill of oil, paints, lubricants;</li> <li>- Soil disturbance (excavation, back filling etc);</li> <li>- Soil erosion and modification of surface relief</li> </ul>	<ul style="list-style-type: none"> <li>- Burrow pit shall be covered or backfilled to avoid stagnant water bodies;</li> <li>- Store lubricants, oils and paints at appropriate storage areas;</li> <li>- Dispose all waste at permitted points to avoid leaching and soil contamination;</li> <li>- Backfill soil and restore site to avoid erosion</li> </ul>
3	Water Quality	<ul style="list-style-type: none"> <li>- Surface and groundwater contamination from surface run-off;</li> <li>- Accidental spill and uncontrolled discharges</li> </ul>	<ul style="list-style-type: none"> <li>- Construct good drainage at site during construction;</li> <li>- Construct treatment/retention pond for storm-water, wash-water from equipment cleaning and wastewater from camp site;</li> <li>- Treat wastewater to conform to relevant national and international standards</li> </ul>
4	Biodiversity	<ul style="list-style-type: none"> <li>- Loss of flora from fauna from construction activities and oil spill</li> </ul>	<ul style="list-style-type: none"> <li>- No siting and excavations in sensitive habitat</li> <li>- Careful planning and selection of sites</li> </ul>
5	Socioeconomic	<ul style="list-style-type: none"> <li>- Creation of employment for skilled and unskilled people;</li> <li>- Traffic congestion;</li> <li>- Improved living condition</li> </ul>	<ul style="list-style-type: none"> <li>- Traffic management prescribed and performed in accordance with the local laws with appropriate measures and signaling systems (e.g., appropriate lighting, traffic safety signs, barriers and flag persons) that are easily seen or easy to follow</li> </ul>
6	Waste Management	<ul style="list-style-type: none"> <li>- Odour and possible loss of aesthetic due to piling of construction wastes, excavated soils and solid waste debris</li> </ul>	<ul style="list-style-type: none"> <li>- Dispose off environmental harmful materials (asbestos sheet) in an appropriate legal and safe manner;</li> <li>- Proper disposal of waste material at appropriate location specified by local authorities;</li> <li>- Cover waste materials removed from site to reduce odour and discharges on roads</li> </ul>
7	Health	<ul style="list-style-type: none"> <li>- Vector attraction;</li> <li>- Dispersion of disease agent;</li> <li>- Respiratory diseases from dust or PM inhalation</li> </ul>	<ul style="list-style-type: none"> <li>- Clear solid waste on time and dispose of at appropriate location ;</li> <li>- Backfill burrow pit and excavated areas to avoid stagnant water bodies;</li> <li>- Provide workers with safety instructions and protective equipment as required by local laws</li> </ul>

## Chapter One: Introduction

### 1.1 Background

The impact of conflict on Liberia's human and urban environments cannot be overstated. During 14 years of war, one in three Liberians has been displaced. More than half a million remain in temporary housing or camps. Major economic activities are limited to shipping, rubber plantations, timber production, and mining, with the export of the latter two currently prohibited by the United Nations sanctions. The Liberian economy has collapsed and unemployment is now estimated to be 80 per cent.

During the years of conflict, Liberia's infrastructure was almost completely destroyed by the war and looting, leading to collapse in many areas. Key services such as energy production and distribution, provision of safe drinking water and waste management ceased being rendered. Following the conflict, the World Bank resumed its presence in Liberia and took on a leadership role in the areas of infrastructure, economic management, and community-driven development. The World Bank approved a grant for US\$16.5 million to address some of the most urgent infrastructure rehabilitation needs in Liberia; US\$7 million of which consist of urban and road works in Monrovia.

The urban infrastructure component is being executed by the United Nations Development Programme (UNDP) and consists of: the removal of large accumulations of solid waste in the city, rehabilitation and construction of drainage channels and sewage networks, rehabilitation of public toilets and markets, and supply of water to the city.

The rehabilitation of urban infrastructure will re-establish basic economic activities and social services by using labour intensive methods to help create jobs.

In accordance with the World Bank's safeguard policies and procedures, including *OP/BP/4.01 Environmental Assessment*, the urban infrastructure rehabilitation works are classified as Category B. This requires the Government of Liberia to prepare and implement an Environmental Management Plan (EMP), to prevent, minimize or mitigate site-specific environmental impacts.

This environmental management plan (EMP) has been prepared in compliance with the World Bank safeguard policies and the environmental policies and laws of the Government of Liberia. The EMP identifies mitigation, monitoring and institutional measures to be taken for avoiding or minimizing adverse environmental impacts during project implementation and operation, and specifies actions needed to implement such measures. More specifically, this EMP is organized to cover the following issues:

- *Executive Summary:* Brief discussion of significant findings and recommended actions.
- *Project Description:* Brief description of the scope of the project, geographical areas of coverage and proposed implementation arrangements.
- *Policy Legal and Administrative Framework:* Summary description of applicable national and international agreements, policies, laws, regulations, standards and guidelines relevant to the proposed project activities, and information on the responsible institutions and their roles.
- *Existing Conditions:* provides a description of the physical, biological and socioeconomic environment within the proposed project area. The description is based on reviews of available documentation, field surveys and investigations.
- *Potential environmental impacts:* Summary description of potential direct and indirect environmental impacts and proposed mitigation measures.
- *Environmental Management Plan:* The EMP outlines the appropriate preventive actions and mitigation measures for addressing the potential adverse environmental and social impacts identified for the project activities. A Monitoring Plan, with monitoring indicators and assigned responsibilities to key stakeholders is given.

## Chapter Two: Project Description

### 2.1 General Description

The details of the subprojects under the urban infrastructure rehabilitation components are presented in this section

#### 2.1.1 Rehabilitation of Public Toilets

The activities under this component were divided into three lots. The following activities were carried out under Lot 1 and 2.

- Roofing works
- Replacement of doors, windows, toilets, gates
- Construction of new sludge and or water tanks
- Concreting, plastering and painting works

The rehabilitation works include cleaning of floor walls and ceiling; installation of ceramic squat and wall tiles; placement of cement screed on entire fall; installation of plywood dividers to toilet stalls; installation of grill door, iron mongery, hand wash basin; painting of wall, ceiling and other structures. Other activities include clearing, backfilling, levelling and compacting of the area around the building for drainage pavement as well as construction of concrete pavement.

Lot 3 involves the rehabilitation of sewer system (replacement of damaged pipes, fixtures, manholes, and manhole covers); emptying of sludge tanks of fifteen (15) toilets; and construction of eighteen (18) additional septic tanks.

#### 2.1.2 Clean-up and Sewer Network Repairs

The planned activities include clean-up of structurally sound pipes and replacement of damaged/collapsed pipes.

#### 2.1.3 Drainage Cleaning and Repair

The drainage cleaning and repair component of the urban infrastructure rehabilitation consist of:

- clearing of open drains including removal of sludge, silt, organic material and debris from open channels and underground crossing points;
- repair of underground crossing points;
- construction of reinforced concrete walls up to 2 meters height; and
- demarcation and plastering of concrete blocks

#### 2.1.4 Rehabilitation of Markets

Three markets Duala, Waterside and Rally Time, were marked for rehabilitation. The project was executed in two phases.

##### ▪ Duala Market

The Phase I involved replacement of roofing, rehabilitation of toilets, construction of septic tanks, solid waste collection sites, floors, stairways, gates and doors, windows, school and day care rooms, masonry, plastering and painting works.

The Phase II provided rain gutters, construction of internal and external drainage channels, concrete pavement/aprons to control erosion, electrical works, construction of generator house, installation of generator, and water tanks for storage, chalk board for the day care, ceiling works, tiling, plastering and painting.

##### ▪ Waterside Market

Phase I included the replacement of roofing, rehabilitation of toilets, construction of septic tanks, solid waste collection sites, floors, stairways, gates and doors, windows, school and day care rooms, masonry, plastering and painting works, installation of generators and electrical works.

Phase II made provision of rain gutters, construction of internal and external drainage channels, electrical works, and poly tanks for water storage, chalk board for the day care, ceiling works, tiling, plastering and painting.

- *Rally Time Market*

The Phase I contract was awarded for the replacement of roofing, rehabilitation of toilets, construction of septic tanks, solid waste collection sites, floors, stairways, gates and doors, windows, school and day care rooms, masonry, plastering and painting works.

The Phase II component involves construction of septic tanks and fitting of aluminium windows.

### 2.1.5 *Solid Waste Management*

This component includes the following;

- *Solid Waste Clean-up:* clean up of all solid waste accumulated in the 12 solid waste zones identified by MCC, and disposal at the Fiamah dump site.
- *Solid Waste Collection:* street sweeping of, and collection of waste piles s along street corners; emptying of small waste bins; organization of solid waste collection system and collection of waste from designated collection points once every week. All waste collected by contractors from the collection points is currently deposited at Fiamah. The MCC has designated 120 sites throughout Monrovia to serve as solid waste collection points. Skip trucks and skips have been procured under this project, and are used for a collection system.
- *Upgrade of the Fiamah Waste Dump:* Upgrading of the facility will include earthworks and site clearing; improvement of access roads; leveling, compacting and covering of present and new solid waste; construction of security fence; removal and stockpiling of topsoil; construction of drainage, embankment; gate house and notice board.
- *Preparation of Wein Town Landfill:* The MCC has recently acquired some area of land to be converted to a landfill. A separate EMP is being carried out for the proposed landfill and not covered in this EMP.

### 2.1.6 *Small Urban Works*

The planned urban works includes: street sweeping, open drainage cleaning; cutting and cleaning of vegetation around the Fiamah dumpsite stream; clearing of debris at playground and football fields; rehabilitation of public markets and painting of market stalls.

## 2.2 **Component Status**

The status of work done under the urban infrastructure rehabilitation is as follows

**Table 2.1: Work Status**

<b>Component</b>	<b>Status</b>
Public Toilets	Completed
Repair of Markets	3 Completed/ 1 Ongoing
Drainage cleaning and repair	Completed
Sewer Network clean-up/repair	Yet to start
Solid waste collection	On-going
Fiamah Dumpsite Upgrade	Ongoing
Small Scale Urban Rehabilitation	Completed
Construction of Wein Town Landfill	Yet to start
Mt. Barclay Sanitary Landfill	Yet to start

## Chapter Three: Policy, Regulatory and Legal Framework

Liberia's environmental laws are based on article 71 of the 1986 Constitution which advocates for the participation of all Liberians in the protection and management of the environment and natural resources. It binds state organisations to adopt and activate environmental policies and formulate national development plans that are environmentally sustainable.

### 3.1 Policies

- ***National Environmental Policy (2003)***

The Policy seeks to ensure the improvement of the physical environment, quality of life and coordination between economic development and growth with sustainable management of natural resources. The Policy provides:

- the systematic and logical framework in which to address environmental issues;
- benchmarks for addressing environmental problems in the medium to long-term;
- context for financial/donor support to particular sectors and non-sectors;
- the means for generating information and awareness on environmental problems; and
- demonstrates Liberia's commitment to sustainable management of the environment

- **World Bank Policies**

The World Bank has established its social and environmental safeguard policies in order to prevent and mitigate potential adverse impacts associated with Bank's lending operations to people and their environment. The urban infrastructure rehabilitation project triggered the World Bank safeguard policies on Environmental Assessment OP/BP 4.01 and OP 4.12: Involuntary Resettlement.

A brief overview of these World Bank policies can be found in Appendix 1

- **OP 4.01 – Environmental Assessment**

The OP 4.01 outlines the policy and procedure for the environmental assessment of Bank lending operations. The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA process.

The urban rehabilitation project is classified as Category B which could have potential adverse environmental impacts on human populations or environmentally important areas -including wetlands, forests, grasslands, and other natural habitats. These impacts are site specific; few if any of them are irreversible; and in most cases mitigation measures can be designed.

- **OP 4.12 - Involuntary Resettlement**

This policy covers direct economic and social impacts that both result from Bank-assisted investment projects, and are caused by (a) the involuntary taking of land resulting in (i) relocation or loss of shelter; (ii) loss of assets or access to assets, or (iii) loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or (b) the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons. This policy applies to the urban infrastructure rehabilitation works.

### 3.2 Environmental Legislation

- **Public Health Law (1975)**

The Public Health Act contains provisions for the protection of the sources of drinking water and the inspection of potential sources of pollution, but it has been limited in terms of its enforcement

- ***Environment Protection Agency Act (2003)***

This Act established the EPA as a monitoring, coordinating and supervisory authority for sustainable management of the environment and to provide high quality information and advice on the state of the environment and for matters connected there with.

- ***Environmental Protection and Management Law (2003)***

This was created alongside the Environmental protection Agency Act. It lays down the rules, regulations and procedures for EIAs, auditing and monitoring. It establishes regulations for quality standards, pollution control and licensing, guidelines and standards for the management of natural resources.

- **Land Act (1950)**

The Act bestows title of all land in Liberia on the Government and restricts ownership to citizens and naturalized citizens especially those of the black race. Thus people of non-negro descent cannot, irrespective of their standing, own real estate (land) in Liberia except by extended relationship with a native.

The Act recognises customary land tenure system through which land is held in trust for the collective use and welfare of the community.

### 3.3 International Environmental Agreements

The international environmental protocols signed by Liberia that are relevant to the project are presented in Table 3.1.

**Table 3.1 International Environmental Agreements**

<b>SN</b>	<b>Regulation</b>	<b>Year</b>
1	Treaty on marine life conservation	1966
2	African convention on the conservation of nature and natural resources	1968
3	The convention on prevention of marine pollution by dumping of waste and other matter	1972
4	Convention on the international trade in endangered species of wild flora and fauna	1973
5	Convention on the Prevention of Pollution from Ship	1978
6	Abidjan Convention for Protection of Marine and Coastal Environment of the West and Central African Region	1981
7	Convention on biological diversity	1992
8	United Nations framework convention on climate change	1994
9	Kyoto Protocol - Convention on Climate Change	1997

### 3.4 Assessment of Legal Framework

Parts IV and V of the environmental protection and management law mandated the EPA to establish environmental quality and pollution control standards. However, these standards, which serve as guidelines for the monitoring agencies are generally lacking. An adequate assessment of whether the level of pollution caused by any activity is acceptable or not, safe or; dangerous, depends on the minimum quality standards which have been determined for any activity and at any particular time and place. The appropriate technology and resources required for setting the standards for pollution monitoring are lacking and specific permits for certain activities such as effluent discharge, disposal of hazardous chemicals are not in place. In addition, the legal framework of environmental laws and ordinances lack implementation and enforcement

### 3.5 Institutional Framework

The existing institutions that will play a role in the project are highlighted below with their mandates.

#### **Monrovia City Corporation (MCC)**

The Public Health Law of 1975 granted the MCC the responsibility of ensuring clean and sanitary environmental conditions in Monrovia. The MCC is responsible for environmental management including sanitation primarily in the form of beautification, street cleaning, and solid waste collection and disposal.

#### **Liberia Water and Sewerage Corporation (LSWC)**

The LWSC was established by the National Legislature Act of Liberia 1973 with responsibility to:

- Manage, operate and implement water and sewerage services;
- Establish and maintain facilities throughout Liberia;
- Apply the principle of fair and reasonable charges;
- Trade and manufacture materials; and
- Obtain rights and legal titles.

The planning, development, operation and maintenance of non-sewered domestic and public sanitation facilities are shared between MCC, LWSC and the MHSW.

**Ministry of Public Works (MoPW)**

The MPW is responsible for the design, construction and maintenance of roads and highways, bridges, storm sewers, public buildings and other civil works in the country. Additionally, it has responsibility for the administration of urban and town planning, as well as provision of architectural and engineering services for all ministries and agencies of government. In principle, it is responsible for the installation of the entire infrastructure required for waste management delivery services including the construction of sanitary landfill facilities.

- Special Implementation Unit (SIU)

The SIU is an autonomous unit created under the MoPW. The mandate of the SIU is to manage the implementation of the Urban Works Project on behalf of the Ministry of Public Works in Liberia. This will include focus on the management and implementation of donor supported projects.

**Ministry of Lands, Mines and Energy (MLME)**

The MLME among other things supervises the development and management of water resources and conducts scientific and technical investigations required for environmental assessments. The implementation of water and sanitation activities is done through the Department of Mineral and Environmental Research of the ministry, which houses both, the Liberian Geological Survey (LGS) and the Liberian Hydrological Service (LHS). The LHS is responsible for collecting data on the quality, sources, and quantity of water resources in Liberia and monitoring rainfall and stream flow in river basin as well as ground and surface water quality. Training of technicians of the Ministry of Rural Development for emergency disinfection (chlorination) of open wells has also been undertaken by MLME. The LHS mandate dictates that it be involved in special projects on the evaluation of urban sanitation, particularly the provision of guidance for geotechnical investigation of solid wastes landfill disposal sites.

**Ministry of Planning and Economic Affairs (MPEA)**

The MPEA is responsible for regional development planning, project preparation and co-ordination. The MPEA provides technical guidance to all governmental agencies in preparation of development programs and projects.

**Ministry of Health and Social Welfare (MHSW)**

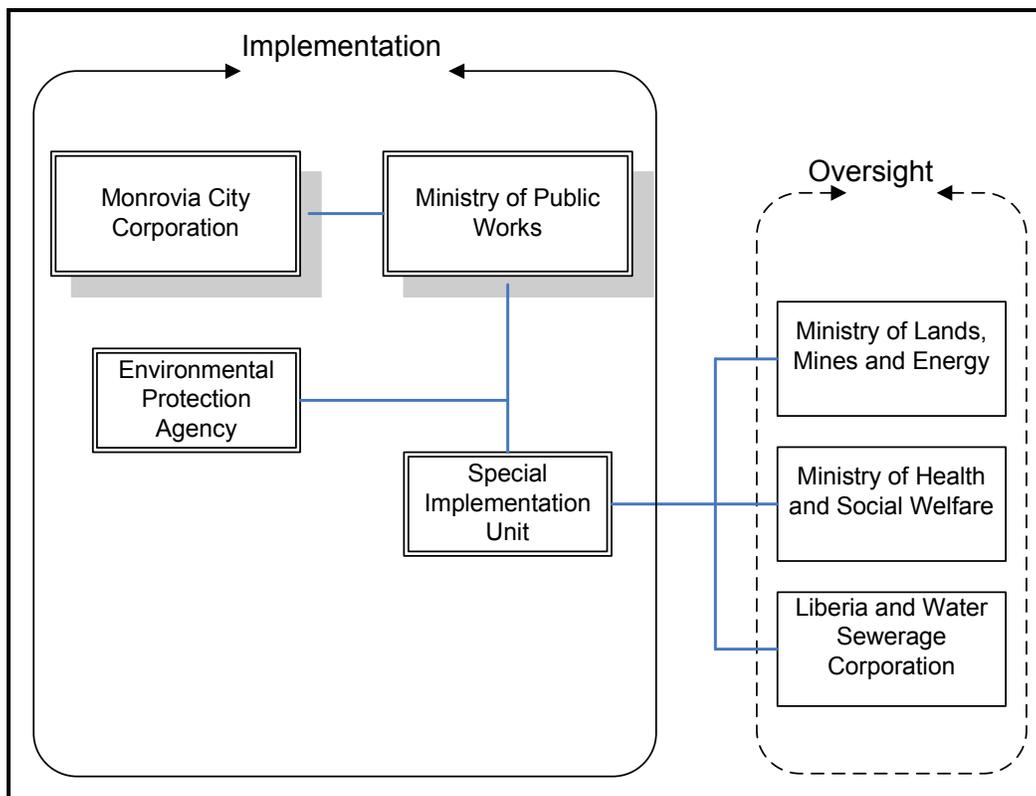
The Division of Environmental and Occupational Health of the MHSW handles matters relating to water and sanitation. It conducts sanitary inspections of food hygiene in public eating places including drinking water surveillance; construction and/or supervision of water wells and pit latrines and the promotion of community health education. MHSW also provides for capacity building and training of environmental health technicians.

**Environmental Protection Agency (EPA)**

The EPA is mandated to set environmental quality standards and ensure compliance for pollution control. The Agency is responsible for the provision of guidelines for the preparation of Environment Assessments and Audits, and the evaluation of environmental permits. These may include certification procedures for landfill and other activities potentially damaging to the environment. The Agency is instrumental for the compliance of contractors to the ESMP recommendations.

**3.6 Implementation Framework**

For a possible implementation framework, it is suggested that the SIU work in conjunction with the Monrovia City Corporation. The SIU which is responsible for project implementation should have representative members from all lead ministries and agencies. The EPA as well as other lead ministries are to have oversight function over all project activities. A recommended institutional framework is shown in Figure 3.1.



**Figure 3.1: Recommended Implementation Framework**

### 3.6 Institutional Gaps

An overview of the legal mandates demonstrates clearly the overlap and imprecise division of responsibilities between the various public authorities. Every stakeholder institution is governed by its own policy, and this causes overlapping of functions and responsibilities. There are no coherent coordination mechanisms among different stakeholders; fragmentation and duplication of efforts are common, leading to ambiguities in responsibilities among the different entities.

The Water and Sanitation (WATSAN) Steering Committee was set up to coordinate the various government institutions which have responsibilities for environmental management. However, the Committee has not been effective in carrying out its mandate.

## Chapter Four: Description of Environment

### 4.1 General Description and Location

Liberia is situated on the southwest corner of the West Coast of Africa, along the Gulf of Guinea, between longitudes 7°30' and 11°30' W and latitudes 4°18' and 8°30' N. It covers a surface area of about 111,370 km<sup>2</sup>. The dry land extent is 96,160 sq. km. Liberia is bounded 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.

**Figure 4.2: Administrative Map of Liberia**



### 4.2 Description of the Natural Environment

The following are the physical, biological and socio-economic characteristics of the environment.

#### 4.2.1 Physical Environment

##### *Climate*

The climate is mainly influenced by the proximity to the Atlantic Ocean and its wet wind. Marginal alterations have been recorded due to landform characteristics, configuration of surrounding shoreline and the generally flat topography of the country. The days vary very little in length because of its location south of the Tropic of Cancer and only a few degrees north of the equator. The tropical solar radiation is intense and the radiation is uniform across the country.

### ***Temperature***

Temperature remains warm all year throughout the country, and there is little change between seasons. The annual mean values range from the 21°C to 27°C. Temperatures inland are warmer than along the coast, but the diurnal range is also greater inland.

### ***Rainfall***

There are two dominant seasons: the wet and the dry seasons. Rainfall, which is the single most important element for defining the climatic seasons in the tropics, depends on the interaction of the tropical maritime air mass and the tropical continental mass. The rainy season begins in late April or early May, and reaches a peak in July through September, to taper off in October. The annual rainfall is estimated at 2,391mm with a spatial variation from 2,000 to 5,000mm. Rainfall decreases going north and inland. The driest part of the country is along a strip of the eastward flowing Cavalla River, but even there, the land receives over 1778mm of rain a year. Monrovia receives almost 4572mm, about twice the estimate of rain annually.

### ***Relative Humidity***

The relative humidity is high throughout the county, and averages from 70 to 90 per cent, especially along the coast. The continental and maritime masses of air alternate their movements back and forth, and from north to south. This brings some seasonal differences in rainfall intensity.

### ***Geology***

Liberia is perched on the West African shield, a rock formation made of granite, schist, and gneiss 2.7 to 3.4 billion years old. This shield has been intensely folded and faulted and is interspersed with iron-bearing formations known as itabirites. Along the coast of Liberia lie beds of sandstone with occasional crystalline-rock outcrops. Monrovia stands on such an outcropping, a ridge of diabase, a dark red-coloured, fine-grained rock.

### ***Soil***

The soil in Monrovia is derived from drift and deposited materials which vary in textural characteristics, but mainly are sand and oxisols (iron and aluminium oxides). The soils are poorly developed, with low water retention capacity. Vegetative cover is very sparse thus exposing the soil to erosion.

### ***Topography***

The area is characterized by flat coastal lowlands, inland rolling hills and mountain ranges in the far north.

### ***Hydrology***

The major rivers draining Liberia are the Cavalla, Cestos, Lofa, Mano, Morro, Saint John and the Saint Paul. The Mano and Morro in the northwest and the Cavalla in the southeast are boundary lines for part of the country.

Most of the rivers flow from the mountains inland in the northeast to the coast in the southeast, and parallel each other. Among the low mountains and hills, the river beds are steep and irregular, with frequent falls or rapids. Many rocks, waterfalls, rapids and sandbanks reduce navigation of these rivers very far inland. Closer to the coast, the river grade becomes less, and tidal current prevent the rivers from removing sand bars and accumulations. However, most streams overflow their banks regularly, and during the rainy seasons there is often severe flooding along the coastal plains.

### ***Surface and Ground Water***

Water supply for most of Monrovia is from ground water. Although, the surface water quality is good, there is increased pollution from oil residue, raw sewage and water intrusion from the ocean during high tide.

Storm and surface water collects large pollution loads as it flows through the city. This is coupled with the fact that Monrovia has inadequate provision for solid waste collection. The drainage systems have also been blocked due to water flowing through them containing high silt and domestic waste loads.

The groundwater table is high. The major water sources include hand dug wells with hand pumps; most of which were installed during the emergency relief programme; and open shallow hand dug wells

which are prone to contamination from urban run-off and pose infection risk for those drinking it directly.

#### **4.2.2 Biological Environment**

##### ***Fauna***

The elephant and buffalo were once common in Liberia but have largely disappeared. Several species of antelope are found in the interior. Other animals include diverse species of snakes, monkey, including the long-haired and the Diana, found in the forests. Wild pigs and porcupines exist in sparsely settled areas, and several members of the leopard group are also found. The bird species includes the hornbill, wild guinea fowl, cattle egret (cowbird), flamingo, woodpecker, and weaver.

##### ***Flora***

Vegetation varies in relation to climate, soil, elevation, and human impact on the environment. Central Monrovia and its immediate surroundings are devoid of vegetation largely as a result of urbanization. However, immature grass and tweedy areas still exists in some area (Paynesville, Airfield Road, and the Northern edge of Bushrod Island).

There are over 2,000 flowering trees in Liberia, 225 are timber species The wild rubber tree (*Funtumia Africana* and *F- elastica*) is indigenous, but the cultivated *Hevea brasiliensis* is the source of Liberia's commercial rubber. Fruit trees include citrus varieties, the alligator apple, papaya, mango, and avocado. Among the cultivated plants are cassava, cotton, cacao, indigo, and upland rice.

#### **4.2.3 Socio-economics**

##### ***Demographics***

The population of Liberia was estimated to be about 3.5 million, (Census 2004) 52 percent of which are rural inhabitants and 48 percent living in urban, peri-urban and small towns. Metropolitan Monrovia covers 43.2 km<sup>2</sup> constituting 0.07% of the country's total area. Central Monrovia is made up of 9 districts and its environs are made up of 7 districts. Monrovia has a population of about 1.5 million people; with population density of 70,000 persons /km<sup>2</sup>. It is the administrative and economy capital of Liberia, and public institutions, commerce and informal sector businesses are the mainstay of the economy in the city.

Liberia is presently divided into 15 major counties; Bomi , Margibi, Maryland, Montserrado, Sinoe, Nimba, Grand Gedeh, Grand Bassa, Grand Cape Mount, Lofa, Bong, Gbarpolu, Grand kru, River Cess, and River Gee. Each of these subdivisions is headed by a superintendent who serves as the vice juror to the President of Liberia.

##### ***Land Use Pattern***

Land use pattern varies around the country; , forested areas accounts for 46%of the land use, pastures about 20% and others 34%

##### ***Economics***

The economy relies majorly on agriculture and mining. Timber and rubber are the main export items earning more than \$100 million and \$70 million annually respectively. Alluvial diamond and gold mining activities also account for some economic activity.

##### ***Health Care Delivery***

The health infrastructure in the country is in very poor condition with about 70% of public health care facilities in a non-functional state. Access to basic health services is extremely low, which accounts for high infant and child mortality rates. Malaria, diarrhoea, acute respiratory infections, neonatal tetanus, measles, and malnutrition are the major causes of morbidity.

The incidence of communicable diseases e.g. HIV/AIDS, Tuberculosis, and River Blindness continues to increase. HIV/AIDS prevalence is estimated at 8.2% of the population between the ages of 15-49 years. The lack of knowledge, exacerbated by poverty, and bi-sexual behavioural practices, continue to pose great challenges for the survival of young adolescents especially females who have been the main victims of rape and sexual abuse.

## Chapter Five: Environmental Management Plan (EMP)

### 5.1 Potential Environmental Impacts

The project will impact both the surrounding physical and social environment. These impacts can be grouped into short-term civil works related impacts and long-term beneficial impacts. The short-term impacts include construction traffic and noise, dust, increased sediment transport from the sites, soil contamination, surface and ground water pollution and disruption of pedestrian traffic. The long-term beneficial impacts include poverty reduction through creation of skilled and unskilled employments, improved living conditions, better infrastructure, improved health conditions and improve capacity of the MCC to finance urban infrastructure through increase revenue generation.

#### Air Quality

Dust emission will occur from clearing of debris from project sites, excavation of top soil, rehabilitation of local defects, movement of machinery performing transportation of waste materials and other construction related activities. The dust emissions will result in temporary rise in particulate matter in ambient air near construction sites. Also there are other, relative sources of air emissions, such as gaseous emissions from construction vehicles and power generators. There are no specific standards for dust emissions from diffuse sources. Measures to minimize dust and other gaseous emission during soil excavation, stockpiling, haulage and other construction activities will be recommended.

#### Noise

Noise will also be associated with construction activities, especially those associated with using heavy machinery for demolition, piling, tunneling and use of cranes, heavy trucks and generators. The noise from this equipment varies from continuous sources, such as cranes and trucks, to intermittent impacts, from piling and demolition. The increased noise level will impact construction workers and nearby residential areas. These are short-term impacts that will cease when the construction is complete.

#### Soil

Excavation of soil for drainage channel construction and other project activities may result in the accumulation of water in burrow pits. The water contained in burrow pit could cause significant nuisance if it was not properly drained, as it could develop serve as breeding ground for insects, mosquitoes and other infectious organisms. Accidental spill of oil or lubricant at construction site may cause soil contamination.

#### Water Quality

Water and wastewater removed from excavated areas, piping trenches, clearing solid waste debris are an environmentally important issue in terms of quantity and quality. Surface water pollution may result from uncontrolled discharges into the river, accidental spills of oil and chemicals, runoff, erosion, and sediment transport. Polluted water flowing into receiving streams could impact the quality of life of downstream users. Groundwater contamination may occur from percolation of oil and lubricants in soil.

#### Waste Management

Large amount of waste materials like cleared solid waste debris, backfill earthwork and other construction wastes will be generated during rehabilitation period. If the piling and transportation of these waste materials is not disposed properly during construction, it will block the traffic and contaminate the environment. The construction waste and domestic waste will be generated at certain amount during civil works; the long term random piling will deteriorate the air quality due to the flying dust and could result in respiratory infection to people living around the project area. Used lubricants, paints, oils and other chemicals if not properly handled and disposed according to manufacturer's specification constitute high risk and could result in soil and groundwater contamination.

#### Flora and Fauna

Construction activities during the urban works could result in clearing and depletion of vegetation that will result in: loss of plant cover, disturbance and loss of fauna habitats, weakening and degradation of soils, disturbance of the natural landscape and disfiguring of the natural morphology.

## 5.2 Potential Social Impacts

### – Traffic

The main impact on roads traffic will be during clearing of solid waste debris and blocked drainages, excavation of soil for construction of drainage channels along, or cross main roads. Longitudinal excavation will cause narrowing of the road for relatively long period, while the lateral crossing of roads may cause blocking of the road, but for relatively short period, possibly few hours.

### – Health

Excavation and drainage construction activities will have negative impacts on children and elderly people who may accidentally fall in open trenches. Dust and particulates inhalation during construction activities could result in respiratory infection for members of local community within project site.

**Table 5.1: Summary of Impacts**

S/No	Environmental Attributes	Potential Impact	Project Activities					
			Public Toilet Rehabilitation	Repair of Sewer Network	Drainage Cleaning/Repair	Market Rehabilitation	solid waste management	Small urban Rehabilitation
1	Air Quality	Dust emission from clearing of debris, excavation, stock piling and other construction activities	✓	✓	✓	✓	✓	✓
		Emissions from construction machinery/vehicle	✓	✓	✓	✓	✓	✓
		Noise increment from construction equipment	✓	✓	✓	✓	✓	✓
2	Soil	Soil contamination from accidental spill of oil, paints, lubricants	✓	✓	✓	✓	✓	✓
		Soil disturbance (excavation, back filling etc)	✓	✓	✓	✓	✓	✓
		Soil erosion and modification of surface relief	✓	✓	✓	✓	✓	✓
3	Water Quality	Surface and groundwater contamination from surface run-off	✓	✓	✓	✓	✓	✓
		Accidental spill and uncontrolled discharges into river	✓	✓	✓	✓	✓	✓
		Sedimentation of drainage channels and surface waterways	✓	✓	✓	✓	✓	✓
4	Biodiversity	Loss of flora from fauna from construction activities and oil spill	✓	✓	✓	✓	✓	✓
5	Socioeconomic	Creation of employment for skilled and unskilled people	●	●	●	●	●	●
		Traffic	✓	✓	✓	✓	✓	✓
		Improved living condition	●	●	●	●	●	●
		Odour and possible loss of aesthetic	✓	✓	✓	✓	✓	✓
		Temporary disruption of business activities	✓	✓	✓	✓	✓	✓
6	Health	Vector attraction	✓	✓	✓	✓	✓	✓
		Dispersion of disease agent						
		Respiratory diseases from dust or PM inhalation	✓	✓	✓	✓	✓	✓

Key: ● = Positive impact  
✓ = Negative Impact

### **5.3 Mitigation Measures**

This section describes the measures recommended to mitigate the impacts identified above.

#### **Air Quality**

Dust emission shall be controlled by wetting exposed soil and site areas with water as necessary. Tarpaulins should be used over truck-beds hauling wastes materials, soil and debris. The contractor shall ensure that site roadways and transport equipment are cleaned on a regular basis. Particulate emissions shall be controlled by the off-site disposal of construction and demolition debris. Burning of debris from construction activities should not be allowed on the site. Any asbestos containing materials should be removed by licensed abatement contractors using appropriate means to limit particulate emissions. Construction vehicles/machinery should be well maintained to minimize emissions.

Site work activities shall be restricted to daytime. Attempts will also be made to limit unnecessary noises during the day so as to limit impact to the adjoining residences.

#### **Water Quality**

Water and wastewater generated from equipment cleaning and other activities during rehabilitation program will be channelled into an oil water separator. The oil will be skimmed off and the water will be treated to acceptable national and international standard prior to discharge into recipient environment. Run-off and sediment transport from the project site will be diverted into a retention pond. Filter strips and barriers should also be installed to prevent sedimentation of drainage channels and waterways.

#### **Soil**

Excavated pit shall be covered or backfilled to prevent erosion and avoid stagnant water bodies which could serve as breeding ground for mosquitoes and other vectors. Lubricants, oils and paints used during rehabilitation and construction activities will be stored in appropriate places and handled according to manufacturer's specification to reduce possibility of accidental spill and possible soil contamination.

#### **Traffic**

Temporary traffic management measures will be used to direct vehicles and pedestrians to prevent conflicts while vehicles are moving in and out of the site. The project shall take place at hours that will not severely impact traffic and construction barriers shall be erected for safety and to direct pedestrian traffic safely around the construction site. Where necessary, vehicle traffic will be controlled by redirection or flagging.

#### **Waste Management**

The Contractor shall minimize as much as practical the generation of all wastes. Environmentally harmful materials generated by the rehabilitation and construction activities will be disposed of at designated disposal sites. In the event that hazardous wastes are generated during construction, the contractor will dispose offsite in accordance with waste regulations. All other wastes generated on site will be disposed of in accordance with appropriate waste disposal regulations.

#### **Landscape and Ecology Impacts**

Rehabilitation activities, e.g. civil works, may impact landscape. The integration of engineering design with the natural landscape to create a unified and visually appealing design will reduce impact on landscape. No ecological impact is envisaged within the project sites.

### **5.4 Environmental Monitoring Plan**

Environmental monitoring is essential to ensure that impacts identified are prevented and mitigated by the EMP. The Environmental Management Plan (EMP) includes measures to address the potential impacts listed above that will be implemented during the construction phase of the project. More specifically, contracts for the respective rehabilitation works will include in the Technical Specifications, environmental guidelines for contractor (Appendix 2). The implementation of the EMP shall be monitored to ensure overall potential environmental and safety impacts are readily avoidable and can be easily mitigated by adopting good engineering practices.

Environmental monitoring and supervision shall be integrated into the project management and reporting system. The SIU, EPA, and other relevant authorities will be involved in auditing project performance and will receive copies of monitoring reports. These agencies/institutions may also

request an increase in frequency of monitoring and that appropriate actions are taken for environmental mitigation as they deem necessary. Table 5.3 summarizes the proposed mitigation measures and monitoring activities under the project and specifies the location of the monitoring, frequency and duration of monitoring.

### 5.5 Institutional Framework for Implementation

During project preparation and implementation, the various institutions (MoPW, MCC, MLME, LWSC, and MHSW) responsible for urban infrastructure rehabilitation and environmental management responsibilities will be involved. The contractors will be responsible for incorporating appropriate mitigation measures in engineering design and during construction.

The ESMU established within the SIU to monitor contractor's compliance with the EMP. Monthly monitoring report shall be submitted to the EPA and the World Bank. The EPA will work with the SIU in ensuring Contractor's compliance with all applicable national and local environmental regulations, guidelines, and standards; and issuance of all necessary clearances and permits related to environment, safety and occupational health.

The SIU has overall supervision responsibility for the environmental performance of the project. The unit has a highly qualified Environmental Management Specialist who is the overall Environmental Manager of the project. In addition to supervising environmental performance, the Environmental Specialist will be responsible for assigning specialized environmental experts for specific tasks with support from other ministries and project counterparts. Each project component is expected to have an Environmental Officer who will provide field supervision to construction contractors.

### 5.6 Capacity Building Requirements

Currently, the Environmental Unit within the SIU is understaffed, thus the SIU will recruit environmental officers. The SIU will strengthen the environmental and social capacities of the Environmental Unit through functional training in environmental monitoring, auditing, inspection and other environmental management techniques. The following training courses are recommended for the environmental staff, to acquire know-how for the tasks assigned to them.

**Table 5.2: Recommended Training Courses**

Training Course	Content	Duration	Participants	Proposed Schedule	Cost (US\$/person)
Environmental assessment	<ul style="list-style-type: none"> <li>- Legal aspects</li> <li>- Environmental impacts and mitigation measures</li> <li>- Monitoring and Evaluation</li> </ul>	3 days	SIU, MLME, MCC, LWSC	Once before project implementation	Course fee – 2000 Travel Cost – 700 DSA @ 250– 750 <b>Total - 3450</b>
Environmental sampling and analysis	<ul style="list-style-type: none"> <li>- Sample collection procedure</li> <li>- Laboratory methods</li> <li>- Data analysis</li> </ul>	3 days	SIU, MLME, MCC, LWSC	Once before and during project implementation	Course fee – 1500 DSA @ 250– 750 <b>Total - 2250</b>
Occupational health and safety	<ul style="list-style-type: none"> <li>- Health and safety training</li> </ul>	3 days	SIU, MLME, MCC, LWSC	Once before project implementation and monthly throughout construction duration	Course fee – 1500 DSA @ 250– 750 <b>Total - 2250</b>
Social Assessment and communication	<ul style="list-style-type: none"> <li>- Social surveys and sampling</li> <li>- Communication skill</li> </ul>	3 days	SIU, MLME, MCC, LWSC	Once before project implementation	Course fee – 1500 DSA @ 250– 750 <b>Total - 2250</b>
Environmental auditing and inspection	<ul style="list-style-type: none"> <li>- Environmental auditing technique</li> <li>- Audit checklists</li> <li>- Auditing reports</li> </ul>	3 days	SIU, MLME, MCC, LWSC	Once before implementation and once after	Course fee – 2000 Travel Cost – 700 DSA @ 250– 750 <b>Total - 3450</b>

**Table 5.3: Environmental Management Plan**

Environmental Media	Mitigating measure	Implementation Schedule	Parameter to monitor	Frequency	Cost	Institutional responsibility for Implementation	Institutional responsibility for supervision
Noise disturbance including vibrations	Reduce site activities to daytime operations; The construction equipment will strictly conform to World bank noise standards; Workers shall be provided with earplugs where required.	During construction	Use of earplugs Monitoring of construction equipment	Unannounced inspection during work and on complain	Included in bidding documents	Contractor	Supervisory Engineer, SIU Environmental Specialist
Air quality	Water will be sprayed on soil to prevent dust generation; Vehicles delivering or removing materials and wastes from site shall be covered to reduce spills on roads or around the site; Maintain construction equipment to good standard, Restrict access to faulty equipment/machinery.	During construction  During construction	PM, CO, NOx, SOx	Monthly, throughout construction	\$90,000	Contractor	Supervisory Engineer, SIU Environmental Specialist, EPA
Water Quality	Construct good site drainage Construct treatment/retention pond for storm water, wash water and wastewater. Treat wastewater to conform to relevant national and international standard Construct barriers and filter strips	During construction	Removal of oil from separator pH, BOD, TSS, TDS, coliforms, DO, conductivity sampling and analysis	Monthly, throughout construction	\$150,000	Contractor	Supervisory Engineer SIU Environmental Specialist EPA
Soil	Burrow pit should be covered or backfilled to avoid stagnant water bodies; Store lubricants and oils at appropriate storage areas; Dispose all waste at permitted wastes places to avoid leaching and soil contamination	During construction  During operation	Unscheduled inspection heavy metals sampling and analysis	Monthly, throughout construction	\$60,000	Contractor	Supervisory Engineer SIU Environmental Specialist EPA
Waste management	Dispose hazardous material e.g. asbestos sheet in an appropriate manner; Proper disposal of waste material at appropriate location specified by local authorities; Cover waste materials removed from site to reduce odour and discharges on roads	During construction and operation	Solid waste handling and disposal facilities; Proper storage, handling and disposal; Workers camp, drainage condition, sanitation facilities	Once per month	Included in bidding documents	Contractor EPA	Supervisory Engineer SIU Environmental Specialist

Workers' safety	Provide workers with safety instructions and protective equipment as required by local laws	During construction	protective equipment; organization of work on the site	Unannounced inspection during work and on complain	Included in bidding document	Contractor	Supervisory Engineer SIU Environmental Specialist
Traffic disruption during works	Traffic management temporary plan implemented using appropriate lighting, safety signs, barriers and flags in conjunction with appropriate government agencies.	Before construction	Traffic pattern at work site	Once per month at peak and non peak periods	Included in bidding documents	Contractor	Supervisory Engineer SIU Environmental Specialist
Biodiversity	No siting and excavations in sensitive habitat Careful planning and selection of sites	During construction	Conduct surveillance of established buffer zones; Identify flora and fauna indicators;	Once per month	Included in bidding documents	Contractor	Supervisory Engineer SIU Environmental Specialist

**References**

1. African Development Bank (2007): Liberia Water Supply and Sanitation Rehabilitation Programme; Environmental and Social Management Plan
2. African Development Bank (2007): Monrovia Expansion and Rehabilitation of Three County Capitals Water Supply and Sanitation Project: Appraisal Report.
3. United Nations Development Programme (2008): Baseline/Impact Assessment of Urban Works, Draft Final Report.
4. United Nations Environment Programme (2004): Desk Study on the Environment in Liberia.
5. United Nations Development Programme (2006): State of the Environment Report for Liberia

**Appendix.1: Overview of World Bank Policies**

<b>Policy Document</b>	<b>Key Features</b>
OP/BP/GP 4.01: Environmental Assessment(operational policy)/Bank Procedure/Good Practice	<ul style="list-style-type: none"> <li>▪ Potential environmental impacts of a project are identified at an early stage of project processing;</li> <li>▪ EIA and Environmental Management Plan are required for projects that are likely to have significant adverse environmental impacts and/or involve resettlement of local communities;</li> <li>▪ EA is required to examine project alternatives (including the 'no project' scenario);</li> <li>▪ Disclosure of information and public consultation are prerequisite to the Bank appraisal of a proposed project.</li> </ul>
OP 4.04: Natural Habitats (Operational Policy)	<ul style="list-style-type: none"> <li>▪ Prohibits Bank support for projects which would lead to the significant loss of degradation of any critical natural habitats (exception: the absence of feasible project alternatives);</li> <li>▪ Requires to carry out a comprehensive cost/benefit analysis;</li> <li>▪ Requires to prepare the EA and environmental management plan (EMP)</li> </ul>
OP 4.36: Forest (Operational Policy)	<ul style="list-style-type: none"> <li>▪ The Bank does not finance commercial harvesting operations in the areas that constitute critical forests or related critical natural habitats</li> </ul>
OP 4.09: Pest Management (Operational Policy)	<ul style="list-style-type: none"> <li>▪ The Bank supports environmentally sound and integrated pest management;</li> <li>▪ The borrower is required to address pest management issues in the context of the projects environmental assessment.</li> </ul>
OP 4.12: Involuntary Resettlement (Operational Policy)	<ul style="list-style-type: none"> <li>▪ The policy triggered in situations involving involuntary taking of land and involuntary restrictions of access to legally designated parks and protected areas;</li> <li>▪ It requires the active participation of displaced people in resettlement planning and implementation;</li> <li>▪ It aims to improve or at least restore the incomes and living standards of displaced persons after resettlement</li> </ul>
OP 4.10: Indigenous Peoples (Operational Policy)	<ul style="list-style-type: none"> <li>▪ The policy aims to ensure that indigenous peoples participate in and benefit from bank-funded operations in a culturally appropriate way; and that adverse impacts on them are avoided, or minimized and mitigated;</li> <li>▪ The policy applies to the proposed projects that are likely to affect indigenous peoples;</li> <li>▪ It requires the borrower to engage in the process of free, prior, and informed consultation with indigenous peoples and their communities.</li> </ul>
OP 4.37: Safety of Dams (Operational Policy/Bank Procedure)	<ul style="list-style-type: none"> <li>▪ The policy applies to large dams (15m or more in height);</li> <li>▪ Requires the independent review of the investigation, design, and construction of the dam and the start of operations, and periodic safety inspections of the dam after completion</li> <li>▪ Requires EA and detailed plans for construction, operation and maintenance of the dam.</li> </ul>
OP/BP/GP 7.50: Projects on International Waterways	<ul style="list-style-type: none"> <li>▪ The policy applies to any river, canal, lake, or similar body of water that forms a boundary between, or any river or body of surface water that flows through two or more states; and to any bay, gulf, strait or channel bounded by two or more states;</li> <li>▪ The policy applies to hydroelectric, irrigation, flood control, navigation, drainage, water and sewerage, industrial, and similar projects that involve the use or potential pollution of international waterways;</li> <li>▪ The policy requires notification and consent of riparian parties, detailed maps, water resource surveys and feasibility studies for the proposed projects..</li> </ul>
OP/BP 7.60: Projects in Disputed Areas	<ul style="list-style-type: none"> <li>▪ The policy applies to projects sited in disputed areas;</li> <li>▪ The prior agreement of the governments concerned is a prerequisite to the Bank's support for the proposed project;</li> <li>▪ The Policy required the detailed consideration of the nature of the dispute at an early stage, to be described in all project documents.</li> </ul>

## Appendix 2: Environmental Guidelines for Contractors

### General

- 1 In addition to these general conditions, the Contractor shall comply with any specific Environmental Management Plan (EMP) or Environmental and Social Management Plan (ESMP) for the works he is responsible for. The Contractor shall inform himself about such an EMP, and prepare his work strategy and plan to fully take into account relevant provisions of that EMP. If the Contractor fails to implement the approved EMP after written instruction by the Supervising Engineer (SE) to fulfil his obligation within the requested time, the Owner reserves the right to arrange through the SE for execution of the missing action by a third party on account of the Contractor.
- 2 Notwithstanding the Contractor's obligation under the above clause, the Contractor shall implement all measures necessary to avoid undesirable adverse environmental and social impacts wherever possible, restore work sites to acceptable standards, and abide by any environmental performance requirements specified in an EMP. In general these measures shall include but not be limited to:
  - a) Minimize the effect of dust on the surrounding environment resulting from earth mixing sites, asphalt mixing sites, dispersing coal ashes, vibrating equipment, temporary access roads, etc. to ensure safety, health and the protection of workers and communities living in the vicinity dust producing activities.
  - b) Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation, blasting) are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.
  - c) Ensure that existing water flow regimes in rivers, streams and other natural or irrigation channels is maintained and/or re-established where they are disrupted due to works being carried out.
  - d) Prevent bitumen, oils, lubricants and waste water used or produced during the execution of works from entering into rivers, streams, irrigation channels and other natural water bodies/reservoirs, and also ensure that stagnant water in uncovered borrow pits is treated in the best way to avoid creating possible breeding grounds for mosquitoes.
  - e) Prevent and minimize the impacts of quarrying, earth borrowing, piling and building of temporary construction camps and access roads on the biophysical environment including protected areas and arable lands; local communities and their settlements. In as much as possible restore/rehabilitate all sites to acceptable standards.
  - f) Upon discovery of ancient heritage, relics or anything that might or believed to be of archaeological or historical importance during the execution of works, immediately report such findings to the SE so that the appropriate authorities may be expeditiously contacted for fulfilment of the measures aimed at protecting such historical or archaeological resources.
  - g) Discourage construction workers from engaging in the exploitation of natural resources such as hunting, fishing, and collection of forest products or any other activity that might have a negative impact on the social and economic welfare of the local communities.
  - h) Implement soil erosion control measures in order to avoid surface run off and prevents siltation, etc.
  - i) Ensure that garbage, sanitation and drinking water facilities are provided in construction worker camps.
  - j) Ensure that, in as much as possible, local materials are used to avoid importation of foreign material and long distance transportation.
  - k) Ensure public safety, and meet traffic safety requirements for the operation of work to avoid accidents.
  - l) Ensure construction vehicles and other motorized equipment are well maintained to minimize emissions

- m) Install barriers, filter strips and diversions to prevent sedimentation of drainage channels and water ways.
- 3 The Contractor shall indicate the period within which he/she shall maintain status on site after completion of civil works to ensure that significant adverse impacts arising from such works have been appropriately addressed.
- 4 The Contractor shall adhere to the proposed activity implementation schedule and the monitoring plan /strategy to ensure effective feedback of monitoring information to project management so that impact management can be implemented properly, and if necessary, adapt to changing and unforeseen conditions.
- 5 Besides the regular inspection of the sites by the SE for adherence to the contract conditions and specifications, the Owner may appoint an Inspector to oversee the compliance with these environmental conditions and any proposed mitigation measures. State environmental authorities may carry out similar inspection duties. In all cases, as directed by the SE, the Contractor shall comply with directives from such inspectors to implement measures required to ensure the adequacy rehabilitation measures carried out on the bio-physical environment and compensation for socio-economic disruption resulting from implementation of any works.

#### **Worksite/Campsite Waste Management**

- 6 All vessels (drums, containers, bags, etc.) containing oil/fuel/surfacing materials and other hazardous chemicals shall be banded in order to contain spillage. All waste containers, litter and any other waste generated during the construction shall be collected and disposed off at designated disposal sites in line with applicable government waste management regulations.
- 7 All drainage and effluent from storage areas, workshops and camp sites shall be captured and treated before being discharged into the drainage system in line with applicable government water pollution control regulations.
- 8 Used oil from maintenance shall be collected and disposed off appropriately at designated sites or be re-used or sold for re-use locally.
- 9 Entry of runoff to the site shall be restricted by constructing diversion channels or holding structures such as banks, drains, dams, etc. to reduce the potential of soil erosion and water pollution.
- 10 Construction waste shall not be left in stockpiles along the road, but removed and reused or disposed of on a daily basis.
- 11 If disposal sites for clean spoil are necessary, they shall be located in areas, approved by the SE, of low land use value and where they will not result in material being easily washed into drainage channels. Whenever possible, spoil materials should be placed in low-lying areas and should be compacted and planted with species indigenous to the locality.

#### **Material Excavation and Deposit**

- 12 The Contractor shall obtain appropriate licenses/permits from relevant authorities to operate quarries or borrow areas.
- 13 The location of quarries and borrow areas shall be subject to approval by relevant local and national authorities, including traditional authorities if the land on which the quarry or borrow areas fall in traditional land.
- 14 New extraction sites:
  - a) Shall not be located in the vicinity of settlement areas, cultural sites, wetlands or any other valued ecosystem component, or on high or steep ground or in areas of high scenic value, and shall not be located less than 1km from such areas.
  - b) Shall not be located adjacent to stream channels wherever possible to avoid siltation of river channels. Where they are located near water sources, borrow pits and perimeter drains shall surround quarry sites.
  - c) Shall not be located in archaeological areas. Excavations in the vicinity of such areas shall proceed with great care and shall be done in the presence of government authorities having a mandate for their protection

- d) Shall not be located in forest reserves. However, where there are no other alternatives, permission shall be obtained from the appropriate authorities and an environmental impact study shall be conducted.
  - e) Shall be easily rehabilitated. Areas with minimal vegetation cover such as flat and bare ground, or areas covered with grass only or covered with shrubs less than 1.5m in height, are preferred.
  - f) Shall have clearly demarcated and marked boundaries to minimize vegetation clearing.
- 15 Vegetation clearing shall be restricted to the area required for safe operation of construction work. Vegetation clearing shall not be done more than two months in advance of operations.
- 16 Stockpile areas shall be located in areas where trees can act as buffers to prevent dust pollution. Perimeter drains shall be built around stockpile areas. Sediment and other pollutant traps shall be located at drainage exits from workings.
- 17 The Contractor shall deposit any excess material in accordance with the principles of these general conditions, and any applicable EMP, in areas approved by local authorities and/or the SE.
- 18 Areas for depositing hazardous materials such as contaminated liquid and solid materials shall be approved by the SE and appropriate local and/or national authorities before the commencement of work. Use of existing, approved sites shall be preferred over the establishment of new sites.

#### **Rehabilitation and Soil Erosion Prevention**

- 19 To the extent practicable, the Contractor shall rehabilitate the site progressively so that the rate of rehabilitation is similar to the rate of construction.
- 20 Always remove and retain topsoil for subsequent rehabilitation. Soils shall not be stripped when they are wet as this can lead to soil compaction and loss of structure.
- 21 Topsoil shall not be stored in large heaps. Low mounds of no more than 1 to 2m high are recommended.
- 22 Re-vegetate stockpiles to protect the soil from erosion, discourage weeds and maintain an active population of beneficial soil microbes.
- 23 Locate stockpiles where they will not be disturbed by future construction activities.
- 24 To the extent practicable, reinstate natural drainage patterns where they have been altered or impaired.
- 25 Remove toxic materials and dispose of them in designated sites. Backfill excavated areas with soils or overburden that is free of foreign material that could pollute groundwater and soil.
- 26 Identify potentially toxic overburden and screen with suitable material to prevent mobilization of toxins.
- 27 Ensure reshaped land is formed so as to be inherently stable, adequately drained and suitable for the desired long-term land use, and allow natural regeneration of vegetation.
- 28 Minimize the long-term visual impact by creating landforms that are compatible with the adjacent landscape.
- 29 Minimize erosion by wind and water both during and after the process of reinstatement.
- 30 Compacted surfaces shall be deep ripped to relieve compaction unless subsurface conditions dictate otherwise.
- 31 Re-vegetate with plant species that will control erosion, provide vegetative diversity and, through succession, contribute to a resilient ecosystem. The choice of plant species for rehabilitation shall be done in consultation with local research institutions, forest department and the local people.

#### **Water Resources Management**

- 32 The Contractor shall at all costs avoid conflicting with water demands of local communities.
- 33 Abstraction of both surface and underground water shall only be done with the consultation of the local community and after obtaining a permit from the relevant Water Authority.

- 34 Abstraction of water from wetlands shall be avoided. Where necessary, authority has to be obtained from relevant authorities.
- 35 Temporary damming of streams and rivers shall be done in such a way avoids disrupting water supplies to communities down stream, and maintains the ecological balance of the river system.
- 36 No construction water containing spoils or site effluent, especially cement and oil, shall be allowed to flow into natural water drainage courses.
- 37 Wash water from washing out of equipment shall not be discharged into water courses or road drains.
- 38 Site spoils and temporary stockpiles shall be located away from the drainage system, and surface run off shall be directed away from stockpiles to prevent erosion.

#### **Traffic Management**

- 39 Location of access roads/detours shall be done in consultation with the local community especially in important or sensitive environments. Access roads shall not traverse wetland areas.
- 40 Upon the completion of civil works, all access roads shall be ripped and rehabilitated.
- 41 Access roads shall be sprinkled with water at least five times a day in settled areas, and three times in unsettled areas, to suppress dust emissions.

#### **Disposal of Unusable Elements**

- 42 Unusable materials and construction elements such as electro-mechanical equipment, pipes, accessories and demolished structures will be disposed of in a manner approved by the SE. The Contractor has to agree with the SE which elements are to be surrendered to the Client's premises, which will be recycled or reused, and which will be disposed of at approved landfill sites.
- 43 As far as possible, abandoned pipelines shall remain in place. Where for any reason no alternative alignment for the new pipeline is possible, the old pipes shall be safely removed and stored at a safe place to be agreed upon with the SE and the local authorities concerned.
- 44 AC-pipes as well as broken parts thereof have to be treated as hazardous material and disposed of as specified above.
- 45 Unsuitable and demolished elements shall be dismantled to a size fitting on ordinary trucks for transport.

#### **Health and Safety**

- 46 In advance of the construction work, the Contractor shall mount an awareness and hygiene campaign. Workers and local residents shall be sensitized on health risks particularly of AIDS.
- 47 Adequate road signs to warn pedestrians and motorists of construction activities, diversions, etc. shall be provided at appropriate points.
- 48 Construction vehicles shall not exceed maximum speed limit of 40km per hour.

#### **Repair of Private Property**

- 49 Should the Contractor, deliberately or accidentally, damage private property, he shall repair the property to the owner's satisfaction and at his own cost. For each repair, the Contractor shall obtain from the owner a certificate that the damage has been made good satisfactorily in order to indemnify the Client from subsequent claims.
- 50 In cases where compensation for inconveniences, damage of crops etc. are claimed by the owner, the Client has to be informed by the Contractor through the SE. This compensation is in general settled under the responsibility of the Client before signing the Contract. In unforeseeable cases, the respective administrative entities of the Client will take care of compensation.

#### ***Contractor's Health, Safety and Environment Management Plan (HSE-MP)***

- 51 Within 6 weeks of signing the Contract, the Contractor shall prepare an EHS-MP to ensure the adequate management of the health, safety, environmental and social aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an EMP for the works. The Contractor's EHS-MP will serve two main purposes:

- For the Contractor, for internal purposes, to ensure that all measures are in place for adequate HSE management, and as an operational manual for his staff.
  - For the Client, supported where necessary by a SE, to ensure that the Contractor is fully prepared for the adequate management of the HSE aspects of the project, and as a basis for monitoring of the Contractor's HSE performance.
- 52 The Contractor's EHS-MP shall provide at least:
- a description of procedures and methods for complying with these general environmental management conditions, and any specific conditions specified in an EMP;
  - a description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
  - a description of all planned monitoring activities (e.g. sediment discharges from borrow areas) and the reporting thereof; and
  - the internal organizational, management and reporting mechanisms put in place for such.
- 53 The Contractor's EHS-MP will be reviewed and approved by the Client before start of the works. This review should demonstrate if the Contractor's EHS-MP covers all of the identified impacts, and has defined appropriate measures to counteract any potential impacts.

### ***HSE Reporting***

- 54 The Contractor shall prepare bi-weekly progress reports to the SE on compliance with these general conditions, the project EMP if any, and his own EHS-MP. An example format for a Contractor HSE report is given below. It is expected that the Contractor's reports will include information on:
- HSE management actions/measures taken, including approvals sought from local or national authorities;
  - Problems encountered in relation to HSE aspects (incidents, including delays, cost consequences, etc. as a result thereof);
  - Lack of compliance with contract requirements on the part of the Contractor;
  - Changes of assumptions, conditions, measures, designs and actual works in relation to HSE aspects; and
  - Observations, concerns raised and/or decisions taken with regard to HSE management during site meetings.
- 55 It is advisable that reporting of significant HSE incidents be done "as soon as practicable". Such incident reporting shall therefore be done individually. Also, it is advisable that the Contractor keeps his own records on health, safety and welfare of persons, and damage to property. It is advisable to include such records, as well as copies of incident reports, as appendixes to the bi-weekly reports. Example formats for an incident notification and detailed report are given below. Details of HSE performance will be reported to the Client through the SE's reports to the Client.

### **Training of Contractor's Personnel**

- 56 The Contractor shall provide sufficient training to his own personnel to ensure that they are all aware of the relevant aspects of these general conditions, any project EMP, and his own EHS-MP, and are able to fulfil their expected roles and functions. Specific training should be provided to those employees that have particular responsibilities associated with the implementation of the EHS-MP. General topics should be:
- HSE in general (working procedures);
  - emergency procedures; and
  - social and cultural aspects (awareness raising on social issues).

### **Cost of Compliance**

- 57 It is expected that compliance with these conditions is already part of standard good workmanship and state of art as generally required under this Contract. The item "Compliance with Environmental Management Conditions" in the Bill of Quantities covers these costs. No other payments will be made to the Contractor for compliance with any request to avoid and/or mitigate an avoidable HSE impact.

