

# Environmental Assessment and Management Framework

## Strategic Cities Development Project (SCDP)



**Ministry of Megapolis and Western Development  
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## ABBREVIATIONS AND ACRONYMS

<b>ADD</b>	Agrarian Development Department
<b>AIA</b>	Archaeological Impact Assessment
<b>AMSL</b>	Above Mean Sea Level
<b>CCAC</b>	Coast Conservation Advisory Council
<b>CCCRMA</b>	Coast Conservation and Coastal Resources Management Act
<b>CCCRMD</b>	Coast Conservation and Coastal Resources Management Department
<b>CDF</b>	Confined Disposal Facility
<b>CEA</b>	Central Environmental Authority
<b>DI</b>	Department of Irrigation
<b>DMC</b>	Disaster Management Centre
<b>DMDP</b>	Dredge Material Disposal Plan
<b>DO</b>	Dissolve Oxygen
<b>DoA</b>	Department of Archaeology
<b>DWLC</b>	Department of Wildlife and Conservation
<b>EA</b>	Environmental Assessment
<b>EAMF</b>	Environmental Assessment & Management Framework
<b>EIA</b>	Environmental Impact Assessment
<b>EMP</b>	Environmental Management Plans
<b>EPL</b>	Environmental Protection License
<b>FFPO</b>	Fauna and Flora Protection Ordinance
<b>GIS</b>	Geographic Information System
<b>GHF</b>	Galle Heritage Foundation
<b>GoSL</b>	Government of Sri Lanka
<b>GMC</b>	Galle Municipal Council
<b>GSMB</b>	Geological Survey and Mines Bureau
<b>ICTAD</b>	Institute for Construction Training and Development
<b>ID</b>	Irrigation Department
<b>IDA</b>	International Development Agency
<b>IEE</b>	Initial Environmental Examination
<b>ILO</b>	International Labour Organization
<b>ISEA</b>	Integrated Strategic Environmental Assessment
<b>IWMI</b>	International Water Management Institute
<b>JKWSSP</b>	Jaffna-Kilinochchi Water Supply and Sanitation Project
<b>JMC</b>	Jaffna Municipal Council
<b>KMC</b>	Kandy Municipal Council
<b>LA</b>	Local Authorities
<b>LAA</b>	Land Acquisition Act
<b>LHZ</b>	Landslide Hazard Zonation
<b>MC</b>	Municipal Council
<b>MCUDP</b>	Metro Colombo Urban Development Project
<b>MoM&amp;WD</b>	Ministry of Megapolis and Western Development

<b>MPPA</b>	Marine Pollution Prevention Authority
<b>NCDM</b>	National Council for Disaster Management
<b>NEA</b>	National Environmental Act
<b>NGO</b>	Non-Governmental Organization
<b>NIRP</b>	National Involuntary Resettlement Policy
<b>NWPC</b>	North Western Provincial Council
<b>PAP</b>	Project Affected Person
<b>PCR</b>	Physical Cultural Resources
<b>PDO</b>	Project Development Objectives
<b>PEA</b>	Project Executing Agency
<b>PID</b>	Provincial Irrigation Department
<b>PMU</b>	Project Management Unit
<b>PPA</b>	Project Partner Agency
<b>RDA</b>	Road Development Authority
<b>SAP</b>	Sediment Analysis Plan
<b>SCDP</b>	Strategic Cities Development Project
<b>SLLRDC</b>	Sri Lanka Land Reclamation & Development Cooperation
<b>SWM</b>	Solid Waste Management
<b>ToR</b>	Terms of Reference
<b>UC</b>	Urban Council
<b>UDA</b>	Urban Development Authority
<b>USEPA</b>	United States Environmental Protection Agency
<b>WB</b>	World Bank

## CHAPTER 1: PROJECT DESCRIPTION

### 1.1 Project concept & objective

In keeping with Sri Lanka's urban vision to develop as *a system of competitive, environmentally sustainable and well-linked cities*, the Government has rightly turned its attention to the development of its secondary cities in a bid to foster economic growth and prosperity in major urban centers outside of Colombo under the project of Strategic Cities Development Project (SCDP). It is intended that this process will help produce a more spatially balanced distribution of economic opportunities, which is currently concentrated in the Colombo Metropolitan Region, reduce congestion in the capital city and bolster overall national economic growth.

In order to achieve its urban vision and national development objective, the Government of Sri Lanka has set out the **Sri Lanka Strategic Cities Program** as a common platform where the Government and its development partners could undertake strategic investments in selected cities either in parallel or in phases. The World Bank will embark on the first phase of this program by investing in selected strategic interventions in the cities of **Kandy, Galle and Jaffna** where it will address a number of issues that are preventing these cities from realizing their full economic potential.

The project development objective (PDO) is **to contribute to the improvement of urban services and livability in selected strategic cities of Sri Lanka**. This would be achieved through shaping city transformations based on the cities' cultural and economic assets with strategic investments.

### 1.2 Project Description

The project comprises of four components. Component 1 encompasses interventions for Kandy City Region while Component 2 focuses on the interventions for Galle City Region. Component 3 provides implementation support and Component 4 focuses on the interventions in Jaffna City Region. In each City Region, the project will target two broad categories of strategic investments: (i) integrated urban services improvement - with system-wide basic services improvement thereby enhancing the functional aspects of the city; and (ii) public urban spaces enhancement - with catalytic urban upgrading efforts thereby enhancing the attractiveness and livability of the city.

1. **Component 1 - Kandy City Region Urban Interventions**. This supports priority improvements to relieve traffic congestion and upgrade municipal services to enhance livability and to sustain the world heritage city and its agglomeration areas. This component includes:

*Urban services improvements and public urban spaces enhancements*. This will include: (i) traffic improvements, such as the rehabilitation of selected by-pass roads, improvements to selected public transport facilities and traffic management measures; (ii) augmentation and rehabilitation of Kandy municipal water supply system; (iii) rehabilitation of major drains; (iv) urban upgrading, including the enhancement of selected streetscapes and public spaces, restoration and adaptive reuse of historic and landmark buildings, and development of an integrated master plan.

*Institutional strengthening and capacity building.* This will include the provision of capacity building support for PPAs to plan, design and maintain urban infrastructure; and to provide municipal services.

**Component 2 - Galle City Region Urban Interventions.** This supports priority improvements to reduce flooding and coastal erosion, and upgrade public urban spaces to improve and sustain the City Region. This component includes:

*Urban services improvements and public urban spaces enhancement.* This will include: (i) flood reduction measures, including the rehabilitation of selected canals and surface drainage infrastructure; (ii) coastal erosion reduction measures for selected areas; (iii) urban upgrading, including the enhancement of selected streetscapes and public spaces, restoration and adaptive reuse of historic and landmark buildings, and development of an integrated master plan.

*Institutional strengthening and capacity building.* This will include the provision of capacity building support for PPAs to plan, design and maintain urban infrastructure; and to provide municipal services.

**Component 3 - Implementation Support.** This component will provide support needed to implement the project such as: (i) implementation support in the areas of project management, monitoring and evaluation, procurement, financial management, and environmental and social safeguards, including compliance; (ii) public awareness and communications support regarding project interventions; (iii) purchase of vehicles, office furniture, and IT equipment for the PMU; and (iv) operating costs of the PMU; and (v) support for the national Strategic Cities Program such as preparatory studies and planning for other strategic cities, and other implementation and management tools.

**Component 4 - Jaffna City Region Urban Interventions.** This supports priority improvements to reduce flooding and coastal erosion, and upgrade public urban spaces to improve and sustain the City Region. This component includes:

*Urban services improvements and public urban spaces enhancement.* This will include: (i) improvement of drainage network including rehabilitation of ponds and existing drainage infrastructure, preparation of drainage master plan; (ii) urban upgrading and cultural heritage, including the enhancement of selected streetscapes and public spaces, restoration and adaptive reuse of historic and landmark buildings; and (iii) connectivity improvements such as rehabilitation of link roads and traffic management measures.

*Institutional strengthening and capacity building.* This will include the provision of capacity building support for PPAs to plan, design and maintain urban infrastructure; and to provide municipal services.

### **1.3 Objective of the Environmental Assessment and Management Framework (EAMF)**

Projects and Programs financed with IDA resources need to comply with World Bank Operational Policies. Therefore, sub-projects and components eligible for funding under this project will be required to satisfy the World Bank's safeguard policies, in addition to conformity with environmental legislation of the Government of Sri Lanka (GOSL). However, since detail



designs for a majority of sub-projects or investments under SCDP have not been finalized at this stage, site-specific Environmental Assessments (EA) cannot be conducted. What is possible at this stage would be to carry out an identification of generic issues that are typically associated with the type of sub-projects proposed and determine safeguard procedures and instruments to be applied to sub-projects as and when they become technically ready for implementation.

Therefore, the main purpose of this document is to (a) carry out a generic assessment of environmental impacts from SCDP and (b) outline a framework for environmental screening, assessment and management, giving details of potential environmental issues, screening criteria and guidelines on what type of environmental tools need to be applied for the various investments prior to commencement of activities. The EAMF will serve as the basis for carrying out safeguards due diligence for all sub-projects under the SCDP.

The objectives of this Environmental Assessment & Management Framework are:

- i. To describe of the proposed project area in terms of key physical, hydrological and biological features and carry out an early assessment of anticipated environmental impacts from SCDP
- ii. To establish clear procedures and methodologies for environmental screening, planning, reviewing, approval and implementation of subprojects
- iii. To specify appropriate roles and responsibilities, and outline the necessary reporting procedures, for managing and monitoring environmental concerns related to subprojects
- iv. To determine the training, capacity building and technical assistance needed to successfully implement the provisions of the EAMF and;
- v. To provide practical resources for implementing the EAMF

Specifically, the EAMF includes the following sections;

- A description of proposed investments under SCDP and the level of readiness at appraisal
- The technical framework for environmental safeguards management including screening, preparation of EA/EMP, review and approval of sub-projects
- Preliminary assessment of anticipated environmental impacts from the project, general mitigatory measures for construction related impacts, guidelines for anticipated significant environmental issues, preparation and approval of EA process and a description of EA tools
- Safeguards implementation arrangement and roles and responsibilities of various parties involved
- Procedures for stakeholder consultation and disclosure
- Key environmental issues in Metro Colombo area related to flood and drainage management
- Strategic planning needs of the SCDP

## CHAPTER 2: POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

### 2.1 Overview of Environmental Legislation

Sri Lanka is one of the leading countries in the South Asian region in enacting environmental legislations. Its concern for environment dates back to over two and a half millennia. The constitution of the Democratic Socialist Republic of Sri Lanka under chapter VI Directive Principles of State policy and Fundamental duties in section 27-14 and in section 28-f proclaim “The state shall protect, preserve and improve the environment for the benefit of the community”, “The duty and obligation of every person in Sri Lanka to protect nature and conserve its riches” thus showing the commitment by the state and obligations of the citizens.

The overall environmental concerns are addressed by the National Environmental Act No. 47 of 1980 (and subsequent amendments by act no 56 of 1988 and act no 53 of 2000). It is the umbrella legislation for environmental protection in the country. In addition several other sectoral legislative enactments are in place (see section below and the summary table of sectoral legislative enactments in **Annex 1**). The national organization that has the mandate to protect and take measures to safeguard the environment is the Central Environmental Authority. It currently operates in the entire country except in the North Western Provincial Council (NWPC), where the NWPC has enacted a separate statute under the 13th amendment to the Constitution of Sri Lanka and had created a separate provincial institute.

There are several other key national agencies with a mandate for environmental management and protection. The Forest Department, the Department of Wildlife Conservation, Department of Archeology, Department of Coast Conservation and Coastal Resources Management, Disaster Management Center and Geological Survey and Mines Bureau have their regional offices and staff to cater to and monitor the environmental safeguards as per the policies and regulations governing them. In addition there are several national agencies that are impacting on the environment and adopting environmental safeguards as well. They are the Sri Lanka Land Reclamation and Development Corporation, Urban Development Authority, Water Supply and Drainage Board, Water Resources Board and Irrigation Department.

The Local Authorities (LA) are also have provisions under their respective acts to safeguards and provide useful facility and maintain the same for the convenience of the public in their respective areas. The Municipal Council (MC) Act No. 19 of 1987 & Urban Council (UC) Act No. 18 of 1987 provide for the establishment of MCs and UCs with a view to provide greater opportunities for the people to participate effectively in the decision making process relating to administrative and development activities at a local level and it specify the powers, functions and duties of such LAs and provide for matters connected therewith or incidental thereto. These acts contain sixteen and eight parts respectively, several schedules and 327 & 249 sections respectively. The MC act, spell out its status, powers & functions in Section IV, Section V and Section VI in sections 34 to 154 and covers public health, drainage, latrines, unhealthy buildings, conservancy & scavenging, nuisance etc. Further the respective local authorities have mandate regionally to implement the project activities and monitor the progress of compliance work.

The National Physical Plan (2007) is a means to identify the relationship between environmental sensitive areas, metro regions, metro cities and supporting infrastructure network. According to the National Physical Plan, the Northern Metro Region is one of five proposed Metro Regions for

the Country and Jaffna will be considered as a Metro City. One aim of the plan is the preparation of detailed plans and cost estimates for implementation of the following infrastructure facilities within the Metro Regions: drinking water facilities, waste disposal, and provision of electricity, management of solid waste and transport facilities.

The document, *Caring for the Environment (2008-2012)* published by the Policy Planning Division of the Ministry of Environment and Natural Resources, 2008, discusses the state of Health, Sanitation, and Urban development within the country.

## **2.2 Detail Review of Key Environmental and Urban Services Related Legislation**

### **1. The Constitution of Sri Lanka & the 13<sup>th</sup> Amendment**

The Constitution of Sri Lanka contains several provisions, relating to the environment 9 Article 27 (14) and article 28 (f). The 13<sup>th</sup> amendment to the constitution introduced a new level of institution for environmental protection and management. Therefore the provincial government also has legislative and executive power, the North Western Provincial Environmental Authority to control, prevent and monitor all environmental related activities.

**Application to SCDP:** Overall responsibility of individuals and organizations to protect and conserve the natural environment. All project proponents/implementers and public are responsible.

### **2. The National Environmental Act. No. 47 of 1980 & its amendments**

The National Environmental Act (NEA) provides conservation and development guidelines for natural resources including water, soil, fisheries resources, forest, flora and fauna in Sri Lanka. It also paved the way for the creation of the Central Environmental Authority (CEA). Further it spells out the creation of an Environmental Council in collaboration with the respective line agencies to advise the CEA (Section 7) and provide necessary guidelines to establish District Environmental Agency under the chairmanship of the District Secretary. The NEA is the basic national decree for environmental protection. The three main regulatory tools implemented under the NEA are Environmental Impact Assessment/Initial Environmental Examination, Environment Protection License (EPL) and Schedule Waste Management License supported by standards for discharge and waste disposal guidelines.

A comprehensive description of EIA/IEE process is given in the Annex 6. It is the key regulatory tool enabling any developer to implement the development activity in line with the NEA and thereby assuring the long term sustainability of the development undertaken while paying due respect to the environment.

The second regulatory tool under the provisions of the National Environmental Act is the Environmental Protection License (EPL). The EPL procedure has been introduced to prevent or minimize the release of discharges and emissions into the environment from industrial activities in compliance with national discharge and emission standards, to provide guidance on pollution control for polluting processes and to encourage the use of pollution abatement technology such as cleaner production, waste minimization etc. Here the industries are classified into three lists named A, B and C. List A is comprised of 80 potentially high polluting industries, List B is comprised of 33 medium polluting industries and List C is comprised of low polluting industrial activities. The operational details are given in CEA website ([www.cea.lk](http://www.cea.lk)).

The third regulatory tool deals with the disposal of scheduled waste. The gazette notification No 1534/18 of 1<sup>st</sup> February 2008 made by the Hon. Minister under section 23A and 23B of the National Environmental Act No. 47 of 1980 is referred to as the National Environmental (Protection & Quality) regulations No. 1 of 2008. It deals with waste from specific and non-specific sources. The notification has three parts and eight schedules. The Part I deals with the Issue of Environmental protection License for Emission of Disposal of waste. Part II deals on issue of license for the management of scheduled waste (Hazardous Waste) and Part III on General matters including definitions and the effectiveness and validity of the license issued under National Environment (Protection & Quality) regulation No 1 of 1990 published in extraordinary gazette No 595/16 of February 1990. The eight schedules include the tolerance limits, applications, formats for reporting, categorization of non-specific and specific waste etc.

The 1994 amendment delegated the authorization to the local authorities to issue EPL for low polluting industries. The CEA's environmental management functions are holistic and they are very well set out in section IV of the act. Along with the EPL procedures several standards also have been gazette with regard to disposal of effluents to land and water bodies.

**Annex 2** contains a detail description of the EIA/IEE procedure in Sri Lanka. For further information of prescribed projects please visit: [www.cea.lk](http://www.cea.lk)

**Application to SCDP:** As per the initial screening, majority of sub-projects selected for three cities are not required IEE/EIA but it is mandatory to undergo NEA stipulated environmental assessment requirements for all sub-projects regardless of the complexity of the same. Considering the low impacts of subprojects already identified and the present assessment carried out in compliance with World Bank's safeguard policies would be sufficient with continuous monitoring during the construction, operation & maintenance phases.

### 3. State Land Ordinance Act No 13 of 1949

The State Lands Ordinance provides necessary guidelines to:

- The protection of the source, course or bed of any public stream
- The protection of springs, reservoirs, lakes ponds lagoons, creeks, canals, aqueducts etc.
- The construction or protection of roads, paths, railways and other means of internal communication.
- The prevention of the erosion of soil.
- The preservation of water supplies.

In addition, section 75 of the State Land Ordinance highlights on riparian proprietors activities. The occupier of land or the bank of any public lake or public stream shall have the right to use the water in that lake or stream for domestic purpose and shall not be diverted through a channel, drain or pipe or by means of a pump or other mechanical contrivance but shall be removed in a bucket or other receptacle.

**Application to SCDP:** This has significant influence on the waterbodies that will come under the project for improvements by way of bank stabilization, erosion control and other small infrastructure development etc. Some of the project interventions support the mandate of this act by ensuring the protection and preservation of the canals and its banks. Further no supplies of water through the network of canals are proposed and hence none of the project investments are

in violation of its provisions.

#### **4. The Coast Conservation and Coastal Resources Management Act No.49 of 2011 (Amendment)**

The Coast Conservation and Coastal Resources Management Act (CCCRMA) makes provisions for the regulation and control of development activities within the coastal zone as well as formulates and executes schemes of work for coast conservation. Under the section 6 of the act, there is provision to appoint a Coast Conservation Advisory Council (CCAC) which would advise the Coast Conservation and Coastal Resources Management Department (CCCRMD) on all development activities proposed to be implemented in the coastal zone and review its coastal zone management plans. The law specifies that projects located wholly or partly within the coastal zone (the area lying within a limit of three hundred meters landwards of the Mean High Water line and a limit of two kilometers seawards of the Mean Low Water line and in the case of rivers, streams, lagoons, or any other body of water connected to these either permanently or periodically, the landward boundary shall extend to a limit of two kilometers measured perpendicular to the straight base line drawn between the natural entrance point thereof and shall include waters of such rivers, stream and lagoons or any other body of water so connected to the sea) must undergo the approval process that is laid down in the Coast Conservation and Coastal Resources Management Act irrespective of its size.

Only those projects located totally outside the Coastal Zone will be subject to the approval process laid down in the National Environmental Act. Therefore, any development work taking place within this zone falls under the jurisdiction of CCCRMD. According to the CCA, Director of the CCCRMD has the discretion to request for an EIA/IEE from the project proponent if the initial screening reveals significant impacts in the coastal areas by the project. The process is very much similar to the NEA excepting that the Director of the CCCRMD reserves the right to request for an EIA/IEE depending on the nature and scale of anticipated impacts of the proposed investments rather than on pre-determined prescribed limits as in the NEA and also to make a final decision. The Director is advised by the CCAC on the findings of EIA/ IEEs.

**Application to SCDP:** Investments confirmed so far in the greater Galle and Jaffna city areas that fall under the coastal zone includes development such as improvements to canals, roads, walkways and leisure areas along the coastal belt. The GMC has discussed with CCCRMD and shared the details of the proposed investments for their perusal. Initial discussions with CCCRMD are underway on selection project interventions in Jaffna city. As none of these investments are expected to trigger serious environmental impacts and the possibility of the CCCRMD requesting for a separate EIA/IEE is unlikely. However, the PMU would need to obtain CCCRMD permission for all work commencing in the coastal zone. It is also recommended that a copy of the EAMF should be shared with the CCCRMD, if necessary.

#### **5. The Flood Protection Ordinance Act No.22 of 1955**

This act provides room for the Minister to declare any area in the country as flood area. It has provisions to prepare scheme for protection of flood area, creation of flood authority, regulations for management of flood area and acquisition of land for the purpose of the ordinance. The flood authority is usually the District Secretary of the affected area. In case of a large area of a Municipality is coming under flood the Minister may substitute the District Secretary by appointing the Mayor of the Municipality.

**Application to SCDP:** Overall, knowing the experiences in the past, this need to be considered. Three cities, Kandy, Galle and Jaffna have experienced high intensity rains and subsequent flash floods. The flood mitigation is a primary objective of this project that will facilitate the flood mitigation efforts project and strengthened the storm water management interventions and improve drainage in three cities.

#### **6. The Fauna & Flora Protection Ordinance Act No. 49 of 1993 & its amendments**

This act provides the protection, conservation and preservation of the fauna and flora of Sri Lanka. Under the Fauna and Flora Protection Ordinance (FFPO), five categories of protected areas are established viz. Strict Nature Reserves, National Parks, Nature Reserves, Jungle Corridors and Intermediate Zones including sanctuaries. According to this Act, any development activity of any description what so ever proposed to be established within a national reserve or within one mile from the boundary of any national reserve, is required to be subjected to EIA/IEE, and written approval should be obtained from the Director General, Department of Wildlife Conservation prior to implementation of such projects. The FFPO follows a similar process as the NEA in conducting scoping, setting the TOR, preparation of EA, review of EA and public consultation and disclosure. The decision of project approval or disapproval is finally granted by the Director General of the Department of Wildlife Conservation.

**Application to SCDP:** The only area protected under the FFPO in the vicinity of project boundaries is the Hikkaduwa Marine National Park which is a coral reef. As no impacts to the coral reef are expected as a result of project activities, provisions of this act will not apply.

#### **7. The Sri Lanka Land Reclamation & Development Corporation Act No. 15 of 1968**

The Act provides the formation of the Sri Lanka Land Reclamation & Development Corporation (SLLRDC). The latest amendment to this act is the No 35 of 2006 which incorporated section 2A- Prohibiting filling or developing and reclaiming land, section 2B-Declaring areas as low lying marshy or swampy and section 20 C- stipulating that pollution of canal as an offence. In addition Section 28 of the principal enactment has added new definition- retention areas. The gazette regulations under this act also had declared several areas as wetland.

**Application to SCDP:** The project supports and enhances the provisions set out in the act through improvement to the canal network for the smooth flow of storm water in three cities. Also, the SLLRDC, who implements this act, will be involved as a designer in the project although none of the SLLRDC acquired areas are found within both project sites.

#### **8. The Urban Development Authority Act No. 41 of 1978**

This act has provided provisions to establish the Urban Development Authority (UDA), declaration of areas as urban development area. Its Part II outlines 22 point powers and functions of the UDA. Under Part IV it has power to acquire immovable property and sale of land belonging to the authority. The act provides room to make regulations for the purpose of carrying out or giving effect to the principles and provisions of this law. The amendment brought in Act no 2 of 1980 under special provisions provided room to declare lands urgently require for urban development projects and remedies to affected parties and the uphold the power of Supreme court. The amendment brought under Act No 4 of 1982 in its Part II A describes the planning procedure, appointment of planning committees, preparation of draft development plans, approval of the same also provide room for subsequent amendment. It also provides room to

issue permits for development work, and delegation of the powers of the authority and procedures to be followed if activity takes place in contrary to the permit issued. Further the principle enactment amended by the addition of section 29 by adding a schedule, indicating the matters for which provisions may be made in the development plan. The subsequent amendments deal with levies, joint venture development projects etc.

**Application to SCDP:** Cities selected namely, Kandy, Galle and Jaffna are UDA declared area and all the development plans should be cleared by the UDA. Hence the subprojects undertaken by the KMC, GMC, JMC and other agencies need to be assessed and cleared by the UDA for consistency with the UDA regulations. This will provide more scientific planning and avoid adhoc development activities which have led to most of the current issues in these urban areas. Some of the project investments will involve land acquisition and resettlement and hence relevant provisions in the act will be triggered.

### **9. The Mines and Mineral Act No.33 of 1992**

The Geological Survey and Mines Bureau established under the Mines and Minerals Act No. 33 of 1992. Under this act, mining falls within the purview of the Geological Survey and Mines Bureau (GSMB). Mining and exploitation for minerals, including sand, must be licensed under the act by the GSMB. Mining licenses are issued only to a qualified individuals and companies registered to do business in Sri Lanka. Mining is not permitted within Archaeological Reserves and within specified distance of monuments. New mining licenses are subject to the EIA process, if the type and extent of mining is listed under the EIA regulations. Additionally, the GSMB has power to stipulate conditions including the taking of deposits and insurance for the protection of environment. Regulations made by the GSMB under the act cover a variety of environmental stipulations, criteria and conditions for licensing and operating mines.

This also covers the disposal of mine wastes. The act also deals with the health, safety and welfare of miners. Reclamation of mines is a major problem in Sri Lanka and due to current practice requires the mining enterprise to make a deposit to cover costs of recovery. The deposit however is inadequate for the purpose. Large extents of mined areas, particularly areas mined for clay and sand remain open. Mining rights on public and private land are subject to licensing by the GSMB and all minerals wherever situated belonging to the state. The right to mine particular parcels of public lands may be subject to EIA procedures as well as to lease for permit conditions.

**Application to SCDP:** Earth and quarry material will be needed for the development work undertaken by the respective implementing agencies either directly or through contractors. In such cases quantities specified need to be extracted and permission from the GSMB is required. Alternatively, the project contractors can procure them from the open market but they will have to make sure that such sources/traders are operating with valid licenses.

### **10. Local Authorities Acts**

The Municipal Council (MC) Act No. 19 of 1987 & Urban Council (UC) Act No. 18 of 1987 provide provisions for the establishment of MCs and UCs with a view to provide greater opportunities for the people to participate effectively in decision making process relating to administrative and development activities at a local level and it specify the powers, functions and duties of such Las and provide for matters connected there with or incidental there to. These acts contain sixteen & eight parts respectively, several schedules and 327 & 249 sections respectively. The MC act, spell

out its status, powers & functions in Section IV, Section V and Section VI in sections 34 to 154 and covers public health, drainage, latrines, unhealthy buildings, conservancy & scavenging, nuisance etc. Further the respective local authorities have mandate regionally to implement the project activities and monitor the progress of compliance work.

**Application to SCDP:** Since two local authorities are involved in implementing the sub projects these acts are relevant. The infrastructure improvement subprojects funded under SCDP through the LAs comprise of the basic services they ought to render to the public in line with these acts. Subsequently, maintaining these infrastructure would be the prime duty of the local authorities.

### **11. Water Resources Board Act No. 29 of 1964**

Main responsibility under this act highlighted are control, regulation and development including the conservation and utilization of the water resources of the country. In addition, the promotion of afforestation, control of soil erosion, prevention of the pollution of rivers, streams and other water sources are also required to be considered. Mainly, the Water Resources Board is the key player of the formulation of national policies relating to the control and use of water resources of the country, as well as coordination of projects undertaken by government departments, local authorities and public corporations relating to the conservation, utilization development of the subterranean water resources of the country and the assessment of the possibilities, benefits and economic feasibilities of such projects.

**Application to SCDP:** SCDP interventions can be involved in trapping of water sources and supply drinking water and can be any kind of improvements to the hydrogeological system which has direct or indirect impact on water sources. Especially, in Jaffna district improvements to the ground water ponds will have an impact on groundwater infiltration system in considering its sensitivity, the approval of the Water Resources Board is required for such projects.

### **12. Forest Ordinance including Amendments**

The Forest Ordinance is one of the oldest ordinances in the country, first enacted in 1887 under which the Forest Department was established in 1887. This act has been amended several times in the past. The Forest Reserves gazetted under the provisions of the ordinance and all proposed reserves that are not gazetted under these provisions but selected for conservation based on biological and hydrological importance should be taken into account in implementation of this project.

**Application to SCDP:** project interventions especially lands within the purview of Forest Department, should be obtained approval from Forest Department prior to implement the activities.

### **13. National Wetland Policy**

The National Policy & strategies on Wetlands (2005) seeks to give effect to National Environment Policy and other relevant national policies, while respecting national commitments towards relevant international conventions, protocols, treaties and agreements on wetland protection to which Sri Lanka is a party. Among the International Conventions, Ramsar Convention on Wetlands of International Importance (1971), the Convention on Conservation of Migratory Species of Wild Animals (1979) and the Convention on Biological Diversity (1992) are significant.



The definition given for Wetlands in the policy is “Areas of marsh, fen, peat and or water, where natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters and may incorporate riparian and coastal zones adjacent to the wetlands and islands or bodies of marine water deeper than six meters at low tide within the wetlands”.

The policy has six sections, Introduction, need for a national policy on wetlands, principles, objectives, policy directions and explanation of key concepts. The policy directions address wetland management, institutional arrangement, inter-sectoral linkages, research, development and education. The local level and national level institutions are proposed to be established. All sectoral development plans should be based on principles of wetland ecosystem management.

Institutional Arrangement to manage wetlands is well established at present. A multi-stakeholder National Wetland Steering Committee has been established in the Ministry of Environment to advise on wetland issues in the country and wetland management unit has been set up at the Central Environmental Authority to oversee and facilitate policy implementation.

**Application to SCDP:** Project investments identified so far have no direct impacts on wetlands. However there are a number of freshwater marsh patches and mangrove habitats along some of the canals and the coastal area of Greater Galle, respectively. Any impacts to these areas will be identified in the respective project specific screening and EAs and mitigatory measures will be identified.

#### **14. The Irrigation Ordinance (Chapter 453)**

The ordinance in its part VI covers the protection of irrigation works and conservation of water in section 64. The section 65 deals with removal of encroachments. The Part V covers the construction and maintenance of major and minor irrigation schemes in sections 33, 34, 46, 54, 61, 62 and 63.

**Application to SCDP:** Tank Rehabilitation work for the Dulumadalawa and Rosneath Tanks, improvements to the water quality of the Kandy Lake as well as the rehabilitation of a number of canals in both cities will be undertaken via project interventions. As such, some of the proposed development work is in line with the legal provisions of this act. In Kandy the Irrigation Department holds the management and maintenance responsibility of both Tanks as well as the Kandy Lake and will be directly designing and implementing the project interventions.

#### **15. Agrarian Development Act No. 46 of 2000**

This act deals with implementation of the national agricultural policy. All project activities falling on lands under the jurisdiction of the Department of Agrarian Development are under the obligation Agrarian Development Act. Written permission from the Commissioner General of Agrarian Development should be obtained before any interventions within lands belongs to Department of Agrarian Development.

**Application to SCDP:** Some of the project interventions are been initially considered such as Ponds in JMC area are belonging to Agrarian Development Department purview. Therefore, prior approval from the commissioner is a prerequisite.

### **16. Mahaweli Authority of Sri Lanka Act (Act No.23 of 1979)**

This act established the Mahaweli Authority of Sri Lanka, which is the authority responsible for the implementation of the Mahaweli Ganga Development Schemes including the construction and operation of reservoirs, irrigation distribution systems and installations for the generation and supply of electrical energy.

Further, the functions of the authority include fostering and securing the full and integrated development of any special area, conservation and maintenance of the physical environment within any special area, optimizing agricultural productivity, employment potential and generation and securing economic and agricultural development within any special area, promotion and securing the co-operation of Government Departments, State Institutions, Local Authorities, public cooperation and other persons, whether private or public, in the planning and implementation of the Mahaweli Ganga Development Schemes and in the development of any special area etc.

**Application to SCDP:** Development interventions proposed to be carried out in and around Mahaweli Development area should obtain consents from Mahaweli Authority of Sri Lanka as per the Act.

### **17. The Antiquities Ordinance**

The Antiquities Ordinance (Revised in 1956 & 1998) is the main legislation dealing with Cultural Assets Preservation in Sri Lanka. Section 16 covers Ancient Monuments and their declaration as well as the declaration of specified trees as ancient monuments. According to Section 21, the restoration, repair, alteration or addition in connection with any protected monuments has to be conducted in accordance with the conditions of a permit issued by the Director General of Archaeology, or in accordance with an agreement entered in to under Section 20. Section 24 prohibits or restricts subjects to certain prescribed conditions, the erection of buildings or carrying out mining, quarrying, or blasting operations on any land within the prescribed distance of any ancient monument situated on Crown land or any protected monument. As per the ordinance the Director General of Archaeology “shall cause an impact assessment survey to be undertaken at the expense of the sponsors of such project or scheme to assess the consequences thereof upon the antiquarian, historical or archaeological aspects or value of the land in question or on any antiquities upon it and shall, within such period of time as may be agreed on.

**Application to SCDP:** The project activities will be conducted in proximity to a number of ancient monuments, in Kandy, Galle and Jaffna. Necessary clearances and permits will be obtained from the Department of Archaeology who will also be the main implementers for restoration work of interventions under the urban upgrading component of any heritage buildings or properties demarcated as ancient monuments, in Galle, Kandy and Jaffna.

### **18. Disaster Management Act No. 13 of 2005**

Under the Disaster Management Act No.13 of 2005, there is a provision to establish a National Council for Disaster Management (NCDM). The Act defines “disaster” as an actual or imminent occurrence of a natural or man-made event, which endangers or threatens to endanger the safety or health of any person or group of persons in Sri Lanka, or which destroys or damages or threatens to destroy or damage any property, and inter alia includes:

- An industrial hazard
- A fire
- An explosion
- A chemical accident
- Oils spills including inland oil spills
- Cyclones
- Tsunamis

Disasters may happen as the result of a malfunction of the normal operating procedures or precipitated by the intervention of an outside force such as a cyclone, flood or deliberate acts of arson or sabotage.

The major objective of this act is to protect human life, property and the environment of Sri Lanka from any event defined as a disaster. Therefore this act plays key role to protect the environment and provides necessary guidelines for the protection of human life, property and the environment of the country.

Major functions of the NCDM include, to formulate a National Policy and Program on the management of disasters which shall provide for the protection of life of the community and environment and the maintenance and development of disaster affected areas; the effective use of resources for preparedness prevention, response, relief, reconstruction and rehabilitation; and the enhancement of public awareness and training to help people to protect themselves from disasters.

Section 10 of the Sri Lanka Disaster Management Act stipulates that “It shall be the duty of every ministry, Government Department and public corporation to prepare a Disaster Management Plan with respect to such ministry, Government Department or public corporation to counter any disaster or impending disaster based on the National Disaster Management Plan and in accordance with such guidelines as may be specified by the National Council for Disaster Management. As per the definition of public corporation provided under Section 25 of the said act, a Disaster Management Plan is compulsory for coal-based thermal power plant operations.

**Application to SCDP:** One of SCDP’s major objectives is flood mitigation in the selected three cities. In terms of flood mitigation within these cities, interventions such as improvements of drainage networks will be undertaken. During the implementation stage, Disaster Management Centre (DMC) should play a major role in recognizing critical drains which are to be rehabilitated/improved and consent of DMC should be obtained prior to implementation of project interventions.

### **19. Prevention of Mosquito Breeding Act No. 11 of 2007**

This act has been passed for the purpose of ensuring the prevention and eradication of all mosquito-borne diseases. Under this act, it shall be the duty of every owner or occupier of any premises to cause, (a) open tins, bottles, boxes, coconut shells, split, coconuts, tyres or any other article or receptacle found in or within such premises, capable of holding water, to be removed, destroyed or otherwise effectively disposed; (b) any well found in the premises and its surroundings to be maintained and kept in good repair so as to make it mosquito-proof and thereby prevent the breeding of mosquitoes; (c) any artificial pond or pool found in such premises

to be emptied at least once every week; (d) any casual collection of water within the premises which is conducive to mosquito breeding, to be regularly drained; (e) shrubs, undergrowth and all other types of vegetation, other than those grown for the purpose of food or those which are ornamental, found within or outside any building or structure within the premises used as a dwelling place which has become a breeding place for mosquitoes, to be removed; (f) the removal and destruction of water plants having the botanical name pistiastratiotes and commonly known as “diyaparandal”, “kondepasei”, “telpassy”, “barawa-pasi”, “nanayaviraddi” and of any other water plant, or plants, found within the premises, which may facilitate the breeding of mosquitoes. Hence, this act placed to eradicate or prevent mosquito borne diseases and is mainly targeted at water sources.

**Application to SCDP:** All project interventions during the construction and operational stages should be comply with Prevention of Mosquito Breeding Act requirements to control or mitigate or avoid generation breeding sites.

#### **20. Coconut Development Act 46 of 1971 amended by Coconut Development Law, No 24 of 1975 - Section 63**

##### **Regulations stipulated in the Gazette Notification No 331 of August 18, 1978 of Palmyra Development Board**

Ministry of Plantation constituted by the Gazette Notification 331 of August 18, 1978 published in terms of introduction of amendments of 74 of 1975 to the Sri Lanka Coconut Development Act of 46 of 1921 to carry out all forms of cultivation and development in relation to Palmyra Plantation. Under this gazette notification, Palmyra Development Board established and its main office located in Jaffna district. According to this gazette notification, engaging in the regulation, control, supervision, direction, management and inspection of the cultivation and utilization of land in Palmira plantation and the cultivation of land with Palmyra palms.

**Application to SCDP:** Any of SCDP interventions requiring use of Palmyra cultivated lands, prior approval from the Palmyra Development Board has to be obtained.

#### **21. Occupational Health and Safety**

Project interventions involve multifarious activities during construction and operation and maintenance phases. These activities are also associated with problems of occupational health and safety. The problems envisaged during construction and erection stages can mainly be due to exposure to dust, accidents and noise. The problems envisaged during the operation and maintenance phase are accidents, exposure to heat, noise, arc lights, chemicals etc.

The National Policy on Occupational Safety and Health in Sri Lanka is in the drafting stage. The Labour and Labour Relations Ministry in collaboration with 25 ministries, trade unions, employers and other authorities are involved in the drafting with the intention of reducing work place related injuries and other mishaps (Ceylon Daily News; 14th November 2014).

**Application to SCDP:** All project activities, during construction should comply with Factory Ordinance requirements related to occupational, health and safety and International Labour Organization (ILO) guidelines on the same.

## 22. World Heritage Convention

The United States initiated the idea of cultural conservation with nature conservation. A White House conference in 1965 called for a 'World Heritage Trust' to preserve "the world's superb natural and scenic areas and historic sites for the present and the future of the entire world citizenry." The International Union for Conservation of Nature developed similar proposals in 1968, and they were presented in 1972 to the United Nations conference on Human Environment in Stockholm. States Parties are countries which have adhered to the World Heritage Convention. They thereby agree to identify and nominate properties on their national territory to be considered for inscription on the World Heritage List. When a State Party nominates a property, it gives details of how a property is protected and provides a management plan for its upkeep. States Parties are also expected to protect the World Heritage values of the properties.

Under the World Heritage Committee signatory countries are required to produce and submit periodic data reporting providing the World Heritage Committee with an overview of each participating nation's implementation of the World Heritage Convention and a "snapshot" of current conditions at World Heritage properties.

State parties that have ratified the World Heritage (WH) Convention, agree to assure the effective implementation of any measure to protect designated WH properties. They are bound to ensure that development or change does not impact negatively on the "Outstanding Universal Value (OUV)", integrity and/or authenticity of the property. Despite this, management deficiencies of nations that have ratified the convention and aggressive development, especially in urban areas, are the two major threats to WH properties. These are typical scenarios under the WH context within which the WH Convention has a strong mandate to ensure that proper due diligence mechanisms are undertaken.

According to the UNESCO WH Committee, over the last decade they have addressed a considerable number of Status of Conservation Reports related to threats to WH properties from various forms of large-scale development. These developments include roads, bridges, tall buildings, "box" buildings (e.g. malls), inappropriate, a contextual or insensitive developments, renewals, demolitions and new infrastructure typologies like wind farms, as well as land-use policy changes and large scale urban frameworks. The Committee has also examined threats from excessive or inappropriate tourism.

WH properties need to be seen as single entities that manifest OUV. The OUV of Heritage Assets, both designated and non-designated, is reflected in a range of attributes, and in order to sustain OUV it is those attributes that need to be protected. Heritage Impact Assessments (HIAs) have been identified by The WH Committee as the most appropriate tool to evaluate effectively the impact of potential development on the OUV of properties and ensure proper management mechanisms are put in place to mitigate any potential negative impacts. In order to provide a clear directive on the HIA requirements the International Council on Monument and Sites (ICOMOS) published the Guidance on Heritage Impact Assessments for Cultural WH Properties in January 2011. ICOMOS is the Advisory Body to the WH Committee for cultural World Heritage properties. The guidance document was prepared in order to contribute to an effective impact assessment of potential development on the OUV of properties. It is addressed to managers,

developers, consultants, donors and decision-makers, but also to the WH Committee and States Parties.

The HIA process increases objectivity related to individual assessments while providing better protection of OUV attributes. It also facilitates a clear understanding not only of the key threats and causes to OUV attributes but also on the level of integrity of OUV attributes, while considering both substantive and procedural effectiveness and continual conservation and management of the heritage asset.

**Application to SCDP:** Both Kandy and Galle have undergone an appraisal and were demarcated as UNESCO world heritage sites in 1988. In both cities heritage committees have been established within the Municipalities to collaborate with Department of Archeology and the Central Cultural Fund that are the main bodies that are responsible for conducting periodic reporting to UNESCO on the status of management and monitor the implementation of the World Heritage Convention. Periodic reporting is conducted every ten years. The last disclosed periodic reports for Galle and Kandy were completed in 2003. Status of Conservation reports have thereafter been completed for Galle with the latest being done in 2013. A primary goal of the SCDP is to ensure the sustainable management and conservation of these two heritage cities, to enhance their value and ensure it is conserved. Project interventions will look at the maintenance of many demarcated heritage buildings, monuments etc and any proposed activity will be implemented by the Department of Archeology and the Municipalities who are responsible for the ensuring all aspects of the Conventions are complied with.

## 2.3 World Bank Safeguard Policies

### a. OP 4.01 on Environmental Assessment

Projects and programs funded by IDA resources need to comply with the World Bank's operational policies. Therefore, all sub-projects eligible for funding under this project will be required to satisfy the requirements of the safeguard policies of the World Bank, in addition to conformity with national environmental regulations. The Strategic Cities Development Project (SCDP) undertakes several infrastructure subprojects and they have to be screened and impacts have to be identified. The World Bank OP4.01 discusses the environment assessment process to be followed.

The WB Operational policies that require consideration under this project OP/BP/GP4.01: Environmental Assessment, OP/BP 4.04: Natural Habitats, OP/BP 4.11: Physical Cultural Resources and will be triggered under the proposed project. Special emphasis should be given to ensure during the subproject design stage to have no or minimum impacts to the natural environment.

### World Bank safeguards policies triggered by the project

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP/GP 4.01)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Natural Habitats (OP/BP 4.04)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pest Management (OP 4.09)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Physical Cultural Resources(OP 4.11)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Involuntary Resettlement (OP/BP 4.12)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Indigenous Peoples (OD 4.20, being revised as OP 4.10)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Forests(OP/BP 4.36)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Safety of Dams (OP/BP4.37)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects on International Waterways (OP/BP/GP 7.50)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

This policy is triggered, if a project is likely to have potential (adverse) environmental risks and impacts in its area of influence. The policy requires environmental assessment (EA) of projects proposed for World Bank financing to ensure that they are environmentally sound and sustainable, and thus to improve decision making. EA should take into account the natural environment, human health and safety and social aspects in an integrated way. It should also take into account the variations in project and country conditions, the findings of country environmental studies, national environmental action plans, the country's overall policy framework and national legislation, the project sponsor's capabilities related to the environment and social aspects, and obligations of the country, pertaining to project activities, under relevant international environmental treaties and agreements.

The pollution prevention and abatement measures and emission levels that are normally acceptable to World Bank is described in the *Pollution Prevention and Abatement Handbook*. However, taking into account country's legislation and local conditions, the EA may recommend alternative emission levels and approaches to pollution prevention and abatement for the project.

### **Project Categorization**

When OP 4.01 is triggered, the World Bank classifies proposed projects in to one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

(1)A proposed project is classified as Category A, if it is likely to have significant adverse environmental impacts that are sensitive, diverse or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.

(2)A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas including wetlands, forests, grasslands and other natural habitats are less adverse than those of Category A projects. These impacts are site specific; few if any are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of an EA for Category B projects may vary from project to project, but it is narrower in scope when compared with Category A projects.

(3)A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. For example, technical assistance projects on institutional development, computerization, and training fall in Category C.

(4)A proposed project is classified as FI when the Bank provides funds to participating national banks, credit institutions and other financial intermediaries (FIs) for on lending at the Fis' risk to final borrowers.

In the case of such projects, the FI screens each sub project proposed for financing, and classifies it in to any one of three categories: A, B or C. FIs must prepare an Environmental and Social

Management Framework, following the Bank’s consultation and disclosure requirements as in the case of other safeguards documents (e.g., EAs, RAPs, IPPs). The ESMF, including the screening process for categorization of subprojects, must be spelled out in the operational manual.

**Classification of Sub Projects** (as per WB OP 4.01 Para 8)

Category	Impacts	Bank Requirement
A	Subprojects in the proposed project are characterized by creating significant adverse environmental impacts, with regard to sensitivity, diversity, irreversibility, and/or unprecedented impacts.	Comprehensive EIA and EMP
B	Subprojects in the proposed project are characterized by being small in volume and size, implying reversible environmental impacts.	Simplified EIA and EMP
C	Subprojects in the proposed project do not comprise construction works, and do not cause air, soil and water contamination.	No EA required
F1	Proposed Projects that involve investment of bank funds through a Financial Intermediary(FI), in subprojects that may result in adverse environmental impacts	The FI should screen each sub project and ensure that each sub borrower carries out appropriate EA according to sub-project category

**Environmental Assessment**

SCDP has been placed under environment **category A** given that some of the sectors involved (such as SWM) carry an inherently high risk and also lead resettlement issues. In the long run, the project is expected to bring about environmentally and socially beneficial outcomes through improved urban services and infrastructure. During the construction stage, project interventions will trigger environmental impacts. These will vary in extent, scope and nature depending on the type of intervention and the topographical setting of the sites. At the moment most of the interventions confirmed are category B type where the impacts tend to be localized and mitigatable.

As investments which are fairly straight forward and rather uncomplicated such as improvement to existing roads, drainage and urban landscaping, adverse impacts are expected to be minimal.

At appraisal, the overall project categorization will be reviewed.

**Environmental Management Plans**

According to annex C of the World Bank OP 4.01 an Environmental Management Plan (EMP) is an essential element of EA reports for Category A projects. The EMP should consist of a set of mitigation, management, monitoring, and institutional measures to be taken during implementation and operation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. The plan should also include the actions needed to implement these measures. In preparation of an EMP, the EA consultant should:



- a. Identify the set of responses to potentially adverse impacts
- b. Determine requirements for ensuring that those responses are made effectively and in a timely manner
- c. Describe the means for meeting those requirements.

A guide to preparing EMPs is attached in **Annex 3**.

**b. OP 4.04 on Natural Habitats**

OP 4.04: Natural Habitats seek to ensure that World Bank-supported infrastructure and other development projects take into account the conservation of biodiversity, as well as the numerous environmental services and products which natural habitats provide to human society. The policy strictly limits the circumstances under which any Bank-supported project can damage natural habitats (land and water areas where most of the native plant and animal species are still present). Specifically, the policy prohibits Bank support for projects which would lead to the significant loss or degradation of any Critical Natural Habitats, whose definition includes those natural habitats which are either: legally protected, officially proposed for protection, or unprotected but of known high conservation value. In other (non-critical) natural habitats, Bank supported projects can cause significant loss or degradation only when there are no feasible alternatives to achieve the project's substantial overall net benefits; and acceptable mitigation measures, such as compensatory protected areas, are included within the project. Identification and assessing of impacts to natural resources is generally undertaken as part of EA work. Where significant impacts are anticipated special habitat management plans will be required, depending on the circumstances. Also, it is essential to ensure any formal clearances/approvals are taken from relevant government authorities as per National legislations

This policy has been triggered mainly on precautionary basis because some of the project sites will be within or adjacent to protected natural habitat such as the drinking water reservoirs and roads proposed for improvements in Kandy. Also, in Galle, there are wetlands associated with the natural storm-water drainage network and could possibly be damaged during canal dredging. In Jaffna, there are extensive natural ground water aquifers, naturally formed ponds, salt marshes and shallow lagoon area are associated with the project area which might be impacted due to project interventions such as drainage improvements, urban upgrading, and road rehabilitation. However, major impacts are not anticipated.

**c. OP 4.36 on Forests**

The forest policy is a follow on from the Natural Habitats policy and applies specifically to all types of natural forests and plantation forests. The key objective of this policy is to assist the borrowing countries to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into economic development and protect vital local and global environmental services that forests provide. The Bank will not finance projects that in the Bank's opinion would involve significant conversion or degradation of critical natural forests or those that contravene applicable international environmental agreements. If a project involves significant conversion or degradation of forests the Bank must determine they are not critical, there are no other feasible alternatives and that comprehensive analysis has been carried out that demonstrates benefits outweigh environmental costs. Identification and assessing of impacts to forests is generally undertaken as part of EA work. Where significant impacts are anticipated special forest management plans will be required, depending on the circumstances. Also, it is

essential to ensure any formal clearances/approvals are taken from relevant government authorities as per national legislations. The policy also has strict stipulations on commercial forest harvesting and community aspects on forest management. The policy is usually triggered when projects are expected to have impacts on health and quality of forests, rights and welfare of people who depend on forest resources and those that aim to bring about changes to management, protection and utilization of forests and plantations.

This policy has been triggered mainly on precautionary basis because some of the project sites will be within or adjacent to protected natural habitat such as the drinking water reservoirs and roads proposed for improvements in Kandy.

**d. OP 4.11 on Physical Cultural Resources (PCR) Policy**

The World Bank acknowledges that Cultural resources are of extreme importance, as sources of valuable historical and scientific information, as assets for economic and social development, and as integral parts of a people's cultural identity and practices. The loss of such resources is irreversible, but fortunately, it is often avoidable.

The objective of the World Bank safeguard policy OP/BP 4.11 on Physical Cultural Resources is to avoid, or mitigate, adverse impacts on cultural resources from development projects that the institution finances. Identification and assessment of impacts to PCRs is generally undertaken as part of the Environmental Assessment process and any mitigation measures are included in the Environmental Management Plans prepared for specific projects.

However in projects where direct impacts on PCRs are envisioned, due diligence mechanisms that are more detailed and will focus specifically on the impacts to cultural heritage assets are undertaken as part of the safeguard procedures. This has been commonly observed in projects working on Urban Upgrading and projects that are located within designated World Heritage cities. Where specific conservation interventions historical restoration and/or adaptive reuse of heritage assets are undertake, approved plan for the management of potential safeguards issues will be necessary. Under this policy too it is essential to ensure any formal clearances/approvals are taken from relevant government authorities as per National legislations.

The policy on Physical Cultural Resources has been triggered under the Strategic Cities Development Project (SCDP) as the cities the project is working in have a rich historical and cultural significance to Sri Lanka. The cities of Kandy and Galle, the original parent project locations, are home to World Heritage Sites and the city of Jaffna hold a rich historical and cultural significance as the Capital of the Northern Province. In addition Kandy, Galle and Jaffna possess many important heritage sites and buildings which could be adversely affected during the implementation of physical interventions if precautions are not taken. The city of Kandy as a whole has been designated a World Heritage Site as well as the Galle Fort, in Galle. This designation gives these locations acknowledged international importance as they are inscribed as WH properties and the OUV is globally. Kandy, Galle and Jaffna are cities rich in cultural heritage and requires particular attention to mitigate any negative impacts on PCRs that can take place either directly or indirectly during project implementation.

**Consultations and Disclosure Requirements**

For all Category A projects and as appropriate for Category B projects during the EA process, the

project sponsor should consult project-affected groups and local non-governmental organizations (NGOs) about the project's environmental aspects and take their views into account. The project sponsor should initiate such consultations as early as possible. For Category A projects, the project sponsor should consult these groups at least twice (a) shortly after environmental screening and before the terms of reference for the EA are finalized, and (b) once a draft EA report is prepared. In addition, the project sponsor should consult with such groups throughout project implementation, as necessary to address EA related issues that affect them.

**Application to SCDP:** In order to comply with the safeguard policies triggered the GOSL is carrying out an Environmental Assessment and Management Framework (EAMF) and project-specific screening and preparation of Environmental Management Plans for all project interventions. The implementing agency will publicly disclose this draft final EAMF for public review and comments in appropriate locations for a period of 120 days in keeping with the Pelosi requirement for Category A project. It will also be made available in the ministry website. Newspaper and other media outlet will be needed to alert the community to the availability of the documentation. The EAMF will also be made available at IDA's public information center.

#### **2.4 World Heritage Convention**

The United States initiated the idea of cultural conservation with nature conservation. A White House conference in 1965 called for a 'World Heritage Trust' to preserve "the world's superb natural and scenic areas and historic sites for the present and the future of the entire world citizenry." The International Union for Conservation of Nature developed similar proposals in 1968, and they were presented in 1972 to the United Nations conference on Human Environment in Stockholm. States Parties are countries which have adhered to the World Heritage Convention. They thereby agree to identify and nominate properties on their national territory to be considered for inscription on the World Heritage List. When a State Party nominates a property, it gives details of how a property is protected and provides a management plan for its upkeep. States Parties are also expected to protect the World Heritage values of the properties.

Under the World Heritage Committee signatory countries are required to produce and submit periodic data reporting providing the World Heritage Committee with an overview of each participating nation's implementation of the World Heritage Convention and a "snapshot" of current conditions at World Heritage properties.

**Application to SCDP:** Both Kandy and Galle have undergone an appraisal and were demarcated as UNESCO world heritage sites in 1988. In both cities heritage committees have been established within the Municipalities to collaborate with Department of Archeology and the Central Cultural Fund that are the main bodies that are responsible for conducting periodic reporting to UNESCO on the status of management and monitor the implementation of the World Heritage Convention. Periodic reporting is conducted every ten years. The last disclosed periodic reports for Galle and Kandy were completed in 2003. Status of Conservation reports have thereafter been completed for Galle with the latest being done in 2013. A primary goal of the SCDP is to ensure the sustainable management and conservation of these two heritage cities, to enhance their value and ensure it is conserved. Project interventions will look at the maintenance of many demarcated heritage buildings, monuments etc and any proposed activity will be implemented by the Department of Archeology and the Municipalities who are responsible for the ensuring all aspects of the Conventions are complied with.

## CHAPTER 3: DESCRIPTION OF THE PROJECT AREA

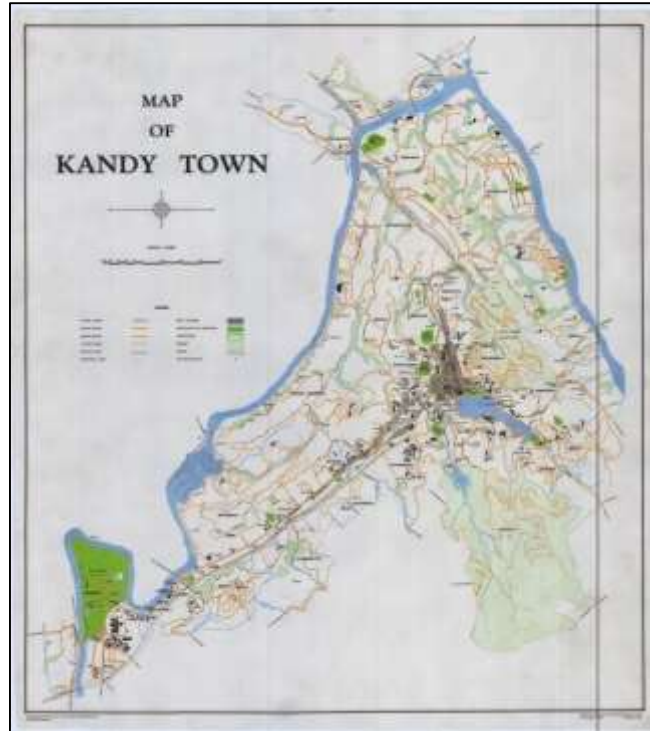
### 3.1 Kandy

Located at the center of Sri Lanka, at an altitude of 488.6m (1629 Feet) above sea level, the city of Kandy is well known both locally and internationally for its historical significance and scenic beauty. Surrounded by the Hantanne Mountain range, the city has been established in the Valley of the Mahaveli River and covers a land area of 1917 square Kilometers. The Mahaveli River, which is the longest running river in Sri Lanka, flows on the Northern, Western and Eastern edges of the city. Referred to as “Maha Nuwara,” which means “Great City,” it is the capital of the Central Province and Kandy District of Sri Lanka. The Central Province encompasses three districts, Kandy, Matale and Nuwara Eliya, which are all located in the central region of the Island. Kandy has become both a residential and commercial hub over the last few decades and has experienced rapid urban development

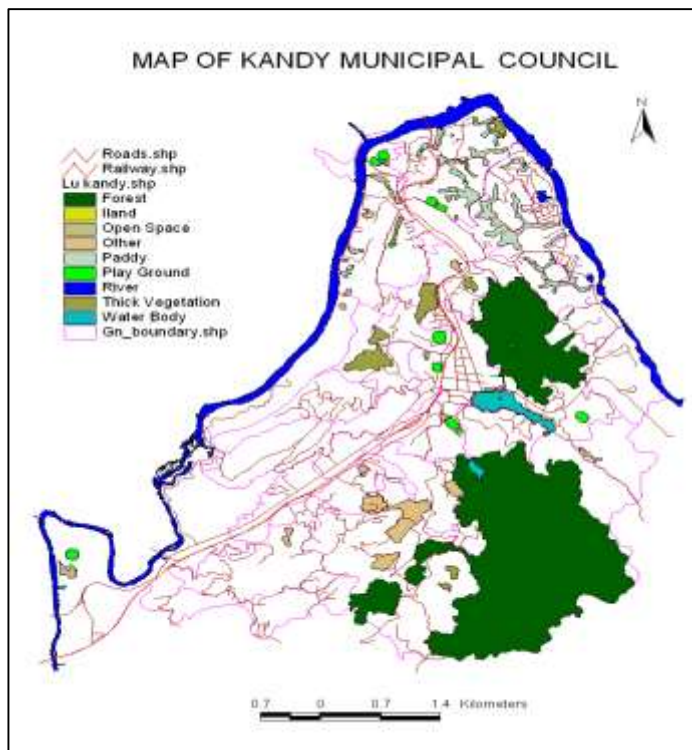
#### 3.1.1 Urban Morphology

Being the gateway to the central highlands, Kandy’s geographic location has made it a major transportation and commercial hub. The city is accessible via road from all directions of the island and the railway line that connects the western province to the central highlands also runs across Kandy. Over the years its strategic positioning has made the city a residential, commercial and administrative hub and it has grown to becoming the second largest city on the Island. The city sees a large influx of people daily as many of the provinces major schools, hospitals, commercial and administrative units are located within the city limits of Kandy. A large number of local pilgrims and tourists also visit the city as it is the home of the Dalada Maligawa, the Temple of the Sacred Tooth Relic of Lord Buddha and the Royal Palace complex, the Royal Botanical Gardens, and a number of other historically and culturally significant sites. Kandy was designated a World Heritage Site by UNESCO in 1986.

Almost 50% of the land area in Kandy consists of residential and commercial areas .The Kandy Municipal area is divided into 23 Municipal Council Wards and 39 Grama Niladari Divisions. A Grama Niladari Division is basically a designated neighborhood that falls under the administration of a member of the local authority referred to as a Grama Seva Niladari. A central business district is located at the center of the city, also referred to as the grid city, surrounded by three commercial zones. Peradeniya, Mahaiyawa-Katugastota and the Tennekumbura areas form these commercial zones. Residential areas in the city follow almost three fourths of the perimeter of the inner city. Commercial activities are mostly active in the central business district; the areas along the Peradeniya Road and towards the Katugastota area are the city’s main urban localities. The cities administrative complex, except for the Municipal Council and District Secretariat, were moved to the Kundasala area in order to reduce congestion within the municipal city limits.



The city is also home to three forest reservations, the Udawatta Kalle Rainforest Reserve in the Center of the city and the Dulumadalawa Sanctuary and Hantanne Forest Area, which is yet to be demarcated a forest reserve officially, to the South East of the city. About 15% of the land has been designated as forest reservations.



<b>Kandy: Demographics</b>	
Area	28'53 Sq Km
Population	
Living	150,000
Transit	600,000
Assessment Units	
Residential	28000
Other	17000
Wards	23

### 3.1.2 Physical Environment

#### 3.1.2.1 Topography

Kandy is surrounded by a triangular mountain range, namely the Hantana and Knuckles mountain ranges. The three entrances to the city are located at each apex of the triangle and the other towards the valley on the eastern mountain range. The elevation of these entrances are approximately 450m in the north side (A10 road), 520m in the eastern side (A26 road), 580m southern side (B39 road) and 530m western direction (A1 road) respectively. The area encompassing of greater Kandy consists of hilly terrain. According to the National Building Research Organization, building on steep slopes have made this terrain susceptible to landslides and earth slips, predominantly during seasons of heavy rain. Areas such as Suduhumpola, Mahaiyawa, Bahirawakanda, Nuwarawela and Ginihiriya, in the greater Kandy area, have been zoned as areas of high risk landslide areas.

#### 3.1.2.2 Climate

Due to its geographic location being in the center of the island, at a high elevation, Kandy has a wetter and cooler climate than the tropical climate common to other regions of Sri Lanka. The city has a dry season from December through April followed by a season of Monsoonal rain from May through July and December to January. Mean Annual rainfall recorded from the South-west Monsoon (April to August) is 1800-2500mm. During the intermonsoonal period, from March throughout mid-May, the city experiences light rain and strong humidity. Average levels of humidity in greater Kandy have been recorded between 70-79%.

**Table 1: Typical Climatic Data for Kandy-2012**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Mean Temperature ( °C)	23.4	24.2	25.6	26.1	25.7	24.8	24.5	24.4	24.3	24.4	24.2	23.7	24.7
Precipitation (mm)	79	74	71	188	144	132	128	113	155	264	296	196	1,840
Avg. rainy days	6	5	8	14	11	15	14	13	13	17	16	14	146

*Source-World Climate*

### 3.1.2.3 Main Water bodies and flow regimes

#### Kandy Lake

The Kandy Lake is a man-made body of water in the center of the city, built under the decree of the last Kandyan King Sri Wickrama Rajasingha. Historical records document that the lake was built on land that was previously a paddy field over the period of 1810-1812. Situated opposite the Dalada Maligawa, the lake is connected to the Palace moat and drains out in to the Meda Ela. A number of canals from the hilly regions along Rajapihilla Mawatha and the Ampitiya area also feed in to the lake.

**Table 2: Features of the Kandy Lake**

<b>Features of the Kandy Lake</b>	
Catchment Area	2.85 Sq.Km
Water Surface Area	0.81 Sq.Km
Perimeter	3.05km
Capacity	0.867mcm
Maximum depth	12.5m
Spill Gates	2
Major Silt traps	5
Minor Silt traps	23

The water quality of the Kandy Lake has been deteriorating due to the grey water (sewer and house waste) entering the lake and due to high silting. Algal blooms and sudden fish kills have also been reported a number of times due to eutrophication. The management responsibility of the Kandy Lake was under the purview of Kandy Municipal Council (KMC) from year 1970 to 1997 and was vested with the Department of Irrigation (DI) in 1997. According to the DI, some of the major current challenges with the management of the lake are; excessive erosion at the earthen banks of lake, encroachments into the reservations, dilapidated condition of pavements along the perimeter of the lake, spreading of water weeds in the water spread area, condition of the “Walakulu Bamma” at the verge of collapse, formation of algae in the water body, sudden algal bloom and eutrophication, heavy siltation at the tank bed as well as at silt traps and litter around the surrounding areas, polluting the lake.

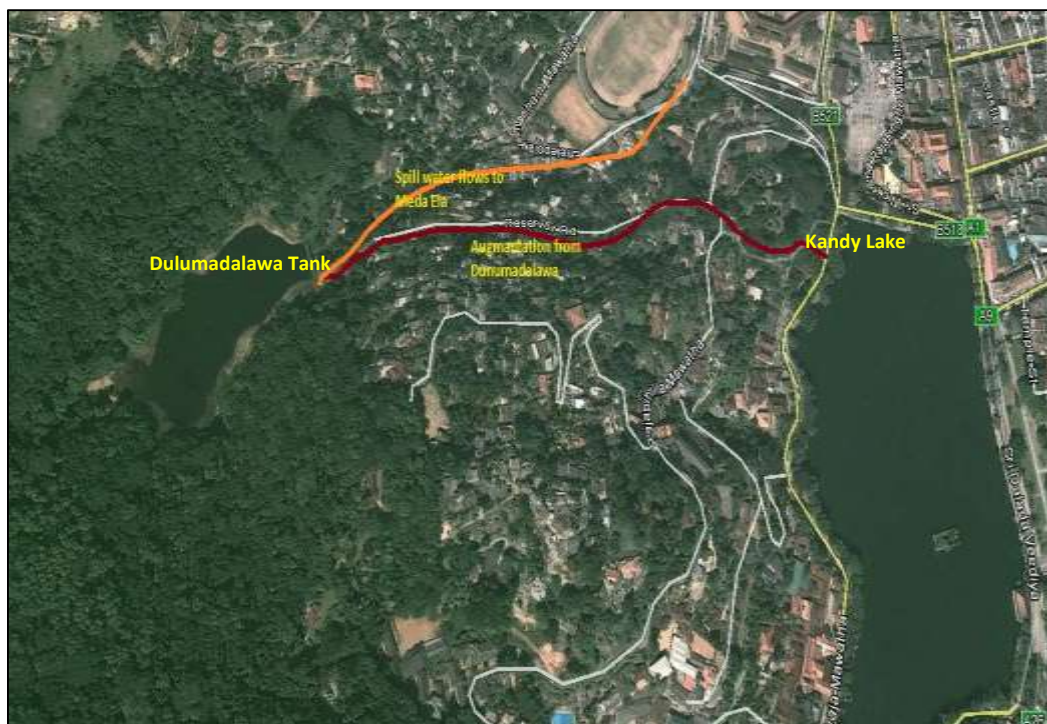


Figure 1: Map of Kandy Lake and Dunumadalawa Tank

### Dulumadalawa and Rosneth Reservoirs

Dunumadalawa (stone dam) and Rosneth (earthen dam) natural water reservoirs of capacity 74,000 m<sup>3</sup> and 6,000 m<sup>3</sup> respectively, are situated in the **Hantana** forest sanctuary and was built about 130 years ago. Since then the reservoirs have not been renovated and currently water leaks can be observed. The reservoirs provide 10% of the city's drinking water. Both reservoirs and owned and managed by the Irrigation Department. The Dulumadalawa Forest Reserve and Hantana forest form the main catchment for the two reservoirs and ensure that the tanks have a continuous supply of water throughout the dry season as well. Spill water from the Dulumadalawa reservoir spills in to the Meda Ela Canal.

### Meda Ela

The Meda Ela is a stream that carries spill water from the Kandy Lake to the Mahaweli River. It flows across an urbanized sub-catchment that covers substantial part of Kandy city. Commercial establishments, residential areas and hospitals along its pathway have direct sewerage outlets connected to the stream. It also receives waste water directly and indirectly from tourist hotels, schools, the central market and other establishments in the catchment area. A network of wastewater canals draining from various parts of Kandy city are connected with Meda Ela while it flows towards Mahaweli. In addition, it is fed by a number of perennial and seasonal streams draining from the adjacent hilly terrain. The uppermost branch streams of the canal are used by local residents for bathing, washing and other household purposes. The canal is heavily polluted by both liquid and solid waste as well as waste water and poses a number of environmental concerns to the residents that live along the canal as well as to the Mahaweli River where it drains in to. Studies, conducted by the University of Peradeniya in 2011, have shown that there is a reduction of dissolve oxygen (DO) in correlation with the depth of water within the canal and mass mortality of fish has also been recorded at rates of 150 fish per day due to high levels of



pollution. Apart from this general physical condition of the canal has been dilapidated due to encroachments and poor management.



Figure 2: Map of Meda Ela

### 3.1.3 Ecologically Important/Sensitive Habitats

#### 3.1.3.1 Udawatte Kelle Sanctuary

Designated as a forest reserve in 1856 and then a Sanctuary from 1938, the Udawatta Kelle Sanctuary is a historic forest reserve situated on a hill ridged stretching between the Dalada Maligawa and the uplands of the Aruppola suburbs over 103 hectares. The highest point of the ridge, Kodimale peak, is recorded at an elevation of 635 meters above sea level and 115 meters above the Kandy Lake. Sites of cultural importance such as a small tank, located in the center of the sanctuary, the Senkada Cave, a number of key forest Hermitages (Forest hermitage, Senanayaka Aramaya, Tapovana temple, Keerthi Sri Pothgul Viharaya Siriwardanaramaya and the ancient Gangarama Viharaya are the five famous temples found within the demarcation of the Udawattakelle Sanctuary. The British Garrison cemetery, in Udawattakele is also considered a site of historic significant as it houses the tombs of many colonial officials that governed the city during that era.

The vegetation in the Sanctuary comprises of fairly dense forest, predominantly secondary and plantation formation. Up to 460 species of plants, of which 135 are tree species and 11 are liana species, of which 9 are endemic, have been recorded at the Sanctuary. The floristic composition of Udawattakele is dominated by Mahogany (*Swieteniamacrophylla*), Magnoliaceae (*Micheliachampaca*), Ceylon Ironwood (*ferrea*) and Peru Balsam (*Myroxylonbalsamum*). Peru Palsam is an exotic introduced species that has later become invasive and is currently threatening the biodiversity of the forest. A very rare endemic orchid species, commonly known as the Wesak Orchid (*Dendrobium mac-carthiae*) is also found within Udawatte Kelle. Massive climbers, locally called 'Pus Wel' is a unique feature of the Sanctuary. These massive climbers are endemic to Sri Lanka and have pods that are over 5 feet long. The Sanctuary is home to a Giant Puswella (*Entadapusaetha*) is recorded to be over 300 years old and is located near the Kodimale peak.

The Udawatte Kelle sanctuary is well known as a haven for avian species. Over 80 avifaunal species have been recorded at the Sanctuary. These include endemic bird species such as the

Layard's Parakeet (*Psittaculacalthropae*), Yellow-fronted Barbet (*Megalaimaflavifrons*), and Brown-capped Babbler (*Pellorneumfuscocapillus*). The rare Three-toed Kingfisher *Ceyxerythacus* has also been observed occasionally within the Sanctuary. The Sri Lanka Myna, Golden-fronted Leaf bird, Blue-winged Leaf bird, Spotted Dove, Emerald Dove, Tickell's Blue Flycatcher, Crimson-fronted Barbet, Brown-headed Barbet and Black-backed Kingfisher are common dwellers. Among Nationally threatened avifaunal species the Red-faced Malkoha and Kashmir Flycatcher are found within the Sanctuary, these have been recorded in the IUCN Red List for 2013 as well as the National Red List for 2013.

The Sanctuary is also home to array of mammals, reptile and amphibian species. Many of these are nocturnal species are found in the dense centers. Common mammals that inhabit the sanctuary include the endemic Pale-fronted Toque Macaque (*Macacasinicaaurifrons*), Mouse deer (*Moschiolameminna*), Porcupine (*Hysterixindica*), Indian Muntjac, Wild Boar, Asian Palm Civet, Golden Palm Civet, Small Indian Civet, Ruddy Mongoose, Indian Giant Flying Squirrel, Greater Bandicoot Rat, Dusky Palm Squirrel, Indian Pangolin, Greater False Vampire Bat, Slender loris and Indian Flying-fox. Species of snakes such as the common hump-nosed pit viper (*Hypnalehypnale*), Green vine snake (*Ahaetullanasuta*), Green pit viper (*Trimeresurustrigonocephalus*), Banded kukri (*Oligodonarnensis*), Boie's rough-sided snake (*Aspidurabrachyorrhos*) Sri Lanka Cat Snake (*Boigaceylonensis*), Oriental Ratsnake (*Ptyas mucosus*) and Spectacled cobra (*Najanaja*). Lizards that can be seen include the Green Forest Lizard (*Calotes calotes*), Sri Lanka Kangaroo-lizard (*Otocryptiswiegmanni*) and the Whistling lizard (*Calotesliolepis*). There are also several species of skinks, geckos, frogs and toads and a wide variety of insects as well as some species of butterflies that inhabit the wet zone of the Island.

Heavy encroachment by squatters and land grabbing by surrounding land owners have reduced the size of the sanctuary over the last few decades. Serious initiatives to both protect and manage the sanctuary have not been taken by the Forest Department nor the KMC. Significant threat to the forest ecosystem is posed by invasive and introduced plant species that are rapidly crowding away native tree and plant species found within the sanctuary, there by threatening the faunal species that inhabit it. Species such as Peru balsam, Devils Ivy (*Epipremnum aureum*), Mahaogony, Glow Vine (*Sariataemagnifica*), and Philippine Evergreen (*Aglaoneamacommunitatum*) are among the most common species that pose a high threat to the Sanctuary's native biodiversity. Severely degraded forest areas are situated between the Temple of the Tooth, the forest department office at the western entrance, and the slopes northeast of the royal pond. A few patches of unspoiled forest, with mostly native species of trees and shrubs, are remaining on the northern and eastern sides of the forest. There is also a patch of native forest on the southeastern side, near the forest department office at the southeastern entrance. Over the last decade there has also been a recorded increase in the population of wild boar and endemic Pale-fronted Toque Macaque monkeys within the Sanctuary due to the absence of sufficient numbers of predators to control population outbursts. This has also lead to reported cases of human-animal conflict in areas along the perimeter of the sanctuary with animals often venturing in to urban areas in search of food.

### **3.1.3.2 Dulumadalawa Forest Reserve and the Hantana Range**

The Dulumadalawa forest reserve, was formally known as the Walker Estate (or "Wakara-watte"), consisting of the Dorwin and Roseneath estates, this area was released from plantation type and subsequently been allowed to naturally regenerate with some plant species being reforested within the last 5 years. Dulumadalawa was designated a forest reserve and spans

across 480 hectares. The reserve is made up of secondary growth forest, having once been the site of coffee, tea and cocoa plantations.

Its immediate borders are Pinus plantations to the southeast at Matinapatana which then run into home-garden villages and a small, private tea estate; the Tea Research Institute and Hantane tea estate to the west which is the beginning of extensive tea cultivation leading to Heeresagala, Bowalwatte and the Hantane hills in the southwest; Kandy town to the north; and Ampitiya town and other villages on the east. It appears to be the northern terminus of what could be a vitally important corridor of forest and agricultural estate land that runs via the Hantane range south through Galaha to the Piduratalagala reserve and beyond via Hakgala all the way to Horton Plains, the Boga valley and Peak Wilderness. This fragile, contiguous corridor is potentially of vital importance as it encompasses a major portion of the central hill country inclusive of representative low, middle and high altitude wilderness areas.

It is characterized by high canopy mixed forest dominated by several species including Albizzia and Jak remaining from the estate days. The abundant Jak appears to provide an important continuous food source for the toque macaques (*Macacasinicaaurifrons*), barking deer (*Cerousmuntjak*), a decreasing species, and wild boar (*Susscrofa*) that inhabit the forest. Large-leaf mahogany (*Sweitiniamacrophylla*), Ceylon almond (*Canariumzeylanicum*) and various Ficus species are also conspicuous. Tea, coffee and cocoa plants grow wild and in some places as well. Dulumadalawa has been noted over the last decade as a key habitat for the Sri Lankan montane zone leopard (*Pantheraparduskotiya*) and the fishing cats (*Prionailurusviverrinus*), both decreasing species as per the National and IUCN Red Lists for 2013, golden palm civets (*Paradoxuruszeylonensis*), common ring-tailed civets (*Viverriculaindica*) and mouse deer (*Moschiolameminna*). It has become one of the main sites for the Leopard Project, aiming to conserve the leopard and big cat populations on the Island, run by the Wilderness and Wildlife Conservation Trust, Sri Lanka, since 2003

### **3.1.3.3 Kandy Lake and Surrounding Catchment**

The area around the Kandy Lake and the lake itself is also a habitat for a number of avian and amphibian species. A variety of trees that include, Nuga, Palm, Sal, Mara and fruit trees have been planted along the lake. Many of them are almost 100 years old according to the KMC, who maintains these trees. These large trees also offer nesting and roosting space for migratory birds during the winter months. There is a resident population of Monitor lizards, tortoises and frogs as well as birds such as the Indian Cormorant, White Egret Crane, Wood Stork and Pelican among the most commonly seen.

### **3.1.4 Built Environment**

The cities built environment has been developed around an elongated square, referred to as the grid city and the quadrangular Kandy Lake. The northern edge of the grid city is where the administrative buildings of the old capital are located, including the Municipal council. On the north shore of the Kandy Lake are the city's main buildings of cultural and religious importance, The Dalada Maligawa which encompasses of the Temple of the Tooth and the Royal Place Complex. A number of Buddhist monasteries also dot the outskirts of the main city.

The city stretched out from the east to the residential and commercial areas of Tennekumburua, Kundasala and Gurudeniya from the west to Peradeniya and from the South to the Hantana area.

The Northern access to the city continues on towards Katugastota. Commercial areas are housed along the main access roads in these areas and built in a densely packed manner. Residential areas have spread towards the hilly areas, with access roads and buildings built in to the contours of the terrain

The Grid city area is Kandy's main commercial hub. A densely populated area along a grid of streets, houses mainly commercial buildings, of which many are, designated historic buildings. Historically the grid city area was where the Ministers and courtiers of the Kandyan kingdom resided and it was also an active hub during the colonial times. Many of the streets and structures including storm water drainage structures were built during the colonial times and are still used today.

### **3.1.5 Historical and Cultural Importance of Kandy**

Kandy has become the foremost cultural city of Sri Lanka due to a rich heritage of living monument. Not only is it home to a multitude of Buddhist religious monuments, but it plays center stage for over 600 years of recorded local history. According to historical records the city of Kandy was first established, under the name "Senkadagalapura," by King Wicramabahu the III during his reign, amid 1357-1374 AD. The present name of the city, "Kandy" originated during the Colonial Era. Three generations of kings ruled the kingdom from Kandy there on forth. It was under the reign of King Wimaladarmasuriya I, which the Sacred Tooth Relic of the Lord Buddha was brought to Kandy and was enshrined at the royal palace complex, which subsequently developed into the Sri Dalada Maligawa. The country's most important Buddhist monasteries, Asgiriya and Malwatta, were also established in Kandy in 1753. From 1592 onwards Kandy, was the last remaining independent kingdom in the Island since the coastal regions has been conquered by the Portuguese. In 1815 the Kandyan Convention was signed between the British and Kandyan aristocrats, this convention recognized the King of England as the ruler of the Kingdom and Kandy became part of the British Empire. The last known King of Sri Lanka, Sri Wickrema Rajasinghe ruled from Kandy and who was exiled to South India by the British during the Colonial Era and the capital was moved to Colombo.

#### **Archeologically and Culturally significant sights**

Kandy city has been declared by UNESCO as a Living World Heritage Site. Thirty two buildings in the city have been identified as heritage buildings and the UNESCO symbol has been displayed on the walls of these buildings, demarcating them as key physical cultural resources. Kandy is also designated as a sacred city by the Urban Development Authority of Sri Lanka. There are an innumerable number of landmarks and buildings from the time of the Kandyan Kings as well as the colonial era. Many of these have been converted to be used for modern day purposes but their historical value is preserved. Temple complexes, such as the Dalada Maligawa, the Asgiriya and Malwatta Monastic complexes, a series of smaller temples and monasteries, churches, Hindu temples and mosques dot the city and are visited by pilgrims and tourists regularly. The KMC is currently in the process of preparing a detailed map of all demarcated culturally and archeologically significant sites within the city. Descriptions of the main sites are provided in **Annex 4**.

### **3.1.6 Other Areas of Environmental Concern**

#### **3.1.6.1 Solid Waste Management**

The KMC currently collects about 120 tons of solid waste daily throughout its municipal area and disposes in a temporary dump site at Gohagoda, located 7 km from the town Centre and about 100 m from the Mahaweli River. This open dump has been used by the KMC for the last 30 years and is estimated to carry about 250,000 tons of waste. The landfill is likely only to have a useful life of another 2-3 years and is a huge environmental and public health concern. The Central Environment Authority (CEA), through its National Solid Waste Management Program, has planned to construct a Regional Waste Management Facility (RWMF) in Udunuwara, 26 km away from the Kandy city Centre, for the utilization of the KMC and 10 other Local Authorities (LA) in the region. The KMC has expressed interest to join the regional waste management program but is challenged with capacity constraints in long-distance waste haulage and the associated costs.

#### **3.1.6.2 Traffic Congestion**

Due to its positioning as a gateway to the central highlands and being the main commercial and administrative hub, Kandy sees a large influx of traffic into the city. Traffic congestion within the grid city area has become a major problem. Due to many of the major roads being located on hilly areas, they are steep and narrow in nature leading to major traffic congestion, especially in areas around the lake, grid city and Peradeniya areas during morning and afternoon rush hours.

### **3.2 Galle**

The city of Galle is the administrative capital of the Southern Province and the district capital of the Galle district. A major coastal city situated on the Island's Southwestern tip, Galle is a 120Km drive away from Colombo. It is the administrative and commercial hub for the Southern regions of the island, with major schools hospitals and administrative units being located within the city. The Greater Galle region includes the coastal cities of Hikkaduwa, Unawatuna as well. Historically a port city, it is also a Heritage city with the Galle fort area being demarcated a Living UNESCO World Heritage Site. The city has a rich a vibrant history and culture, unique to itself, having lived through both a Portuguese and Dutch Colonial period. Today, Galle is a bustling city and undergoing rapid urban development in order to meet the demands

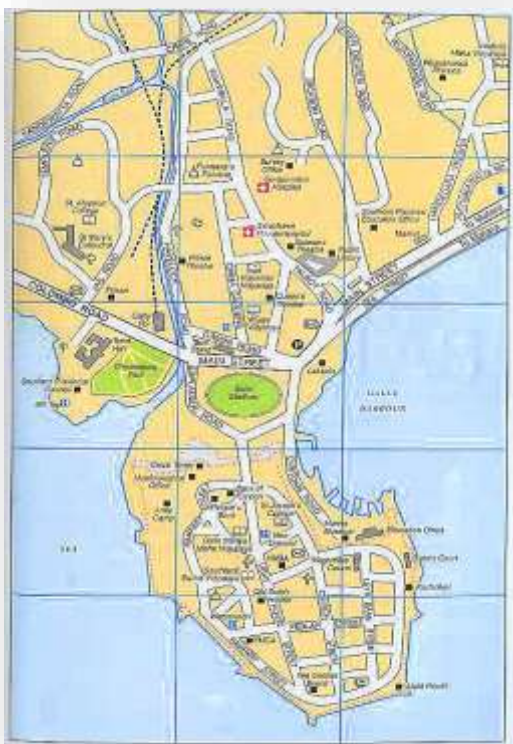
#### **3.2.1 Urban Morphology**

Located between the major tourist destinations of Hikkaduwa and Unawatuna the city is built along the southern coastal belt that opens to the Indian Ocean. The Greater Galle area, including Unawatuna to the South and Hikkaduwa to the North, the city is accessible via the Southern highway and the Southern expressway as well as via rail. Regional sub offices of main governmental Departments and higher order social facilities such as schools, commercial units, banks and hospitals are also located within Galle. The teaching Hospitals at Mahamodara and Karapitiya are two major hospitals that are located in Galle that attract a large influx of people who seek medical facilities. A hub for regional economic activities, Galle is also a popular tourism destination. Agricultural lands are found along the hinterlands of greater Galle while fishery is also a major activity in the coastal belt.

The Galle Municipal Council area covers an extent of 1742.4 hectares, and consists of 15 wards, whose locations and areas which in turn are subdivided in to 43 Grama Niladari Divisions. The city is divided in to the new town area and the fort area. The fort is a residential and commercial

area, with a number of shops, restaurants, museums and galleries and has a unique urban morphology of its own, which attracts local and foreign tourists. The city's main residential, economic and commercial areas are located in the new town. According to the Department of Census and Statistics, the recorded resident population in Galle was 96,836 individuals and its population density was noted as 56 persons/hectare.

On 26 December 2004 the city was devastated by the massive Boxing Day Tsunami caused by the 2004 Indian Ocean earthquake that occurred off the coast of Indonesia. Thousands were killed in the city alone and much of the city's physical infrastructure, including the fort was damaged. Over the last 9 years much of it has been rehabilitated and the city has seen rapid urban development.



### **3.2.2 Physical Environment**

#### **3.2.2.1 Topography**

The city of Galle is situated in the South West coastal plains where most of the land is flat, except for a few hillocks such as the Rumasala area. The area is formed by two shallow ridges extending North South and sloping towards the East and West. Some parts of the central area are almost at mean sea level. Corel reefs, wet lands & lagoons with mangrove patches are observed as geographical formation along the coastal zone.

#### **3.2.2.2 Climate**

Galle, receives sufficient rainfall from the South West Monsoon and heavy rainfall is typically recorded in the Months between May and September annually. Due to its positioning by the coast, rainfalls due to convectional cyclones are also common. Annual rainfall is recorded at 2000 mm. The driest period is between January to March.

Day temperatures range from 28C to 31C and night temperatures 24C to 26C. The Relative Humidity is around 80 to 88 percent.

#### **3.2.2.3 Main Water bodies and flow regimes**

To the North West of the city one of the country's main rivers, the Gin Ganga flows out to sea at Gintota. It is the main source of water supply to the town. At the Eastern end, a major stream the Moragoda Ela runs across the town and discharges at Magalle. There are also a few other water bodies, the largest being Mahamodera Lake fed by Bope Ela. The main drainage of the town is discharged to the sea through the Morgaoda Ela and three other canals namely the Unawatuna Ela, Kepu Ela and Modara Ela. These take the outflow from roadside drains in to the sea are not in good condition. The water flowing in these canals are polluted with wastewater, solid and liquid waste coming in from the city center and residential areas. The water supply to the GMC

is obtained from three sources, the rain fed reservoir at Hiyare and the other is Gin Ganga river intake. Both sources feed the 1.0 million gallon (4550 M<sup>3</sup>) reservoir at Beeke.

### 3.2.3 Biological Environment

#### 3.2.3.1 Ecologically Important/Sensitive Habitats

##### Rummasala Hill

The Rumassala area is a 20 hectare forest range that outcrops to the Indian Ocean from Galle. The mountain is famous as folk laws often connect it to the mythical tales of the Hindu epic the Ramayan. Many species of flora that are commonly found in the Himalayan region of India have been recorded in Rumassala. In addition to luxuriant vegetation of Rumassala it is also the primary habitat for a variety of avifaunal species such as the white-breasted kingfishers, black-capped and white-browed bulbuls, spotted doves, common mynahs, Brahminy kites and tailorbirds. Butterflies like the glassy tiger, blue mormon, common Jezebel, crimson rose and tawny coasters are also commonly seen, in addition to reptiles like green garden lizards and land monitors. Mammals such purple faced leaf monkeys, mouse deer and other small mammals also inhabit the forest of Rumassala.

##### Coral Reefs of Hikkaduwa

The coral reef in Hikkaduwa is a designated National Park. A fringing reef with a high biodiversity the reef was declared a wildlife sanctuary on May 18, 1979 and upgraded to a nature reserve with extended land area on August 14, 1988. However major boosts in tourism over the last two decades led to major degradation of reef and its habitat. Thus in order to strengthen the initiatives to ensure its protection, the reef was declared a national park in September 2002. Located off the coastal strip of Hikkaduwa the reef overlooks major hotels and guest houses densely built and has a high rate of annual visitation. The reef has suffered high degradation due to both natural and human activities. The live coral cover was decreased from 47 percent to 13 percent in a coral bleaching event in 1998, induced by the 1998 El Niño. Much of the reef is dead, except for a few patches, yet studies have shown that regeneration is slowly taking place.

The main species of coral that dominates this reef is Folioseous Montipora, Faviidae and Poritidae corals are contained in the inshore areas of the reef in massive colonies. Staghorn, elkhorn, cabbage, brain, table and star corals are all present in the reef. Over 60 species of coral belonging to 31 genera have been recorded in Hikkaduwa of which *Poritesdesilveri* is an endemic coral species of Sri Lanka which is an endangered species as per the IUCN Red List for 2013.

The reef also recorded over 170 species of reef fish belonging to 76 genera. Sea grass and marine algae belonging to genera Halimeda and Caulerpa also inhabit the sea bed areas of depths ranging from 5-10 m. These seagrass beds provide the perfect habitat for. Eight species of ornamental fishes also inhabit the reef, along with many vertebrates and invertebrates including crabs, prawns, shrimps, oysters and sea worms. *Chlorurusrhakoura* and *Pomacentrusproteus* are two reef fish species confined to Sri Lanka. Blacktip reef sharks (*Carcharhinusmelanopterus*), a near threatened species, are found along the outer slope of the reef. The Hawksbill Turtle (*Eretmochelys imbricate*), a critically endangered species, Green Sea turtles (*Cheloniemydas*), an endangered species, Olive Ridley Turtles (*Lepidochelysolivacea*) a rapidly decreasing species have been recorded from the Hikkaduwa reef as well.

Studies indicate that at least 30-40 percent of coral reef should be restored in order for it to be capable of sustaining itself. Despite being designated as a protected area, the coral reef has been subject to constant exploitation including removal of breeding ornamental fish for the commercial market.

### **Coral Reefs of Bouena Vista**

Located along the Rumassala hill the Bouenavista coral reef is one of the Islands richest coral reefs. Smaller in size compared to those in Hikkaduwa and Kalpitiya, Bouenavista has as many 490 species of fish in its reef and has the richest diversity recorded. In earlier times coral coverage ranged at 70%, however due to anthropogenic activities along the coast and the impacts of the Tsunami, currently only about 40% of the live coral coverage remains.

Studies conducted, by the University of Ruhuna in 2009, have shown that the Bouena-vista reef boasts the highest diversity of life recorded from any marine habitat in Sri Lanka. This reef know to be home to over 490 species of reef fishes, hundreds of species of Marine in vertebrates including Corals belonging to over 34 genera, Leatherback Turtles (*Dermochelyscoriacea*), a critically endangered species and Green Sea Turtles, a threatened species, and many seabird. The reef fauna includes one out of 5 species of fish and 39 out of the 83 species of invertebrates declared as protected species under the Fauna and flora protection law in Sri Lanka. The studies also indicate that the reef is currently regenerating at a steady and successful pace, yet recovers stringent protection measures in order to ensure the regeneration is sustainable.

### **Mangrove Patches**

A number of mangrove patches can be found along the coastal belt from Hikkaduwa to Weligama and close to the Galle Area. The Attaragoda mangrove wetland situated 3Km from Galle is good condition. However many of these fragmented patched face immense pressure due to anthropogenic activities and need to be protected by the local authorities. Diversity and distribution of mangrove species varies in each patch based on the levels of salinity. Studies have shown that these patches are rich in avifauna and marine life and require to be protected formally as well. Studies conducted in 2011 by the University of Sri Jayewardenepura in Attarangoda recorded 35 species of avifauna, of which, 20 were wetland species. There were nine species of migratory birds including one scarce winter visitor- Malayan Night Heron, indicating that Attaragoda wetland is an important destination for migratory birds. The Maha Modera Ganga which is a tributary of the Gin Oya also has some inland wetlands areas that are home to a variety of species.

#### **3.2.4 Built Environment**

The city is divided in to the fort and the new town, which built around the fort area. The fort consists of a network of streets lines with colonial buildings which have been converted for modern day purposes, it provides recreational, residential and commercial facilities to locals and tourists alike. The Galle International Cricket stadium is located opposite the Galle fort. The new town area, consists of large, newly built commercial complex and market as well the main administrative buildings and commercial areas that are densely built along the A2 highway the connects Galle and Matara. Across the Galle Bay is the main harbor, opposite to the Galle fort.



### **3.2.5 Historical and Cultural Importance of Galle**

Historically Galle was an ancient port city and was colonized by the Portuguese, Dutch and the British and ruled by the Sri Lankan monarchs prior to 1587. The Portuguese rule lasted for 150 and the city was known as Point De Galle. The city was fortified by the Portuguese and the Dutch, for the primary purpose of protection. This colonial rule has given the city unique urban morphology. In 1640, the Dutch succeeded in wresting Galle and the rest of Sri Lanka away from Portuguese hold to establish a colonial rule that lasted for almost 150 years. During the Dutch colonial period Galle reached the height of its development and became the country's main port and the center of trade and commerce among Persians, Arabians, Greeks, Romans, Malays and Indians. In 1796, when the British took over Galle from the Dutch, they did very little to alter or renovate any of the Dutch structures. British rule lasted until 1947 when Sri Lanka declared its independence from Britain.

#### **Archeologically and Culturally significant sites**

Built by the Portuguese in 1620, the Galle Fort was fortified by the Dutch in 1667. The fort has a number of Bastions and huge granite walls. Ancient monuments within this historical complex included the Lighthouse, the clock tower, and the first Dutch Reformed and Anglican churches, the Meera Mosque, the Buddhist Temple, and the Commander's Residence. Worthy of mention is the Dutch Reformed Church with its baroque facade and the usual double scroll moldings on its gables which testify to indigenous influence. The military architecture of the Fort is European in design. The unique Galle Fort is still the best preserved fortified city in South Asia and a designated UNESCO World Heritage site. The cobbled streets are lined with colonial buildings converted to shops, restaurants, guest houses and homes. The fort is well preserved yet some of the Bastions and buildings still need to be maintained in order to ensure they are preserved fully. Among other key sites of cultural and archeological interest include The Dutch Museum which is housed in a restored Dutch mansion of the time, contains paintings, prints, documents, furniture and ceramics from the Dutch colonial era. The Dutch Reformed Church, built by a Dutch Army officer at the site of a previous Portuguese church and completed in 1754 the church is situated close to the new entrance to the fort. The church contains record of marriages since 1748 and baptism from 1678. The major highlight of the building is there are no pillars inside the building and the weight of the roof is supported by the walls.

Other prominent sites in Galle include the city's natural harbor, the National Maritime Museum, St. Mary's Cathedral founded by Jesuit priests, one of the main Shiva temples on the island, and Amangalla and Closenbergh which are both historic hotel. Galle is also home to an International Stadium which is considered to be one of the most picturesque cricket grounds in the world.

### **3.2.6 Other Areas of Environmental Concern**

Galle produces up to 50-60 tons of solid waste daily. Although disposal through land filing was carried out some time ago, it is not practiced now and open dumping is taking place, in environmentally sensitive areas such as river banks, paddy fields and wetlands. A proper solution for final disposal of waste is absolutely necessary as the city grows.

Localized flooding and lack of a proper sewerage system also poses many environmental impacts within the city. As a proper Sewerage System is not available, almost all households (80%) use water sealed latrines and around 10% pit latrines, most of which are found among the low-income settlements. Due to the increase in densities of the resident population, the ground water is

polluted. Well water is not generally used for drinking due to its unpalatable taste fortunately for the community. Houses in low-lying lands experience failure of the sanitary system due to rise in the water table resulting in poor soakage of the effluent. Low-income settlements close to canals and waterways discharge waste water directly into these water bodies and pollute them, thus the levels of pollution in the canals that drain in to the Sea is very high.

### **3.3 Jaffna**

The Jaffna Peninsula lies in the northern-most part of Sri Lanka. Jaffna (Tamil: யாழ்ப்பாணம் Yalpanam) is the capital city of the Northern Province of Sri Lanka. It is the administrative headquarters of the Jaffna district located on a peninsula of the same name. Jaffna is approximately six miles away from Kandarodai which served as a famous emporium in the Jaffna peninsula from classical antiquity. Jaffna's suburb, Nallur served as the capital of the four centuries-long medieval Jaffna kingdom. The 1980s insurgent uprising led to extensive damage, expulsion of part of the population, and military occupation. Since the end of civil war in 2009, refugees and internally displaced people have started to return to their homes and government and private sector reconstruction has begun. Historically, Jaffna has been a contested city.

#### **3.3.1 Urban Morphology**

Jaffna is 396 km from Colombo. It is directly connected by railways and the roads system. The city is served by the Yal Devi train and 5 other trains daily from Colombo. The primary railway station in the city is the Jaffna Railway Station. The A-9 highway, which is the main artery connecting the city with the rest of the country was closed during the civil war opened after the 2002 ceasefire, closed again and restored back to its original glory since the end of the war in 2009. It is served by government and private sector coaches and buses. Commercial flights are available from Colombo to Jaffna via the Palali Airport.

Jaffna Municipality area consist of 20.1sqkm out of which 18.96SqKm are developed and 1.19SqKm are undeveloped lands. Nearly 80% of the land are privately owned. JMC has 23 municipal wards with a population of 89,974, Jaffna is Sri Lanka's 12<sup>th</sup> largest city. Prior to the Sri Lankan civil war, it was Sri Lanka's second most populated city after the commercial capital Colombo. The majority of the city's population currently comprise of are Sri Lankan Tamils, although there was a significant number of Sri Lankan Moors, Indian Tamils and other ethnic groups present in the city prior to the civil war. Most Sri Lankan Tamils are Hindus followed by Christians, Muslims and a small Buddhist minority. The Jaffna Municipal Council governs the City of Jaffna. It was established under the Municipalities Ordinance Act of 1865. The project area includes 28 Grama Niladhari divisions (GNDs) from the Jaffna divisional secretariat (DS), and 19 GN divisions from the Nallur DS. Almost 50% of the land area in Jaffna consists of residential and commercial areas.

The city is home to number of educational institutions established during the colonial and post-colonial period. It also has number of commercial institutions, minor industrial units, banks, hotels and other government institutions such as the hospital. It is home to the popular Jaffna library that was burnt down and rebuilt. The city is anchored by the Jaffna fort rebuilt during the Dutch colonial period.

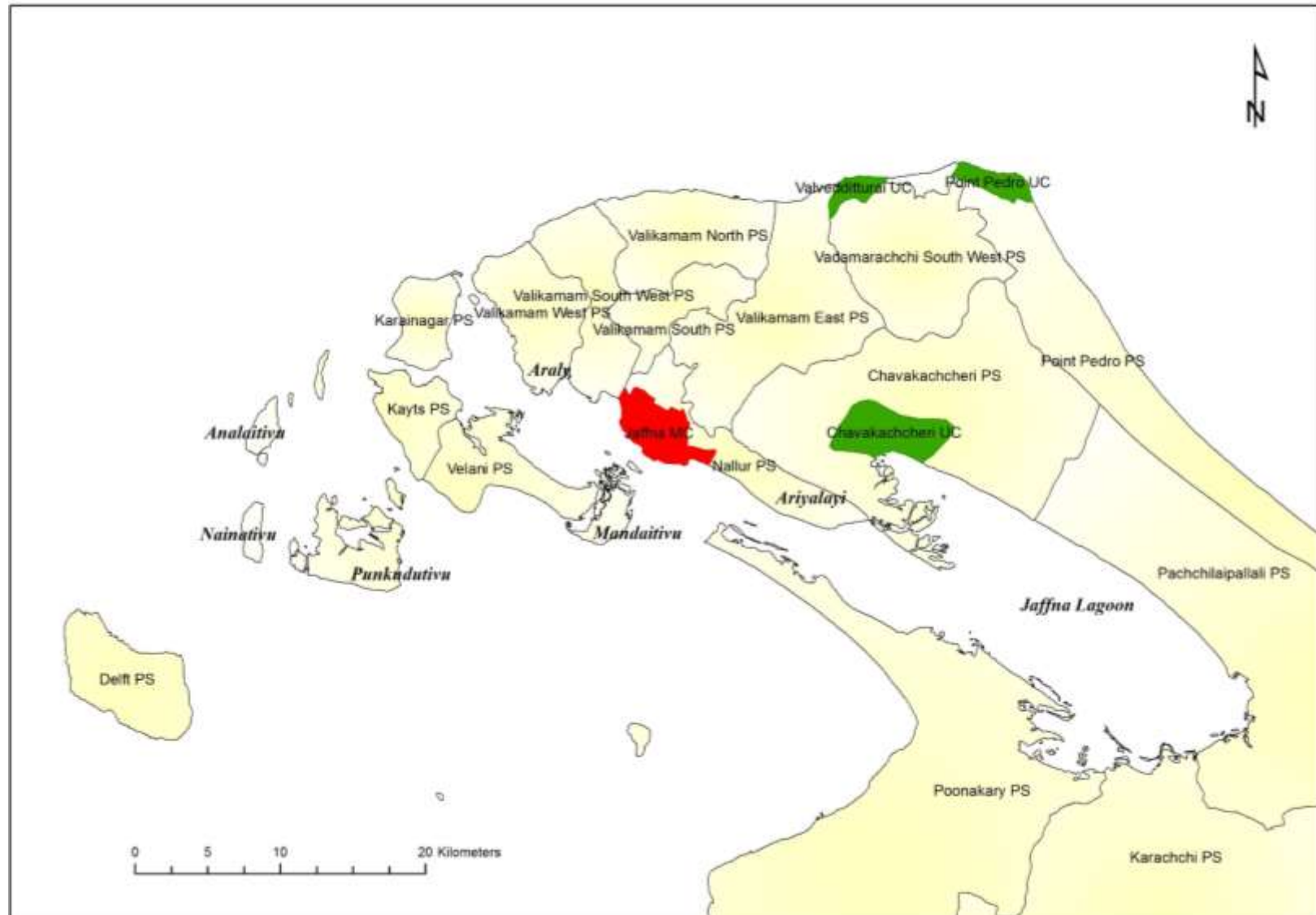


Figure 3: Map of Jaffna District

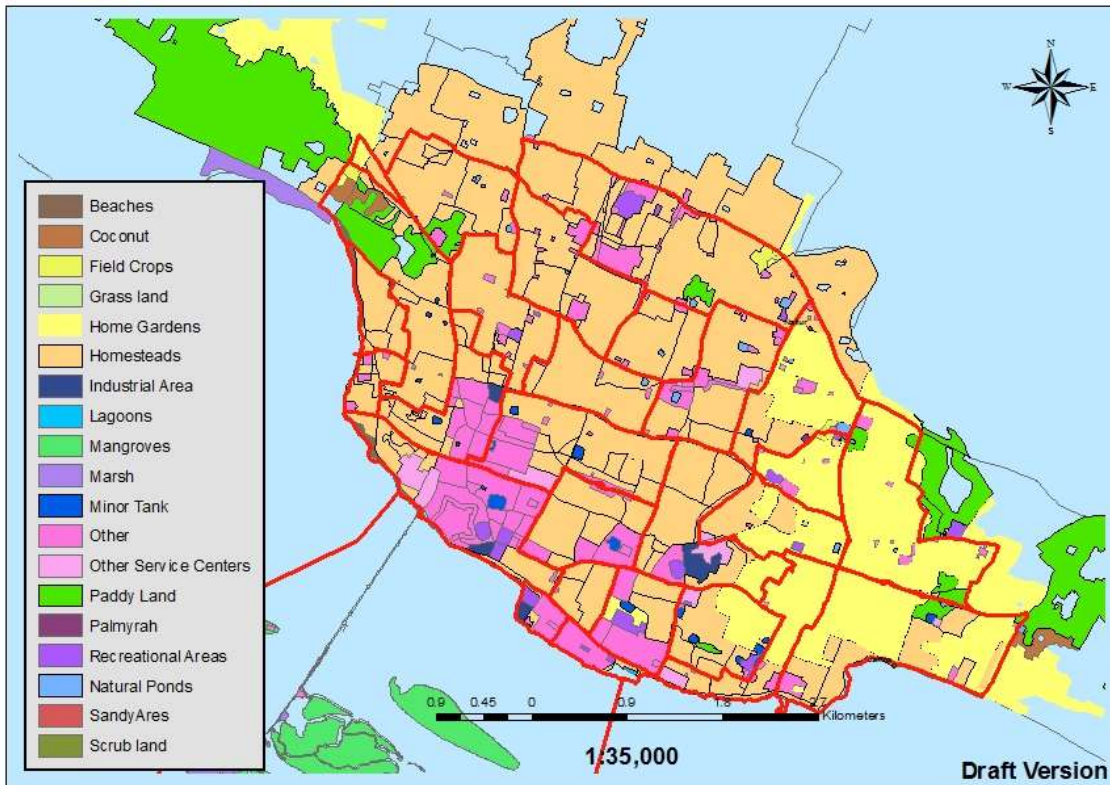


Figure 4: Jaffna Municipal Council Area

Jaffna: Demographics	
Area	20.1 Sq Km
Population	
Living	89,974
Families	27,029
Wards	23

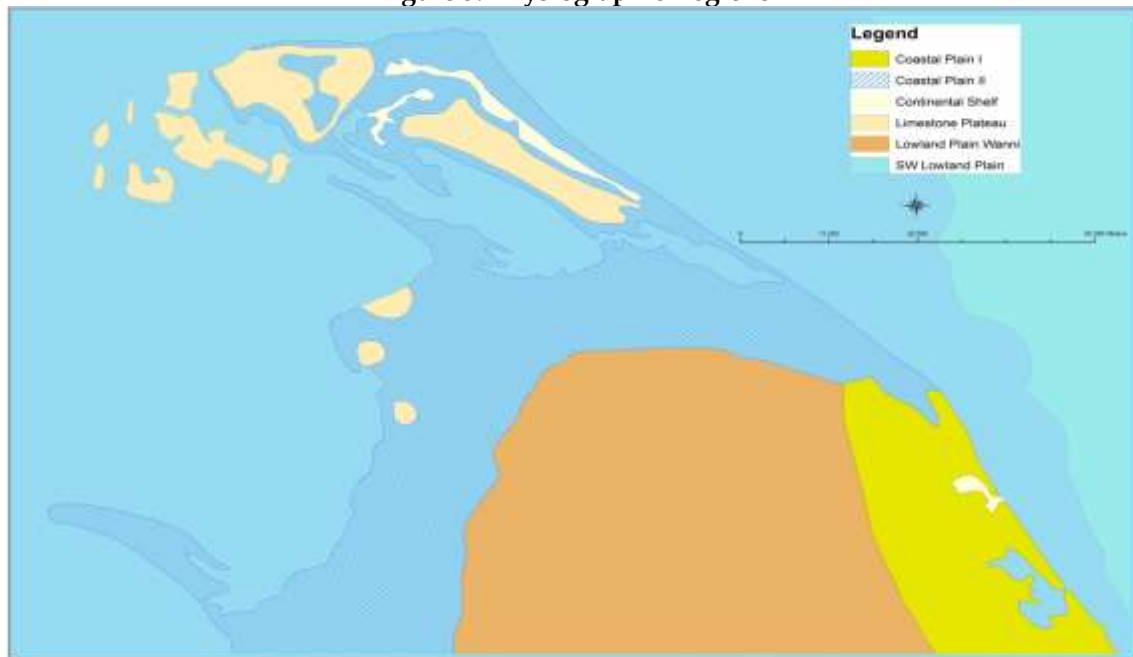
### 3.3.2 Physical Environment

#### 3.3.2.1 Topography

The lowest ground level of the project area is around 0.8m Above Mean Sea Level (AMSL) and the highest ground level is about 8m. The southern border of area borders the Jaffna Lagoon. Entire Jaffna Municipal Council (JMC) lies in the lowest peneplain which is a gently undulating to rolling mantled plain stretching down to the coast. JMC belong to the coastal plain type II physiographic region.

The area of the Jaffna Peninsula landmass is 1,129.9 square kilometres (km<sup>2</sup>) of which lagoons occupy 45.7 km<sup>2</sup>. The project area lies in the lowest peneplain, which is a gently undulating to rolling, mantled plain stretching down to the coast. The highest ground level is 11 m above mean sea level (AMSL). The land forms include floodplains, coastal plains, sand dunes and beaches. The Jaffna Peninsula consists of coastal plain type II and limestone plateau physiographic regions (see Figure 5).

**Figure 5: Physiographic Regions**



Data Source: The National Atlas of Sri Lanka, Second Edition, Survey Department of Sri Lanka, 2007

The soil is sandy along the coast but sandy clay or clayey sand in the interior with high infiltration rates. The peninsula overburden mantle is covered with three different types of soils classified according to agricultural suitability. They are:

- (i) Calcic Red Yellow Latosols;
- (ii) Solodized Solonetz and Solonchaks; and
- (iii) Regosols on recent beach sands



wind speed varies from 13.0 to 7.0 km/h and the highest level is recorded in August and lowest in December (windfinder, 2014).

### 3.3.2.3 Air Quality

Air quality monitoring carried out at project sites have shown that the one hour average for all the parameters is well below the National Ambient Air quality Standards. These parameters included Particulate Matter of less than 10  $\mu\text{m}$  in diameter (PM10) Particulate Matter of less than 2.5  $\mu\text{m}$  in diameter PM2.5 Carbon Monoxide (CO), Sulphur Dioxide (SO<sub>2</sub>), Nitrogen Dioxide (NO<sub>2</sub>) and Ozone (O<sub>3</sub>) and their concentrations were very low. The major contributor to pollutants of CO, SO<sub>2</sub> and NO<sub>2</sub> are the mobile sources. Considering the project area, where no highly polluting industries exist and the number of vehicles is much less than in other areas, except in Jaffna town, the ambient air quality is expected to be within the National Ambient Air Quality Standards. Moreover, with most of the project area being coastal, the potential to attenuate any air pollutants is very high due to wind movement between the land and the sea.

Below tables describe the air quality levels within JMCs. This includes measured baseline ambient air quality levels.

**Table 3: Concentrations of Each Parameter at Each of the Ambient Air Quality Monitoring Locations**

Parameter	Date of Sampling	Date of Analysis	Time Average	Concentration ( $\mu\text{g}/\text{m}^3$ )			
				L1	L2	L3	L4
SO <sub>2</sub>	16/10/2014	16/10/2018	8 hr	6	5	4	7
NO <sub>2</sub>	16/10/2014	16/10/2014	8 hr	11	8	7	12
CO	16/10/2014	16/10/2014	8 hr	1400	1400	<1000	<1000
O <sub>3</sub>	16/10/2014	16/10/2014	1 hr	2	3	2	6
PM 10	16/10/2014	16/10/2014	24 hrs	18	16	23	38
PM 2.5	16/10/2014	16/10/2014	24 hrs	12	9	12	20

Source: EIA Report - JKWSSP

The measured baseline ambient air quality levels at the selected locations were well below the Ambient Air Quality Standards as stipulated by the Ministry of Environment and Natural Resources of Sri Lanka (Extraordinary Gazette, No. 1562/22, August 15, 2008).

### 3.3.2.4 Main Water bodies and flow regimes

In Jaffna, traditionally, surface water has been regarded as “dirty” and groundwater as “purified”, and surface water is collected and conserved only as a means of infiltrating as much water as possible into the ground. Surface water in ponds is not considered acceptable to the Jaffna population as a source of drinking water because it is used for bathing and washing clothes, watering livestock, etc., and is frequently polluted from catchment areas. Dug wells in close

proximity to the ponds are however accepted as sources for drinking water. Ponds hold in storage part of the water that would have escaped to the sea.

The Jaffna Lagoon is a semi enclosed waterbody connected to the Palk Bay. It is 45,000 ha in area. It is surrounded by a dry zone land mass and due to being greatly influenced by freshwater input, has different physical conditions to that of the larger Palk Bay. The lagoon contains a number of coastal wetland habitats and is an important breeding area for numerous marine species. Jaffna Lagoon has been identified as an IBA by Birdlife International.

The lagoon is relatively shallow with the maximum depth being less than 3m. The shoreline is composed mostly of sandy soil while the bottom is mostly mud. The salinity in the lagoon is greatly influenced by rainfall and freshwater run-off from surrounding areas, and varies from a low around 10.3 ppt during the rainy season to a high of around 45.49 ppt during the dry season. The lagoon is located in the dry semi-arid zone with an average temperature of around 27°C and an annual rainfall between 500-700 m.



Figure 7: Valukai Aru Scheme (Source: Provincial Irrigation Department, Northern Provincial Council)



Throughout Jaffna District there are several seasonal streams, natural ponds and man-made storage “tanks” (normally created by building earth bunds across streams), but no permanent rivers. The Valukai Aru is about 14.5 km long and has several regulators across the stream to facilitate flood irrigation of adjoining land, intermittent flood detention in the rainy season, and groundwater recharge. The Valukai Aru Barrage and the Naval Barrage located up river from the Valukai Aru Barrage has been converted to hold freshwater, and is also major device for rain water harvesting and rain water detention.

The Valukai Aru (Araly) Barrage is the salt barrier built at the lowest point of Valukai Aru just prior to the aru being discharged into the Araly Lagoon. At Araly, the Jaffna Lagoon is called by another name, the Araly Lagoon. The Naval Barrage is the next lowest point on the Valukai Aru which is also another salt barrier. The Naval Barrage is a barrier across the aru and consists of lock gates. The waters up-river of the Barrage is fresh while down-river it is saline since saline water enters the aru from the lagoon. The barrage has been built to keep the up-river water as freshwater and to prevent saline water intrusion. However, at times of rainfall and floods, the barrage gates are opened. Alongside the aru, irrigation canals drain excess water into the aru and these have lockgates to control the flow.

There are about 630 large ponds across the entire Jaffna Peninsula, along with about 2,400 minor ditches with interconnecting drainage channels. However, many more ponds that existed in urban areas have been obliterated as they have been used as dumping areas for solid waste (JKWSSP, 2015).

The drains in the city are open channels. Usually they have retaining walls with concrete dished inverts. The bed gradient is too gentle and self-cleansing velocities are not developed even in heavy rain. Stagnation of water and siltation in the invert are therefore inevitable. There are 36 city ponds that function as temporary detention facilities. Unlike the rural area, city ponds do not serve the functions of irrigation. When designed and maintained properly, they help to prevent flooding and enhance the scenic beauty of the city. However the water in both the drains and ponds is contaminated with wastewater and solid waste leachate from the city commercial areas and residences. They are breeding areas for mosquitoes, encourage vermin and are a health hazard in their present condition (JKWSSP, 2015).

In the Peninsula occasionally storms with intense rainfall of more than 100 mm per hour cause floods due to the gentle slopes and sluggish run-off. The surface run-off from rainfall in rural areas is only a minor percentage of the rainfall. The balance infiltrates into the ground or evaporates. There is seldom flooding in rural areas. However, the runoff in urban areas is considerably more, because of the low infiltration rate of built up and paved areas. The run-off from rainfall in urban areas sometimes cause overflowing from drains and ponds and cause temporary flooding of streets, buildings, and compounds. Flooding of streets and inundation occur frequently during rainy months. In some areas drain outfalls to the sea get blocked with sand or debris which also causes flooding and is a chronic problem. The invert levels of many drain outlets are below mean sea level, so that there is perpetual drowning of sea outlets.

Figure below shows the location of drainage channels within the Jaffna Municipal Council Area.

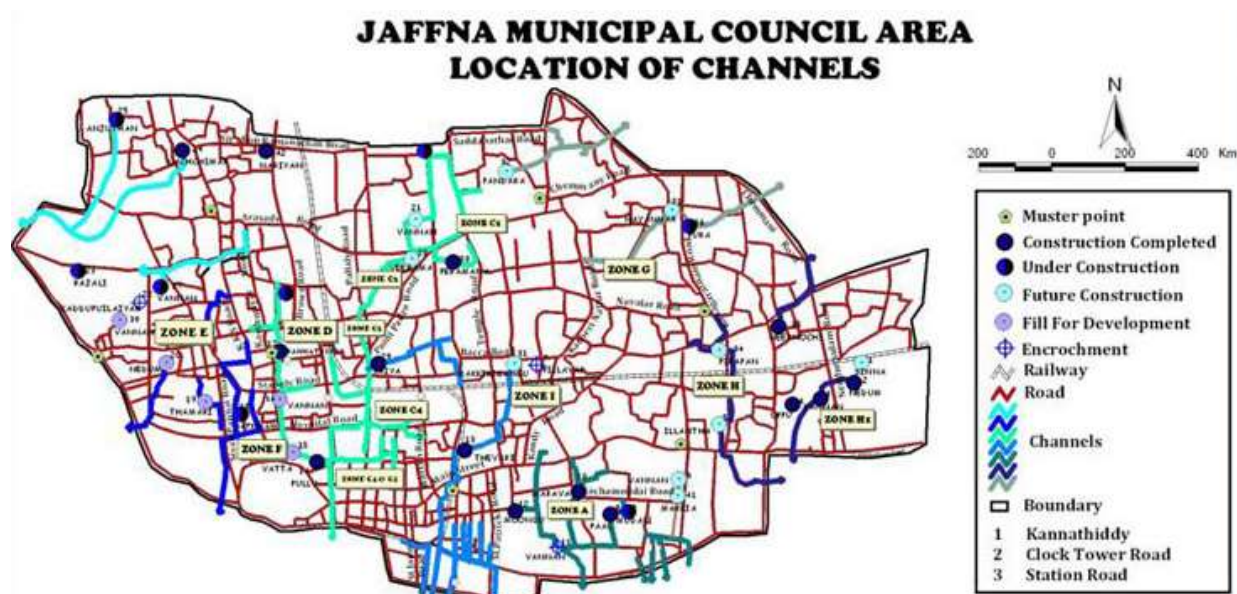


Figure 8: Location of Drainage Channels within the Jaffna Municipal Council Area (Source: [http://www.jaffnamc.lk/city\\_map.php](http://www.jaffnamc.lk/city_map.php))

As far as historical floods are concerned, according to the Provincial Irrigation Department, Northern Province, in 2008, Jaffna town and surrounding areas including the Kallundai area was flooded on the 26<sup>th</sup> November. The tidal level of the lagoon was an abnormal 6ft above mean sea level (MSL) which under normal circumstances is 1-1.5 ft above MSL. There was at least 300mm of rainfall on that day. The flood level in Jaffna town was 3 ft and the roads in Jaffna town were covered by the flood waters.

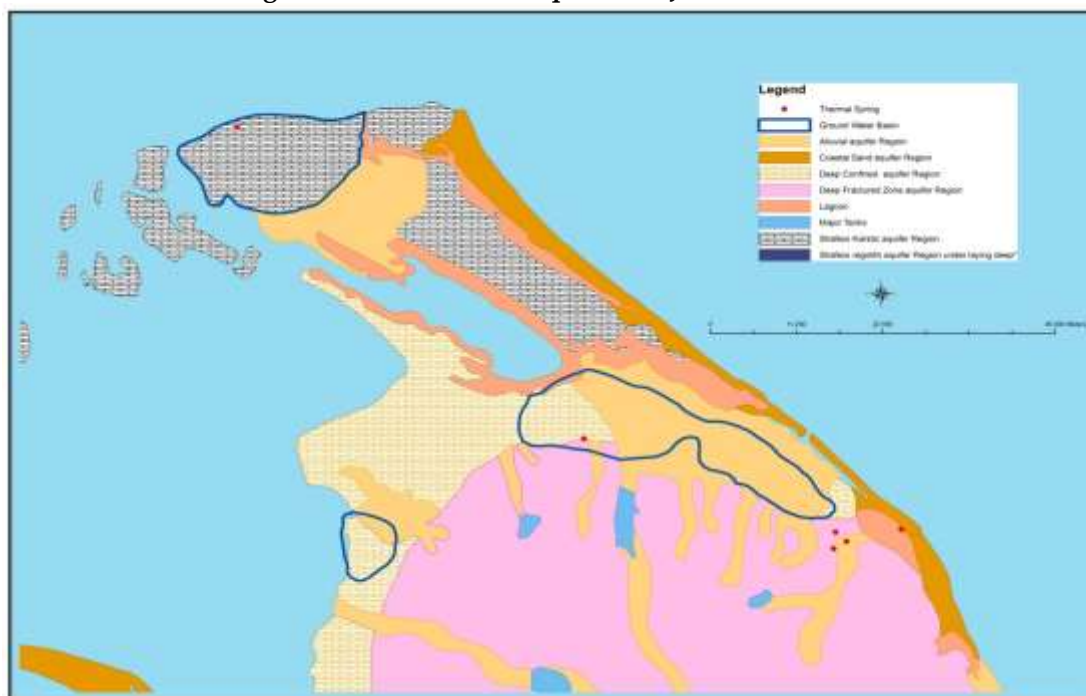
### 3.3.2.5 Ground Water

As depicted in Figure below, there are two types of aquifer present in the Jaffna Peninsula: karstic limestone and sand aquifer. The geology, geomorphology, climatic conditions, and proximity to the ocean combine to create a balanced dynamic groundwater system that is vulnerable to a variety of factors. In the limestone aquifer, the infiltrating rainwater forms freshwater lenses floating on the denser sea water. After infiltration into the ground, there is subterranean flow through solution channels in the limestone aquifer, draining part of the infiltrated water into the sea. However, the cavernous nature of the limestone provides a large storage reservoir, but it's extremely high permeability causes a rapid dissipation of any recharge with rapid movement of freshwater to discharge points around the coastal fringe. Any occurrence of a large body of freshwater is therefore exceptional and its retention depends on maintenance of stringent conditions.

The shallow aquifers are found in channels and cavities (karsts) in Miocene limestone. A large volume of rainwater and other surface waters infiltrate into these spaces during rainy periods. Of this amount possibly 50% eventually drain to sea outlets while the remainder becomes the most intensively utilized groundwater source in the country, mainly for agriculture and domestic purposes. Thickness of the freshwater bodies ranges from 20m to 30m below ground level in the Puttur, Pannikudduvan and Urali areas. The groundwater table is located at 0m to 3m below ground level. The conductivity is very high. The estimated shallow wells are over 80,000 in number constructed up to depths of 5m to 10m. Over 50% of the wells in the Jaffna Peninsula

have high salinity water. Most well-water falls into low to medium sodium and phosphorus content. Nitrate or N levels in most agro-wells are higher than the permissible level. Due to the disposal of sewage from pit-latrines, soakaways and septic tanks, faecal contaminated groundwater has been reported from several places in the Jaffna Peninsula (JKWSSP, 2015).

**Figure 9: Groundwater Aquifers of Jaffna Peninsula**



Data Source: The National Atlas of Sri Lanka, Second Edition, Survey Department of Sri Lanka, 2007

The soil cover and sand deposits originating from ocean and wind activity in turn become sand aquifers providing a limited amount of storage for monsoonal rainfall. These formations are useful and widely exploited for small water supply facilities. The sand aquifers are also underlain by Jaffna Limestone, into which the water in the sand will drain over a longer period of time.

The people of the Jaffna Peninsula have developed water supply facilities that are well-suited to the conditions. The numerous shallow, low-yielding wells distributed over large areas did not have the capacity to cause an imbalance of the dynamic conditions maintaining the fresh water lens. In more recent years however, the increased demand for water has led to pumping rates that have, in places, caused problems. These problems can often be attributed to high pumping rates concentrated in small areas. An additional problem with the widely distributed shallow well system is that the groundwater is vulnerable to pollution in the absence of appropriate waste disposal arrangements (Grontmij, 2014).

**Table 4: Water Quality of Groundwater Wells Located within the Jaffna Municipal Council Area (JKWSSP, 2015)**

Coordinates	Sample Location	Date	Turbidity	pH	Electrical Conductivity $\mu\text{S}/\text{cm}$	Chloride (as Cl) mg/l	Total Hardness (as $\text{CaCO}_3$ )	Alkalinity (as $\text{CaCO}_3$ ) mg/l	Calcium (as Ca)	Nitrite (as $\text{NO}_2^-$ ) mg/l	Nitrate (as $\text{NO}_3^-$ ) mg/l	Fluoride (as F) mg/l	Total Phosphate ( $\text{PO}_4^{3-}$ ) mg/l	Total Iron (as Fe) mg/l	Manganese mg/l	Sulphate (as $\text{SO}_4^{2-}$ ) mg/l	Total Dissolve Solid (TDS)	Bacteriological	
																		T. Coli	E. Coli
SLS 614 : 2013 Maximum Permissible Level			2	6.5 to 8.5	750	250	250	200	100	3.000	50	1.00	2.00	0.30	0.100	250	500	3	-
X-0391067 Y-1068533	Well - PMCIU Offices, KKS Road, Jaffna.	4 <sup>th</sup> , August.	4	7.69	1881	523	480	390	192	Undet	21.3	0.14	0.31	Undet	Undet	306	1204		
X-0391800 Y-1067881	Well - PEIC Offices, Chapel Street, Jaffna.	4 <sup>th</sup> , August.	5	7.49	1596	409	580	450	232	Undet	15.1	0.15	0.20	Undet	Undet	279	1022		
X-0392011 Y-1067497	Well - Mr.Jeyakumar Puthumaimatha East Lane, Gurunagar.	4 <sup>th</sup> , August.	7	7.63	2380	892	510	390	204	Undet	12.0	0.10	0.12	Undet	Undet	329	1523		
X-0393520 Y-1069037	Well - Staff house, No 49, Chetty Street, Jaffna	4 <sup>th</sup> , August.	4	7.53	2940	937	460	420	104	Undet	5.8	0.16	0.30	Undet	Undet	470	1882		
X-0393499 Y-1067436	Well - Mr.Sivatharan, EA, PEIC, Jaffna.	4 <sup>th</sup> , august, 2014	6	7.43	3190	1058	458	370	183	Undet	5.3	0.33	0.34	Undet	Undet	484	2042		
X-0388852 Y-1075743	Kirai Kulam Pond	19 <sup>th</sup> , August.	62	8.18	2920	845	612	380	245	0.108	28.8	0.60	0.05	0.12	0.109	25	1869		

Note: Undet - undeterminable amount; room temperature 30.6 C

Due to the geology of the Peninsula consisting of karstic and sandy aquifers the groundwater is vulnerable to pollution due to pollutant transport being easy within aquifers. Wells which are located very near to the lagoon are highly contaminated by saltwater. Due to the scarce groundwater resource being over-extracted, there is intrusion of saline water inland. The existing underground water resource is contaminated with bacterial and chemical contamination. Pollution sources include domestic sewage, industrial waste, agricultural run-off mainly via artificial fertilizers, agro-chemicals. Groundwater is also contaminated with bacteria due to soakage pits and inadequate space. There is also the contamination of groundwater in the agricultural areas due to the application of heavy dosages of chemical fertilizer and pesticides. Due to the speedy economic development in Jaffna and Kilinochchi, the situation will be further exacerbated in the future (Grontmij, 2014).

Within the very urbanized areas, the main concern is groundwater getting contaminated with bacteria due to soakage pits being placed in close proximity to wells. This is due to inadequate space available in each plot of land within the urbanized areas of the JMC. Some results of water quality sampling of groundwater of wells located within the Jaffna Municipal Council area and a comparison with SLS 614: 2013 given in above table.

### 3.3.3 Ecologically Important/Sensitive Habitats

Project area is mostly confined to urban and semi-urban environments. Hence, most of the habitats which are in the immediate impact zone of the project are highly anthropogenic habitats. Field investigations identified several ecologically important habitats. These include salt marshes, freshwater ponds and canals, remote home gardens, and urban/ sub-urban home gardens.

#### *Salt Marshes*

The salt marsh at Kallundai can be identified as a low- marsh, which is slightly above sea level. A berm constructed by the Provincial Irrigation Department to prevent saltwater intrusion can be observed facing the lagoon. The site is predominantly a coastal mud flat with some sandy areas. An adjacent land is used as an open-dump by the Jaffna Municipal Council; hence faunal species associated with the dump site, especially the avifauna, are also found. Vegetation mainly consists of salt tolerant species such as *Sesuvium portulacastrum*, *Halosarcia indica*, *Suaeda maritima*, *Cressa cretica*, *Volkameria inermis*, *Pedaliium murex* and *Sauropus bacciformis*.

#### *Freshwater Ponds and Canals*

Jaffna municipal council area has a network of ponds connected with drains/canals in cascade patterns. These ponds are believed to be predominantly natural formations resulting from weathering of limestone rocks underneath. Some ponds are believed to be man-made. The ponds help attenuate flooding within the city and harvest rainwater for groundwater recharging while the drains take the overflows to the sea through 8 discharge outlets. Despite these freshwater ponds being subjected to severe drying during the drought season, they can be recognized as important habitats that support a unique floral and faunal assemblage. With the implementation of the project, the ponds are unlikely to dry out completely even during the drought, hence will function as permanent freshwater habitats. The existing vegetation associated with the two freshwater ponds at Kirai Kulum and Kombuthali Kulum as well as the associated irrigation canals are dominated by *Justicia diffusa*, *Achyranthes aspera*, *Digera muricata*, *Calotropis gigantea*, *Vernonia zeylanicum*, *Ipomoea aquatica*, *Abutilon indicum*, *Boerhavia diffusa* and *Phylla nodiflora*.

### ***Freshwater Marsh/ Abandoned Paddy Fields***

Freshwater marsh or abandoned paddy fields is another key type of human modified habitat located in and around JMC. This is the major habitat type found in the terrestrial area surrounding the Arali Barrage, low-lying areas on the banks of Vallukai Aru and the surroundings of the two freshwater ponds; Kirai Kulum and Kombuthali Kulum. *Justicia diffusa*, *Achyranthes aspera*, *Digera muricata*, *Calotropis gigantea*, *Vernonia zeylanicum*, *Ipomoea aquatica*, *Abutilon indicum*, *Boerhavia diffusa* and *Phylla nodiflora* are the dominant floral species found on these habitats.

### ***Urban Home Gardens***

Urban home gardens are the vegetation type found immediately around homesteads in towns. These have been subjected to long-term human manipulation. Urban home gardens are characterized by open lands dominated by grasses and weeds such as *Lantana camara*, *Triumfetta pentandra* and *Stachytarpheta urticifolia*. Multi-purpose tree species such as *Azadirachta indica*, *Artocarpus heterophyllus*, *Cocos nucifera*, *Borassus flabellifer* are occasionally found towards edges of such lands. These provide valuable habitats for urban wildlife.

### ***Remote/ Sub-urban Home Gardens***

Abandoned remote/ sub-urban home gardens in contrast have substantial tree cover comprising of multi-purpose trees such as *Azadirachta indica*, *Artocarpus heterophyllus*, *Cocos nucifer* and *Borassus flabellifer*. Some of them show signs of a well-developed multi-story home garden structure which existed prior to abandonment.

### ***Major Coastal Ecosystems in Jaffna***

The thin edge where the land meets the sea is rich in natural resources and supports critical habitats, but also attracts a disproportionately high human use. The valuable, but vulnerable nature of these near-shore marine and estuarine areas makes them an important focus in marine ecological studies. Despite the extent and importance of shallow water habitats within Jaffna, these areas remain poorly inventoried and mapped. While geophysical and habitat mapping are an integral part of the resource management framework for terrestrial portions of these natural areas, comparatively little mapping has been completed of these submerged lands. The Northwestern maritime region of the island consists of numerous coastal and marine ecosystems and habitats. These include coral reefs, seagrass beds, mangroves, salt marshes, tidal flats, lagoons, estuaries, sand bars and beach vegetation.

### ***Arali Lagoon***

From a marine ecology perspective, the Arali Lagoon (near Arali Barrage) is the only marine habitat which is in the periphery of the project area. The Arali Lagoon is a slow flowing area where mixing of seawater with freshwater occurs. The lagoon bottom is rocky towards the banks, and sandy towards middle. This brackish waterbody provides habitats for fish species such as *Etropus suratensis* (Pearl spot/ Koraliya), *Mugil cephalus* (Sea mullet/ Godaya) and *Chanos spp.* (Milk fish/ Nekkaya). Common lagoon fish species such as *Siganus javus*, *Hemiramphus sp.* *Johnius amblyceph*, *Epinephelus sp.* and *Scylla serrata* (Mud crab) were recorded towards the saltwater dominated part of the lagoon.



Figure 10: Coastal Habitats in the Jaffna

### *Jaffna Lagoon*

The Jaffna Peninsula, is about 45,000ha in extent and approximately 40miles long and 4-8 miles wide. On its Western and Northern sides, it is bounded by the Palk Strait, on the East and South sides, it is hemmed in by the Bay of Bengal and the Jaffna Lagoon respectively. The Jaffna Peninsula is a vast limestone block, the history of which dates back to the Miocene period, when the entire island lay submerged. The Jaffna Lagoon is a semi-enclosed waterbody connected to the Palk Bay. It is surrounded by a dry zone land mass and due to being more greatly influenced by freshwater input, has different physical conditions to that of the larger Palk Bay. The lagoon opens into the Northeastern part of Palk Bay by way of three narrow openings and one wide opening, and is also influenced by tides in the bay. The lagoon is long and narrow, extending from Elephant Pass in the Southeast to Kayts in the Northwest. The lagoon is relatively shallow with the maximum depth being less than 3m. The shoreline is composed mostly of sandy soil while the bottom is mostly mud. The salinity in the lagoon is greatly influenced by rainfall and freshwater run-off from surrounding areas. The lagoon plays a role in flood control during times of heavy rainfall. Being part of the larger Palk Bay area, it plays an important role in regimenting tidal movements, currents and salinity in surrounding waterbodies. The lagoon is surrounded by a dry zone land mass dominated by sandy areas and dry zone scrubland. The lagoon contains extensive inter-tidal mudflats while mangroves are found along the shores of the lagoon. The shallow depths and muddy substrate harbors prawns, crabs and small fish species such as leiognathids, engraulids and clupeids. The blue swimming crab (*Portunus pelagicus*), is a tropical marine crustacean that occurs in large shoals in shallow coastal waters overlying sandy or muddy

substrates. Fishery has been an important economic activity of coastal communities and many are engaged in small scale fisheries using traditional methods such as cages, traps and cast nets. The Jaffna Lagoon contains a diversity of species and a variety of coastal habitats including, mangroves, salt marshes, seagrass beds and mud flats (JKWSSP, 2015).

### *Seagrass Meadows*

The Jaffna Lagoon contains extensive seagrass beds. These habitats are very productive and support a rich diversity of commercially important fish species as well as a large number of other marine organisms. Seagrass communities recorded were Tape Seagrass (*Enhalus acaroides*), Sickie Seagrass (*Thalassia hemprichii*, *Halodule uninervis*), Noodle Seagrass (*Syringodium isoetifolium*, *Cymodocea rotundata*), and *Halophila ovalis*. Dense patches of seagrass *Waattala* (*Enhalus acoroides*) were observed spanning over a large area of the lagoon. In addition, several species of seaweed were also encountered. Seagrass meadows in the shallow areas of the lagoon were a very significant observation in the study. Seagrass was seen growing either homogeneously or heterogeneously in mixed populations forming thick and dense meadows on muddy, sandy, clay soil of the lagoon. The area is a favourable habitat for seagrass due to shallow and limited water movement.

Seagrass meadows are extremely productive habitats that contribute to the sustenance of the lagoon, the bay and near-shore fisheries, and function as nurseries and habitats for many commercially important species of fish and crustaceans. Seagrasses support a large number of organisms which directly or indirectly depend on them. They form the basis of a complex ecosystem supporting many forms of life ranging from plankton to dugongs, and hence contributes to increasing the biodiversity associated with the coastal area. Seagrass ecosystems are recognized as nursery grounds and habitats for a large number of marine aquatic organisms, including the globally endangered marine mammal, the dugong (*Dugong dugon*). In addition, seagrasses provide substrata for epiphytes, which have been widely recognized as food for most of the juveniles that inhabit the seagrass meadows. Seagrasses are important as they die out very quickly when there are changes in the environment – for example – from pollution. Therefore they serve as indicators of sea pollution. Seagrasses also help reduce surface erosion in sedimentation areas and maintain nutrient cycling.

Harmful and unsustainable fishing methods such as drag nets and “maa del” have led to the degradation of seagrass meadows with an indirect adverse effect on fish catch in the area. Seagrass beds are also affected by unplanned establishment of fish landing sites, and fishing boats. Seagrasses are the only marine flowering plants capable of completing their life cycle when submerged in seawater. Seagrass ecosystems are considered to be very productive and are seen as nursery and breeding grounds for many marine organisms. Seagrasses also act as sediment stabilizers, provide a suitable substratum for epiphytes and a good source of food for marine herbivores, as well as fodder and manure. Seagrass meadows, over time, are of primary importance in the surveillance of marine coastal diversity. Seagrasses are commonly found in shallow coastal marine locations, salt marshes and estuaries. Seagrass ecosystem provides habitats for a wide variety of marine organisms. The relatively high rate of primary production of seagrass and its contributions to detritus based food chains, help support many of these organisms. Seagrasses are effective in removing nutrients from marine waters and surface sediments and are therefore important in the control of water quality of coastal waters. The importance of seagrass, as they are often correlated to fish breeding grounds can assist in



identifying both fish breeding and fishing grounds. Seagrasses are the widely dispersed group of plants comprising relatively few species and are often overlooked due to their submerged environment. Seagrasses play an important ecological role in coastal ecosystems due to their habitat value for many organisms. Even though the Gulf of Jaffna is blessed with coral reefs, mangroves and seagrasses, the literature on seagrasses are not readily available. Seagrass ecosystems are sensitive to impacts linked with human activities and are undergoing a substantial decline. Hence, the management of seagrasses becomes a major issue and accurate information on seagrass distribution plays a vital role in the management of the resource. Harmful and unsustainable fishing methods such as drag nets and ma del have led to the degradation of seagrass meadows with an indirect adverse effect on fish catch in the area. Seagrass beds are also affected by the unplanned establishment of fish landing sites and fishing boats.

#### *Mud Flats*

Mudflats are sedimentary inter-tidal habitats created by mud deposition in low energy coastal environments, particularly in sheltered areas during the low tidal season. These sediments consist mostly of silts and clays with a high organic content and are associated with seagrass meadows. Mudflats are found scattered around Jaffna. These mud flats are important in processing nutrients for the ecosystem and in providing feeding areas for fish at high tide and for birds, especially migratory birds, at low tide. Mudflat habitats commonly appear in the natural sequence of habitats between sub-tidal areas and terrestrial inland vegetation.

#### **3.3.4 Built Environment**

It can be observed that it is largely a built up area with waterbodies in the form of ponds, grass and playgrounds. In the Jaffna Peninsula, land is mainly used for settlements and in red soil areas, cash crops are grown intensively under lift irrigation from shallow dug wells. In sandy soils, either coconut plantations or seasonal rain-fed paddy cultivation is common. Within the concerned area of JMC, it is mostly built-up. Entire JMC has divided into 4 zones namely 1. City Centre Area Development; 2. Lagoon Front Development; 3. Island Development; and 4. Housing. The road network in Jaffna District include, 279.69 km of A-class, 246.13 km of B- class, 490.56 km of C-class, and 89.02 km of D-class roads under the Road Development Authority and Road Development Department of the Northern Provincial Council. There are also 3,407.12 km of other roads under the local authorities. Main townships of Jaffna such as Islands, Kankasanthurai, Palali, Karai Nagar and Point Pedro are connected with A9 via AB 17, AB 18, AB 19 and AB 20. Although, the original railway connects Kankasanthurai, the existing railway network ends at Jaffna town. The Jaffna town consists of colonial buildings, Library, large newly built commercial complex, markets, Stadium, Jaffna Fort which is under restoration, well-known schools and residential areas.

Figure 11: Land Use Map



(Data Source: Survey Department of Sri Lanka)

### 3.3.5 Historical and Cultural Importance of Jaffna

While the most ancient records of the history of Jaffna are much debated on by historians and archeologists. The city has a rich share of historical and cultural monuments dating back to an ancient kingdom as well as a colonial era located within the municipal area.

Jaffna was occupied by the Portuguese (1617 to 1658) and the Dutch (1658 to 1795) until the British conquest. In the project area, most of the high priority archaeological, historical and cultural sites are located within the coastal zone. Sites that carry an archaeological value in the Jaffna region were abandoned due to the conflict. Maintenance was not carried out due to the access constraints which arose with security concerns. Some of the sites were damaged and the Archaeological Department of Sri Lanka has taken initiatives in restoration of the sites through its regional office in Jaffna. Currently a project on conservation and restoration of the ancient Fort in Jaffna is in progress with funds received from the Government of the Netherlands. The Jaffna Fort is recognized by its characteristic shape of a star depicted by the moat surrounding the Fort.

High priority archeological, historical, religious and cultural sites within the Coastal Zone were identified in 1989 and updated in 2002 by the Coastal Zone Management Plan of 2004 (GoSL, 2004). Within the study area, Jaffna Fort is included in the list of high priority archeological, historical, religious and cultural sites. Historic places of interest within the Jaffna, Nallur and Valikamam South West DS Division within which the study areas are placed is given in Table 5.

**Table 5: Historic Places of Interest in JMC**

Divisions	Place	GN Division
Jaffna	Public Library, Jaffna	Fort
	Jaffna Fort	Fort
	Sri Naga Viharaya- Jaffna	Sirampady
	Navalar Archaeological Museum, Jaffna	Aththiyady
	Six Pillars Choultry	New Moor Street
Nallur	Sangilian Thoppu	Sangilian Thoppu
	Manthirimanai (King's Place)	Nallur
	Jamuna Eri (Pond)	Sagilian Thoppu
	Nallur Skandan Temple	Nallur
	St. James Church	Nallur

Source: District Planning Secretariat, Jaffna

### 3.3.6 Other Areas of Environmental Concern

#### 3.3.6.1 Ground Water Depletion and Pollution

Groundwater is an extremely valuable resource and pollution of groundwater resources is a matter of serious concern. Among the major threats to ground water from which drinking water supplies are obtained are leachates from human and animal waste matter, along with other chemical pollutants. Agricultural leachates often contribute significantly to ground water pollution. Among the chemical species that pollute ground water supplies are nitrate. These originate mainly from human and animal wastes as well as from nitrogenous fertilizers that are often used in large quantities in agriculture.

The high nitrate levels recorded in well waters of the Peninsula's agricultural areas is very likely related to the intensive cultivation practiced in that region. Farmers apply very large amounts of animal wastes, green manures and crop residues in addition to heavy application of inorganic fertilizers. Additionally, irrigation from well is also provided at a higher rate and water is applied to crops through flood irrigation. In view of the fact, the limestone aquifers are covered by thin mantle of highly permeable *calcic latasol* soil type, rapid movement of any nitrate which is not utilized by crops can reach the aquifers resulting in high nitrate levels.

The farmers cultivate the crops in different ways in Jaffna peninsula. The crops are cultivated as high land crops or highland with banana or banana alone in these lands. Paddy is cultivated during Maha season in separate land, mainly as rain fed paddy. Depending upon the cultivable lands the amount of fertilizer, fertilizer application interval, amount of irrigation, irrigation interval differs.

According to a research carried out by Department of Agric. Engineering, Faculty of Agriculture, University of Jaffna, Jaffna in 70 locations across (give the general area of the sampling) it was revealed that all the wells were accepted for drinking based on pH, EC and Chloride but, 81% of the wells were not suited for drinking due to the nitrate-N concentration. There was a good

correlation between cropping system and nitrate-N concentration in groundwater. High nitrate-N concentration of groundwater was observed at high land crops land use and followed by mixed crops and there was no significant difference between high land and mixed crops to banana and paddy land use but no significant different between paddy and banana. It is worthy of note that the level of nitrate concentration of water show a significant influence by cropping system (T. Jeyaruba and M. Thushyanthy, 2009).

According to IWMI, Spatial variation of net groundwater recharge was observed to be from 12 to 69% of the total rainfall, with an average of 37% at a specific yield of 0.21. When ET is also added to effective recharge, the net recharge varied from 42 to 99% with an average of 67%. This indicates that about 33% of the rainfall results in runoff during the rainy season. The spatial variability observed in computed values could be attributed to local rainfall variability and partly to the geohydrology of the area (Mikunthan T., Vithanage M., Pathmarajah S., Ariyaratne R. and Mantharithilake H, 2013).

The fall in groundwater level during January to July was much less than the estimated evapotranspiration (ET), which implies that considerable seawater intrusion takes place to compensate the loss in head due to ET. It also implies that actual ET takes place at values less than the potential ET during the dry months. However, this concept needs to be clarified through further research. This aspect requires a planned study and careful recommendations need to be made to limit groundwater abstraction that brings the required moisture to the surface during the dry season while considering the crop response to alternate irrigation practices and techniques (Mikunthan T., Vithanage M., Pathmarajah S., Ariyaratne R. and Mantharithilake H, 2013).

It is possible for the midseason water table to reach a depth as low as 0.5 m of water in the wells during the dry period. Therefore, not only is water availability reduced but also the freshwater-saltwater interface could reach as close as 20 to 40 m below the well bottom depending on the freshwater head above mean sea level. In addition, the thickness of the freshwater lens is limited by the flat topography; that is the thickness of the soil above mean sea level which is a limiting factor in the Jaffna Peninsula (Mikunthan T., Vithanage M., Pathmarajah S., Ariyaratne R. and Mantharithilake H, 2013).

Since Jaffna has poor surface drainage with very limited seasonal streams, existing surface water bodies have limited quantity of water. Most of the minor tanks and cascades systems were abandoned during the conflict period. Those systems should be closely examined to facilitate necessary rehabilitation work. It is important to note that a considerable amount of hydro-geological data are available in Jaffna with the Water Resources Board (WRB). To gather new data the WRB carried out a hydro-geological study during the baseline phase of the ISEA-North and recommend measures to develop, manage, allocate and conserve available surface and groundwater resources in a rational, systematic manner to achieve the maximum benefits without harming the environment. In the analysis the information available with both Water Resources Board and the National Water Supply and Drainage Board (NWSDB) has been used.

### **3.3.6.2 Solid Waste Management**

Similar to other LAs, JMC is also facing troubles of managing their Municipal Waste due to several reasons. In JMC it is consisting nearly 26,398 households and total municipal waste quantity been estimated as roughly more than 70tons per day. Quantity of household waste, lot of commercial establishments, significant quantity of agriculture waste, significant amount of construction waste due to physical developments and poor sewer disposal mechanism are the major causes of solid waste in JMC.

Since May 2009, the commercial area of the town centre has a major role to play in the generation of waster as economic activities in that area has drastically increased. The markets, slaughter house, teaching hospital waste are main producers of solid waste from commercial activities in the town. Some waste in the town is also generated from food stalls, tea shops, service stations, tine shops, bakeries and schools.

Release of sanitary waste and solid waste into marine environments from households, commercial establishments, construction sites, etc can substantially affect the water quality and diversity of aquatic biota. Uncontrolled disposal of solid wastes such as excavated soil, dredged material, metallic pieces, wooden planks and stone debris into marine habitats will lead to habitat loss, degradation and reduction of marine biodiversity. Chemicals and oils from construction operations near lagoon areas can wash into the lagoon and further contaminate marine habitats.

## CHAPTER 4: ASSESSMENT OF ENVIRONMENTAL IMPACTS AND IMPACT MANAGEMENT FRAMEWORK

### 4.1 Preliminary assessment of environmental impacts of SCDP

With the preliminary assessment of impacts all types of impacts triggered by SCDP could be generalized under (i) typical generic construction impacts which can be mitigated with good construction practices and (ii) specific impacts that can arise due to engineering interventions proposed for some sub-projects and hence require careful planning.

In general, following are the lists of broad positive and negative impacts that are very likely to arise from the sub-projects funded by the SCDP.

#### Overall positive impacts of the project

- Reduced flood risk and flood damages
- Improved groundwater resource management water scare Jaffna
- Prevention of encroachments on canal reservations
- Reduction in public health hazards due to improved flow/WQ in canals/lake, proper management of solid waste and increased availability of drinking water supplies.
- Reduced air pollution and traffic congestions
- Increased potential and facilities for local and foreign tourism
- Increased aesthetics and attractiveness of the cities
- Protection and conservation of cultural resources
- Protection and conservation ground water resources by increasing re-charge rate

#### Negative impacts of the project

- Impacts on water quality due to canal bank excavation and dredging
- Impacts of dredge material disposal
- Impacts on ground water quality due to deepening of surface water ponds
- Soil erosion and siltation
- Impacts on air quality from use of machinery and construction activities
- Impacts (off-site) of material extraction (earth, rocks, turf)
- Impacts on traffic flow caused by construction activity and vehicles transporting materials to the site etc
- Impacts of noise from construction activity
- Occupational hazards and impacts to public safety
- Impacts of vibration on structural safety of buildings adjacent to construction sites
- Impacts on forest ecosystems and bio-diversity
- Increased risk of landslides when working on mountain slopes (in Kandy)
- Resettlement, land acquisition and other socio-economic impacts

These impacts though occurring in most of the sub-projects will vary in extent and significance **hence individual assessment is of utmost importance**. However, for ease of presentation and reference typical construction impacts related to the project have been discussed under the following thematic categories in both cities.

### **Greater Kandy Interventions**

- i. Rehabilitation of underground storm-water tunnels: Work proposed includes lining the underground tunnel, reconstruction failed areas, removal of bottlenecks in the canals, improvement of the outflow capacity and construction of canal bank protection
- ii. Rehabilitation and augmentation of municipal drinking water supply: Work proposed includes improvements to the intake (weir and pumps) and treatment plant (sedimentation tanks, storage reservoirs, filters, and pumps) at Gatambe; improvements to the intake and filtration systems at the Dunumadalawa and Rosneth reservoirs, increasing reservoir capacity, improvements to access road and inter-connection/overflow streams; improvements to the distribution network amounting to 40kms within the KMC area
- iii. Rehabilitation of roads/side drainage and traffic improvements: Widening/resurfacing of city roads and by-pass roads, establishment of new bus terminals and parking areas, rehabilitation of existing main bus terminals, revisions to bus networks and services, reorganization of internal bus service in the city, establishment of new off-street car parking areas, traffic management and traffic calming interventions.
- iv. Kandy lake water quality improvement: Improving upstream canals with embankment protection to mitigate erosion, redesigning and constructing silt traps with better facilities for de-silting, construction of a siphon system at the spillway, diverting overflows from Dunumadalawa reservoir and provision of laboratory testing facilities.
- v. Urban landscaping for recreation and city beautification: Improvements to streetscape to improve pedestrian walkability, creation of recreational spaces and public recreational walkways, public land re-development
- vi. Conservation of historic/archaeological buildings: Restoration of historic buildings to preserve cultural heritage and to promote local/foreign tourism

### **Greater Galle Interventions**

- i. Rehabilitation of primary/secondary canals and cross drains: Work proposed includes dredging and desilting, clearing of reservations, embankment protection, widening of bridges in the canal system and pumping station if confirmed by modeling results. This may require land acquisition and resettlement.
- ii. Coastal urban development: Securing public beach access with facilities for resting and car parking, erosion control, studies and development plans to regulate coastal town expansion
- iii. Urban landscaping for recreation and city beautification: Improvements to streetscape to improve pedestrian walkability, junction improvement to ease vehicle/pedestrian conflicts, creation of recreational spaces and public recreational walkways

- iv. Conservation of historic/archaeological buildings: Restoration of historic buildings to preserve cultural heritage and to promote local/foreign tourism

**Greater Jaffna Interventions**

- i. Rehabilitation of Ponds and Drains: Work proposed includes desilting, clearing of reservations, embankment protection, rehabilitation of pond gates and other regulatory structures, improvement in direct waste water disposal to the ponds etc. This may require land acquisition and resettlement.
- ii. Coastal urban development: Securing public beach access with facilities for resting and car parking, erosion control, studies and development plans to regulate coastal town expansion
- iii. Rehabilitation of roads/side drainage and traffic improvements: Widening/resurfacing of city roads and by-pass roads, establishment of new off-street car parking areas, traffic management and traffic calming interventions.
- iv. Urban landscaping for recreation and city beautification: Improvements to streetscape to improve pedestrian walkability, junction improvement to ease vehicle/pedestrian conflicts, creation of recreational spaces and public recreational walkways
- v. Conservation of historic/archaeological buildings: Restoration of historic buildings to preserve cultural heritage and to promote local/foreign tourism

The following section lists out the probable impacts under each separate investment category.



4.1.2 General construction related impacts

Investment categories under SCDP	
Greater Kandy	
1. Rehabilitation of underground storm-water tunnels:	
Key project activities	Related Impacts
Site Surveying, Testing & Data Collection	Obstructions to vehicular movement
Land clearing along road side	Disposal of spoilage; Disturbance to existing flora and fauna; Generation of cleared vegetation stockpiles; Potential for the spread of weeds
Traffic diversion/Generation of additional traffic due to construction and temporary parking lots	Obstruction to vehicular movements; Disturbances to residents due to traffic diversions and restricted entry to by-roads; Increased traffic on alternate roads
Excavation of trenches and shoring	Closure of roads for traffic; Disturbance to pedestrian movement and safety issues due to deep excavations and material piles; Emission of dust and air pollutants from equipment and machinery; Generation of high levels of noise and vibration; Slope failures; Loosen soil structure and weaken soil stability; Subsurface soil layers susceptible to collapse and fail under outward seepage flow
Dewatering and site drainage	Reductions of pore pressure build up; slope instability and transport of fines. Local surface ponding
Transportation and stockpiling of material	Emission of dust, noise and vibration; Erosion of material during rains; Stock piling of soil, debris and other material may block surface drainage; localized flooding
Construction of structures such as gullies, manholes, catch pits etc.	Emission of dust; noise and vibration

Compaction & Soil Stabilization	High noise and vibration level; Uneven settlements: cracks and eventual failure of anchorages and pipelines.
Spoilage disposal	Blockage and contamination of surface runoff
Maintenance of drainage pipes, catch pits, manholes, gullies etc. and removal of material and disposal	Emanation of foul odor; Collection of floating matter and blocking catch pits, gullies and manholes; Contamination of water due to improper disposal of debris and sediments
Operational Phase	Maintenance de-silting and cleaning will generate sediment and debris that needs to be properly disposed.
<b>2. Rehabilitation and augmentation of municipal drinking water supply:</b>	
<b>Key project activities</b>	<b>Related Impacts</b>
Site survey and land clearing	Possible obstructions to vehicular/ pedestrian movement
Excavation of trenches to lay distribution lines	Closure of roads for traffic; disturbance to pedestrian movement and safety issues due to deep excavations and material piles; emission of dust and air pollutants from equipment and machinery; generation of noise and vibration; loosened soil structure and slope failures leading to landslide risks; subsurface soil layers susceptible to collapse and fail under outward seepage flow
Improvement to filters and installation of new pumps at water intakes	Generation of spoil for disposal; emission of dust and air pollutants from equipment and machinery; generation of noise and vibration; temporary blockages to drainage lines
Transport and stockpiling of construction material	Emission of dust and air pollutants from equipment and machinery; generation of noise and vibration; disturbance to forest wildlife
Compaction, soil stabilization and pavement reinstatement	High noise and vibration level; uneven settlements: cracks and eventual failure of anchorages and pipelines

Reinstatements of overflow streams from the reservoirs	Removal of trees and vegetation clearance, soil erosion, noise, debris disposal, disturbance to animals
Spoilage disposal	Blockage and contamination of surface runoff
Operational phase	The main operational impact will be increased extraction of water from the river. Other operational impacts are low risk and related to maintenance.
<b>3. Rehabilitation of roads/side drainage and traffic improvements:</b>	
<b>Key project activities</b>	<b>Related Impacts</b>
Transport and stockpiling of material	Emission of dust and air pollutants from equipment and machinery; generation of noise and vibration; disturbance to residents and road users
Traffic diversion	Obstruction to vehicular/pedestrian movements; Disturbances to residents due to traffic diversions and restricted entry to by-roads; Increased traffic on alternate roads
Pavement Demolition	Disturbance to pedestrian movement and safety issues due to uneven surface, material/debris piles; Emission of dust, noise and air pollutants
Excavation of trenches, shoring and dewatering if necessary	Closure of roads for traffic; disturbance to pedestrian movement and safety issues due to deep excavations and material piles; emission of dust and air pollutants from equipment and machinery; generation of noise and vibration; loosened soil structure and slope failures leading to landslide risks; subsurface soil layers susceptible to collapse and fail under outward seepage flow
Drainage diversions during construction;	Temporary drainage blockages, Surface ponding of water;
Provision of permanent drainage, construction of man holes and catch pits, compaction & soil stabilization, road filling and resurfacing/overlay	Obstruction to vehicular movements on roads under construction and increased traffic on alternate roads; Disturbances to day-to-day activities of residents, road-users due to traffic diversions and restricted entry to by-roads; Inconveniences to residents and other road users, especially commercial establishments for their delivery vehicles; Disturbance to pedestrian movement and safety issues due to excavations and material piles; Interruption of livelihoods of pavement vendors, hawkers, middlemen etc. and

	<p>their inability to night parking of carts; Erosion of material during rains; Air pollution due to dust and volatile material emanated from bituminous material, paints, solvents; High levels of noise and vibration; Stock piling of soil, debris and other material may block surface drainage paths; Degradation of water quality</p>
<p>Establishment of material storage yards temporary parking bays for project machinery and vehicles</p>	<p>Reduction of on road parking; Obstruction to vehicular movements; Disturbances to residents; Increased traffic on alternate roads; Disturbance to pedestrian movement and safety issues; Interruption of livelihoods of pavement vendors, hawkers, middlemen etc. causing localized flooding during constructional and operational periods; Establishment of weed species in the project area due to introduction through imported raw material; Erosion and siltation; Contamination of surface runoff; Stagnation of water</p>
<p>Operational Phase</p>	<p>During operations there will be more traffic on the roads which will be mainly used as city by-pass roads and consequently increase in noise, vibration and air pollution. It is difficult to say how significant this impact will be as even now the roads are heavily used. The overall improved traffic arrangements within Kandy will lead to less noise, vibration and air pollution of the core city areas.</p>
<p><b>4. Kandy lake water quality improvement:</b></p>	
<p><b>Key project activities</b></p>	<p><b>Related Impacts</b></p>
<p>Site surveys and data collection</p>	<p>None</p>
<p>Transport and stockpiling of material</p>	<p>Emission of dust and air pollutants from transport vehicles; generation of noise and vibration; disturbance to residents and road users</p>
<p>Desilting of silt traps</p>	<p>Disposal of large quantities of silt; noise and air pollution from construction vehicles and equipment; traffic congestion and inconvenience to lake round walkway.</p>
<p>Construction/improvement to silt traps and gabion walls</p>	<p>Off-site impacts of quarrying; noise and air pollution from construction vehicles and equipment; traffic congestion</p>

Drainage diversions during construction	Temporary blockage and short-term increased siltation in the lake
Construction of siphon system at the spillway	Short-term water quality impairment; noise and air pollution from construction vehicles and equipment; traffic congestion
Operational Phase	In the long-term this will have many positive impacts with anticipated improvements in the quality of water in the lake. Silt collected in traps will need to be disposed and these may be large quantities and may have a secondary use in the construction industry.
<b>5. Urban landscaping for recreation and city beautification:</b>	
<b>Key project activities</b>	<b>Related Impacts</b>
Demolition/dismantling of existing pavements and structures	Disturbance to pedestrian movement and safety issues due to uneven surface, material/debris piles; Emission of dust, noise and air pollutants
Excavation of trenches to re-orient or lay new service lines (telecom, power, water and drainage);	Closure of roads for traffic; disturbance to pedestrian movement and safety issues due to deep excavations and material piles; emission of dust and air pollutants from equipment and machinery; generation of noise and vibration; loosened soil structure and slope failures leading to landslide risks; subsurface soil layers susceptible to collapse and fail under outward seepage flow
Construction of new foot walks and paved areas; installation of street furniture, lighting etc	High noise and vibration level; uneven settlements: cracks and eventual failure of anchorages and pipelines
Material transportation and storage	Emission of dust and air pollutants from equipment and machinery; generation of noise and vibration; traffic congestion; public safety
Provision of temporary drainage and traffic diversion	Obstruction to vehicular movements; Disturbances to residents due to traffic diversions and restricted entry to by-roads; Increased traffic on alternate roads; Temporary drainage blockages, Surface ponding of water;

Filling and re-surfacing/overlay	Off-site impacts of burrowing; traffic, noise, vibration from construction vehicles; dust emission; Increased flows due to altered land use types with less permeable paving surfaces;
Spoilage disposal	Blocking of existing drainage paths; erosion of material during rains
Turfing and tree planting	Introduction of invasives and selection of improper tree species
Operational Phase	Increased pedestrian traffic and visitors mean more solid waste and higher maintenance during the operational stage.
<b>6. Conservation of historic/archaeological buildings: Restoration of historic buildings to preserve cultural heritage and to promote local/foreign tourism via adaptive reuse</b>	
<b>Key project activities</b>	<b>Related Impacts</b>
Site survey and evaluation of structural stability	None
Structural/Aesthetical restoration	Use of wrong construction material, use of inexperienced contractors leading to damage to existing structures or impact on outstanding universal value due to inappropriate adaptive reuse
Operational Phase	Increased visitors mean more strain on the structural carrying capacity of the building, generation of solid waste and need for higher maintenance during the operational stage.
<b>Greater Galle</b>	
<b>1. Rehabilitation of primary/secondary canals and cross drains:</b>	
<b>Key project activities</b>	<b>Related Impacts</b>
Site survey and preparation including provision of access roads, material storage yards	Emission of dust; Disturbance to pedestrian movement, problems of accessibility to houses.

Dredging, dewatering and disposal of bottom sediments	Degradation of water quality; Reduce pore pressure build up, slope instability and transport of fines; Surface ponding of removed water; Stock piling of dredged material, soil, debris; Blocking of surface drainage paths causing localized flooding; Odour problems; Smothering of benthic fauna
Removal of temporary structures, debris, demolition waste and other solid waste along the banks	Emission of dust and noise; Disturbances to traffic and pedestrians during storage of material and debris; Inconvenience to present residents and pedestrians.
Excavation for the gabion wall construction and coffer damming	Collapse of vertical soil faces; Increased susceptibility to erosion; Liquefaction leading to bank failures; Excessive noise and vibration; Inconvenience to present residents and pedestrians; Temporary distraction of fish
Material transport and storage	Emission of dust and noise due to transport of material; Inconvenience to people in the area
Construction of gabion walls	Diversion of flows, erosion of soil embankments, loosening bank support and weakening of the interlocking of rubble used causing immature failure of gabion structure; Inconvenience to present residents and pedestrians, if any.
Reinstatement of storm water drainage connections through protection walls.	Erosion of soil embankments, loosening bank support and weakening of the interlocking of rubble used causing immature failure of gabion structure; Blockage due to accumulation of fines due to cross drainage flows
Backfilling of banks behind the gabions, turfing and replanting of trees	Differential settlements causing the gabion walls to misalign and fail; Inconvenience to present residents and pedestrians and potential accidents
Reinstatement of maintenance roads and construction of road side drain and cross drainage	Localized ponding; weakening of soil sub-base
Operational phase	During the operational phase maintenance dredging would be required which will also require careful disposal of material.

<b>2. Coastal urban development:</b>	
<b>Key project activities</b>	<b>Related Impacts</b>
Site Surveying & data collection	None
Site preparation including provision of access roads, removal of temporary structures (if any), debris and other solid waste along the beach	Emission of dust; disturbance to beach users, inconvenience to present residents and pedestrians, disposal of collected debris.
Construction of beach facilities	Emission of dust and noise due to transport of material and construction, inconvenience to beach users and people in the area, wastewater from car parks, toilets and restaurants
Construction of erosion control structures	Off-site impacts of quarrying, emission of dust and noise due to transport of material and construction, inconvenience to road users and people in the area
<b>3. Urban landscaping for recreation and city beautification:</b>	
<b>Key project activities</b>	<b>Related Impacts</b>
Site Surveying & data collection	None
Site preparation including provision of access roads, removal of temporary structures (if any), debris and other solid waste along the beach	Emission of dust; disturbance to beach users, inconvenience to present residents and pedestrians, disposal of collected debris.
Construction of beach facilities	Emission of dust and noise due to transport of material and construction, inconvenience to beach users and people in the area, wastewater from car parks, toilets and restaurants
Construction of erosion control structures	Off-site impacts of quarrying, emission of dust and noise due to transport of material and construction, inconvenience to road users and people in the area



Operational Phase	Increased pedestrian traffic and visitors mean more solid waste and higher maintenance during the operational stage.
<b>4. Conservation of historic/archaeological buildings:</b>	
<b>Key project activities</b>	<b>Related Impacts</b>
Site Surveying & data collection	None
Site preparation including provision of access roads, removal of temporary structures (if any), debris and other solid waste along the beach	Emission of dust; disturbance to beach users, inconvenience to present residents and pedestrians, disposal of collected debris.
Construction of beach facilities	Emission of dust and noise due to transport of material and construction, inconvenience to beach users and people in the area, wastewater from car parks, toilets and restaurants
Construction of erosion control structures	Off-site impacts of quarrying, emission of dust and noise due to transport of material and construction, inconvenience to road users and people in the area
Operational Phase	Increased visitors mean more solid waste and higher maintenance during the operational stage.
<b>Greater Jaffna</b>	
<b>1. Rehabilitation of Ponds and Drains:</b>	
<b>Key project activities</b>	<b>Related Impacts</b>
Site survey and preparation including provision of access roads, material storage yards	Emission of dust; Disturbance to pedestrian movement, problems of accessibility to houses.

De-silting, dewatering and disposal of bottom sediments	Degradation of both surface and ground water quality; Reduce pore pressure build up, slope instability and transport of fines; Surface ponding of removed water; Stock piling of dredged material, soil, debris; Blocking of surface drainage paths causing localized flooding; Odour problems; Smothering of benthic fauna
Removal of temporary structures, debris, demolition waste and other solid waste along the banks	Emission of dust and noise; Disturbances to traffic and pedestrians during storage of material and debris; Inconvenience to present residents and pedestrians.
Excavation for the gabion wall construction and coffer damming	Collapse of vertical soil faces; Increased susceptibility to erosion; Liquefaction leading to bank failures; Excessive noise and vibration; Inconvenience to present residents and pedestrians; Temporary distraction of fish
Material transport and storage	Emission of dust and noise due to transport of material; Inconvenience to people in the area
Construction of gabion walls	Diversion of flows, erosion of soil embankments, loosening bank support and weakening of the interlocking of rubble used causing immature failure of gabion structure; Inconvenience to present residents and pedestrians, if any.
Reinstatement of storm water drainage connections through protection walls.	Erosion of soil embankments, loosening bank support and weakening of the interlocking of rubble used causing immature failure of gabion structure; Blockage due to accumulation of fines due to cross drainage flows
Backfilling of banks behind the gabions, turfing and replanting of trees	Differential settlements causing the gabion walls to misalign and fail; Inconvenience to present residents and pedestrians and potential accidents
Reinstatement of maintenance roads and construction of road side drain and cross drainage	Localized ponding; weakening of soil sub-base
Operational phase	During the operational phase maintenance de-silting would be required which will also require careful disposal of material.
<b>2. Coastal urban development:</b>	

<b>Key project activities</b>	<b>Related Impacts</b>
Site Surveying & data collection	None
Site preparation including provision of access roads, removal of temporary structures (if any), debris and other solid waste along the beach	Emission of dust; disturbance to beach users, inconvenience to present residents and pedestrians, disposal of collected debris.
Construction of beach facilities	Emission of dust and noise due to transport of material and construction, inconvenience to beach users and people in the area, wastewater from car parks, toilets and restaurants; safety hazards
Construction of erosion control structures	Off-site impacts of quarrying, emission of dust and noise due to transport of material and construction, inconvenience to road users and people in the area
<b>3. Improvements of Roads:</b>	
<b>Key project activities</b>	<b>Related Impacts</b>
Transport and stockpiling of material	Emission of dust and air pollutants from equipment and machinery; generation of noise and vibration; disturbance to residents and road users
Traffic diversion	Obstruction to vehicular/ pedestrian movements; Disturbances to residents due to traffic diversions and restricted entry to by-roads; Increased traffic on alternate roads
Pavement Demolition	Disturbance to pedestrian movement and safety issues due to uneven surface, material/ debris piles; Emission of dust, noise and air pollutants
Excavation of trenches, shoring and dewatering if necessary	Closure of roads for traffic; disturbance to pedestrian movement and safety issues due to deep excavations and material piles; emission of dust and air pollutants from equipment and machinery; generation of noise and vibration; loosened soil structure and slope failures leading to landslide risks; subsurface soil layers susceptible to collapse and fail under outward seepage flow

Drainage diversions during construction;	Temporary drainage blockages, Surface ponding of water;
Provision of permanent drainage, construction of man holes and catch pits, compaction & soil stabilization, road filling and resurfacing/overlay	Obstruction to vehicular movements on roads under construction and increased traffic on alternate roads; Disturbances to day-to-day activities of residents, road-users due to traffic diversions and restricted entry to by-roads; Inconveniences to residents and other road users, especially commercial establishments for their delivery vehicles; Disturbance to pedestrian movement and safety issues due to excavations and material piles; Interruption of livelihoods of pavement vendors, hawkers, middlemen etc. and their inability to night parking of carts; Erosion of material during rains; Air pollution due to dust and volatile material emanated from bituminous material, paints, solvents; High levels of noise and vibration; Stock piling of soil, debris and other material may block surface drainage paths; Degradation of water quality
Establishment of material storage yards temporary parking bays for project machinery and vehicles	Reduction of on road parking; Obstruction to vehicular movements; Disturbances to residents; Increased traffic on alternate roads; Disturbance to pedestrian movement and safety issues; Interruption of livelihoods of pavement vendors, hawkers, middlemen etc. causing localized flooding during constructional and operational periods; Establishment of weed species in the project area due to introduction through imported raw material; Erosion and siltation; Contamination of surface runoff; Stagnation of water
Operational Phase	During operations there will be more traffic on the roads which will be mainly used as city by-pass roads and consequently increase in noise, vibration and air pollution. It is difficult to say how significant this impact will be as even now the roads are heavily used.
<b>4. Urban landscaping for recreation and city beautification:</b>	
<b>Key project activities</b>	<b>Related Impacts</b>
Site Surveying & data collection	None

Site preparation including provision of access roads, removal of temporary structures (if any), debris and other solid waste along the beach	Emission of dust; disturbance to beach users, inconvenience to present residents and pedestrians, disposal of collected debris.
Construction of beach facilities	Emission of dust and noise due to transport of material and construction, inconvenience to beach users and people in the area, wastewater from car parks, toilets and restaurants
Construction of erosion control structures	Off-site impacts of quarrying, emission of dust and noise due to transport of material and construction, inconvenience to road users and people in the area
Operational Phase	Increased pedestrian traffic and visitors mean more solid waste and higher maintenance during the operational stage.
<b>5. Conservation of historic/archaeological buildings:</b>	
<b>Key project activities</b>	<b>Related Impacts</b>
Site Surveying & data collection	None
Site preparation including provision of access roads, removal of temporary structures (if any), debris and other solid waste around the buildings	Emission of dust; disturbance to beach users, inconvenience to present residents and pedestrians, disposal of collected debris.
Renovation and rehabilitation of the buildings	Emission of dust and noise due to transport of material and construction, disposal of debris, safety hazards and hazards to the old structure
Construction of erosion control structures	Off-site impacts of quarrying, emission of dust and noise due to transport of material and construction, inconvenience to road users and people in the area
Operational Phase	Increased visitors mean more solid waste and higher maintenance during the operational stage.

#### **4.1.3 Potential issues that require specific guidelines**

In some of the sub-projects specific issues that are apart from typical construction related impacts may arise. Such issues have to be addressed with specific guidelines so that the real impacts could be evaluated successfully and mitigation measures proposed accordingly. Two such issues have been identified;

##### **4.13.1 Dredging and dredged material disposal**

Themes such as the improvement of main canals and rehabilitation of secondary and tertiary canal in Galle may involve dredging that could lead to potentially serious environmental impacts if sediments of the canals dredged are contaminated with hazardous material. If that is the case, disposal of dredged material should be handled and planned carefully, especially in view of limited options available in the country for disposing contaminated dredged material, in order to ensure that risks to the environment, public and the workers are mitigated and managed well. The extent of impact of dredging will depend on the quantity of material, method of mobilization of machinery and the degree of contamination etc. As such, for sub-project that involve substantial dredging generating significant volumes of dredge material specific guidelines need to be used. Since the GoSL does not have specific environmental guidelines for dredging and dredge material disposal, guidelines developed by the United States Environmental Protection Agency (USEPA), given below, can be used as useful references.

- Evaluation of dredged material proposed for discharge in Waters of the U. S. – Testing Manual, Feb. 1998, EPA-823-B-98-004 (can be downloaded from [www.epa.gov](http://www.epa.gov))
- Evaluating environmental effects of dredged material management alternatives – A technical framework, revised in May 2004, EPA842-B-92-008 (can be downloaded from [www.epa.gov](http://www.epa.gov))

These two guidelines should be adopted in the context of the SCDP and as such it will provide the necessary information as to how dredging and dredged material disposal be handled in an environmental safe manner under the project.

##### **4.1.3.2 Construction in landslide hazard zone**

Landslides constitute a major natural disaster in the Kandy district. Within the Kandy city limits itself various landslide events have taken place in the past causing damage to life and property and are recurring, posing a major challenge to all stakeholders to mitigate such impacts when development work is undertaken. Landslides are caused when mountain slopes are rendered unstable. While this can occur naturally, human induced features such as bad land use practices in steep slopes, poor drainage, improper construction techniques, overloading of slopes, vibration from heavy traffic and displacement of rocks aggravate the situation and raise the landslide risk significantly. In order to guide future land-use and economic activity in hilly areas the National Building Research Organization (NBRO), which is the government authority for landslide disaster management, has prepared Landslide Hazard Zonation (LHZ) maps for vulnerable areas including the Kandy city. The LHZ maps assign risk levels to areas depending on susceptibility for landslides and accordingly within the Kandy city 10% of the areas has been identified as having a high risk while 30% and 60% respectively has been identified as having a moderate and low risk.

It is important for SCDP to use the LHZ for Kandy city as a basis for planning project work and to consult the NBRO for site specific remedial measures when infrastructure development is undertaken in risky areas.

#### **4.1.3.3 Impacts on physical cultural resources (PCR)**

Kandy, Galle and Jaffna are cities rich in cultural heritage and requires particular attention to mitigate any negative impacts on PCRs that can take place either directly or indirectly during project implementation. As highlighted in the preceding chapter, PCRs in three cities are dominated by built PCRs such as historic buildings, monuments, temples and monastic complexes. For Kandy and Galle cities, cultural heritage buildings and properties have been inventoried and mapped by both the Department of Archaeology and the Central Environmental Authority and a historic building code is in practice which requires historic buildings to adhere to conservation guidelines when any change is implemented. For Jaffna, due to the long standing conflict period, a mapping of archeological, historical and cultural property has not been conducted in detail currently, however locations of some of the key PCRs within the municipality are known.

Some of the key interventions undertaken by the project, focuses on rehabilitating and improving existing infrastructure in the urban areas, such as drainage systems, roads and water supply schemes. These subprojects trigger some of the typical impacts that impact PCRs during construction projects highlighted below.

- Direct physical damage during construction work and construction accidents
- Physical damage due to vibration, air, soil and water pollution caused by construction traffic, use of heavy construction equipment and possible use of explosives in road improvement work
- Indiscriminate dumping of waste that could cover and lead to aesthetic damages
- Temporary or permanent access restrictions
- Soil compaction during road and water supply and drainage work leading to burial and damage to buried material
- Quarrying for construction material leading to damage and destruction of PCRs and changing of aesthetic quality of landscapes
- Establishment of worker camps leading to unregulated access to PCR sites, looting of valuable artifacts, accidental damage and vandalism

While the project is not expected to lead to changes in demographic or settlement patterns that can lead to neglect of old areas containing historic centers, it will however undertake construction of urban facilities, bus terminals, walkways, etc. which may have the potential of significantly altering existing scenic townscapes.

In addition the project will also have a cultural heritage focused component focusing on heritage assets under interventions planned for Urban Upgrading. The planned interventions will fall within the purview of conservation, historical restoration, physical rehabilitation, adaptive reuse and management and maintenance of heritage assets. While these interventions are expected to have positive outcomes, care should be taken to employ the right expertise, use sympathetic construction material and techniques and not to over-restore resulting in negative impacts, such as those highlighted below, on the townscape and the OUV of these assets. Also, reuse of restored

heritage buildings should take into consideration impacts of increased visitation and the resultant wear and tear and have adequate management measures to ensure the continual conservation of the cultural heritage asset.

Negative impacts on a cultural heritage resource(s) typically include, but are not limited to:

- Destruction of any, or part of any, significant heritage attributes or features
- Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance
- Shadows created that alter the appearance of a heritage attribute or change the viability of an associated natural feature or plantings, such as a garden
- Isolation of a heritage attribute from its surrounding environment, context or a significant relationship
- Direct or indirect obstruction of significant views or vistas within, from, or of built and natural features
- A change in land use (such as rezoning a church to a multi-unit residence) where the change in use negates the property's cultural heritage value
- Land disturbances such as a change in grade that alters soils, and drainage patterns that adversely affect a cultural heritage resource, including archaeological resources

#### **4.1.3.4 Impacts on Ground Water Resources**

The most sensitive natural resource in the Jaffna peninsula is its scarce fresh water resource. Being flat country, Jaffna has no surface water streams and hence depends solely on its well-developed groundwater aquifers (sand and limestone aquifers). Historically, people in Jaffna learnt to adapt life to whatever nature bestowed upon them. They valued and understood the importance of protecting their only water resource which was limited in supply, and used traditional methods to conserve it. However, with the increase in populations (and congregation into urban areas) and the intensification of agriculture, groundwater resources across Jaffna Peninsula have come under heavy pressure from pollution and over-use. Hence, land use planning and development in the Jaffna peninsula must be approached from the point of view of managing the sensitive ground water resources. This applies to urban planning as well and interventions proposed under the additional financing.

In terms of drainage within the Jaffna city a balance has to be achieved in terms of livability and delaying run off to the sea in order to facilitate recharge. During a mission's visit to Jaffna in November 2015, the city was flooded in several places (knee high in some places) and the inhabitants were seen undergoing many hardships due to access roads and houses being submerged. Flooding in cities can give rise to serious environmental and public health concerns (not to mention economic damages) and hence must be addressed. However, drainage within Jaffna city must be understood viz a viz the groundwater recharge function. Designing a drainage system that flushes out flood water too soon, as may be appropriate in the case of other cities, may contribute to less recharge of ground water aquifers, especially during dry and inter-monsoonal rain periods when GW levels are low. The city has a number of small ponds dotting the urban landscape that are connected by drainage channels which eventually fall to the lagoon through eight outfalls. These ponds are a mix of natural and man-made creations and are believed to play a role in surface water retention and groundwater recharge. As no maintenance has been carried out for decades, these ponds have become heavily silted and collectors of pollution from



the surrounding houses and urban lands that discharge to them. As such, their retention and recharge capacities are believed to be compromised. Under the proposed additional financing, it is expected that these ponds will be cleaned and its surroundings improved as part of the drainage and urban upgrade components.

While many studies have been carried out on water quality and quantum of the groundwater resources within the Jaffna Peninsula, which are very helpful, none of them have covered the JMC area in adequate detail. Hence, a proper hydro-geological and water chemistry study on the pond/ drainage system within the JMC and its links to the Jaffna groundwater aquifers will need to be undertaken (rate of re-charge, pattern of re-charge, groundwater flow direction or patterns, levels of groundwater, etc.). It is quite important to know the sub-surface geology of the ponds so that desilting will not cause any damage to the limestone aquifer. It will also be mandatorily required to consult all the relevant stakeholders within the Peninsula before finalizing the conceptual framework for pond rehabilitation.

Safeguard impacts of this activity will be largely positive, provided designs are based on proper understanding of the surface/ground water interactions, excepting that desilting will generate large quantities of silt that needs disposal in a city that does not have proper SW dumping site. Desilting without removing existing pollution sources can cause concern as desilted ponds could be percolating polluted water down. However, the exact scale and type of impact cannot be assessed without a proper site-specific investigation. It is also important to find solution to the solid waste management issue of JMC to avoid being dumping all the wastes into the ponds and disturb its maintenance in future.

## **4.2 Impact Management Framework**

### **4.2.1 Environmental screening of sub-projects**

Environmental screening is reckoned to be a useful tool in identifying environmental safeguard issues in large investment programs consisting of many sub-projects that cover multiple sectors. As such, all sub-projects under SCDP will be subjected to an environmental screening using the form provided in **Annex 5**. In addition to the list of sub-projects indicated in the previous chapters, any resettlement site that will be used by the project to relocate families from underserved settlements to enable certain sub-projects to be implemented will be subjected to the same screening process. The main objective of Environmental Screening of sub-projects will be to (a) determine the anticipated environmental impacts, risks and opportunities of the sub-project (ii) determine if the anticipated impacts and public concern warrant further environmental analysis, and if so to recommend the appropriate type and extent of Environmental Assessment needed. Screening should go hand in hand with project concept development. This way environmental opportunities and risks can be appropriately and easily integrated into subsequent design stages, rather than being brought in at the last minute. The environmental screening report should be prepared by an environmental expert/s with field visits and available data and information (*implementation arrangements are given in the subsequent chapter*). Once the report is ready, it will be made available to the project implementing agency to take necessary actions particularly in relation to the recommendation given in the report.

### **4.2.2 Sub-project criteria for screening**

In the case of developing criteria for screening and assessing anticipated impacts all sub-projects are categorized into generic themes based on the nature of work proposed, as presented in the

preceding section. The following table provides a template of a typical screening (anticipated outcomes based on potential environmental risks/impacts involved) and classifying all sub-projects in the pipeline in accordance with (a) safeguard categories of OP 4.01 and (b) recommended type of environmental analysis and/or feasibility studies to be undertaken for each type of investment commensurate with the magnitude of potential impacts and risks. According to this table it is evident that most of the sub-projects belong to safeguard Category B and do not need rigorous environmental studies to be undertaken and only the screening report with a site specific EMP would be adequate. Hence project proponents are requested to refer to the EAMF to be informed on the level of environmental studies that would typically be necessary to be undertaken prior to commencement of the project.

It is extremely important to note that this table has been prepared as a **broad guidance** to the PMU and the implementing agencies as possible screening outcomes commensurate with typical environmental risks/impacts associated with each investment category and **should be re-evaluated** at the time of actual screening. The final decision will be based on the actual screening that will be undertaken for each project along with appropriate site investigations.

#### **4.2.3 Physical Cultural Resource Specific Screening and Impact Management**

Implementation of the PCR Safeguards requirements will follow steps presented in Annex 7 closely linking with activity planning, design and implementation steps. In addition to the Environmental Screening and Management Process, any proposed project intervention to be conducted either within or in close proximity to a heritage asset should follow the procedure of due diligence outlined in Annex 7.

The process of implementation focuses on PCRs specifically in order to ensure that all project interventions, predominantly those that will involve direct interventions within heritage properties and will involve direct work on designated sites of cultural heritage under the SCDP. The process will follow a comprehensive due diligence mechanism to be followed as part of the requirements of the project ESMF. The process follows mechanisms which are in consideration of the World Heritage Convention, to which Sri Lanka is party, ICOMOS Guidance on Heritage Impact Assessments for Cultural World Heritage Properties, World Bank Safeguard Policy- OP 4.11 on Physical Cultural Resources, national laws and regulations of Sri Lanka as presented in Annex 7.

**Anticipated Screening Outcomes for Proposed Sub Projects**

1 - SEA; 2 - Feasibility/Analytical study (mainly sediment quality analysis); 3 - EIA; 4 - EA; 5 - EMP only

Recommended Environmental Analysis - √; Safeguard Category of sub-project: A - Impacts are significant and irreversible; B - Significance of impacts vary, mitigatable and not irreversible; C - no impact

Project component and implementing agency	Sub-project type	Potential adverse environmental issues (refer preceding section for a more detail account of potential impacts)	Safeguard Category According to OP 4.01	Type of recommended environmental analysis				
				1	2	3	4	5
<b>Component 1</b>	<b>Greater Kandy Improvement</b>							
	<b>Kandy Basic Services Improvement</b>							
	Augmentation and rehabilitation of the municipal water supply system. <ul style="list-style-type: none"> <li>Augmentation of Getambe, Dunumadalawa, and Rosneth treatment plants, and construction of storage tanks.</li> <li>Rehab of the distribution network</li> </ul>	Mostly construction related impacts of dust, noise, traffic, soil erosion, water stagnation, road closure, inconvenience to public and residents, tree removal, debris disposal, short-term lake water quality impairment. The main operational impact will be increased extraction of water from the river. Other operational impacts are low risk and related to maintenance.	B					√
	Kandy Lake water quality improvement <ul style="list-style-type: none"> <li>Overflow stream restoration from Dunumadalawa Reservoir to Kandy Lake</li> <li>Protection to embankment of upper stream canals to Kandy Lake and</li> </ul>	Removal of trees, disposal of silt, dust, noise, air pollution and traffic congestions, inconvenience to public and residents, introduction on invasive species, short-term lake water quality impairment. In the long-term this will have many positive impacts with anticipated improvements in the quality of water in the lake.	B					√

	<p>construction of new silt traps</p> <ul style="list-style-type: none"> <li>• Lake shore protection and Lake around walkway</li> <li>• Establishment of lab facilities and purchase of equipment</li> </ul>							
	<p>Rehab of the Underground storm water drainage tunnel and surface drainage</p>	<p>Generation of noise and vibration; Slope failures; Loosen soil structure and weaken soil stability; Subsurface soil layers susceptible to collapse and fail under outward seepage flow, dust, noise, traffic, public safety.</p> <p>During operations, cleaning would generate debris that need to be safely disposed.</p>	B					√
	<p>Rehab of surface canal (Meda Ela) and rehab of overflow from <i>Dunumadalawa</i></p>	<p>Bank failures; Loosen soil structure and weaken soil stability; short-term canal water quality impairment dust, noise, traffic, public safety.</p> <p>During operations cleaning of the canals will generate soil and debris which needs to be disposed properly.</p>	B					√
<b>Kandy Traffic Improvement</b>								
	<p>Roads improvement (critical by pass roads and downtown main roads)</p>	<p>Landslide hazard, dust, noise, traffic, public safety, access restriction, soil erosion and water stagnation, air pollution from bituminous material.</p> <p>During operations there will be more traffic on the roads which will be mainly used as city by-pass roads and consequently increase in noise, vibration and air pollution. It is difficult to say how significant this impact will be as even now the roads are heavily used. The overall improved traffic arrangements within Kandy will lead to less noise, vibration and air pollution of the core city areas.</p>	B					√

	Public transport and traffic management	Same as above	B						√
<b>Kandy Urban Upgrading</b>									
	Streetscape improvement in Grid City Lake Around Walkability Public space reconfiguration in front of Prison Land Restoration of heritage buildings	Public safety, traffic, dust, noise, introduction of invasive species.  Increased pedestrian traffic and visitors mean more solid waste and higher maintenance during the operational stage.	B						√
<b>Institutional Strengthening and Capacity Building</b>									
	Preparation of city development master plan		C	√					
<b>Greater Galle Improvements</b>									
<b>Flood and Drainage Management</b>									
	Rehabilitation of primary/secondary canals and cross drains:	Dredging, dredge material disposal. During the operational phase maintenance dredging would be required which will also require careful disposal of material.	B		√				√
	Coastal urban development: Beach Access Urban design for Weligama		B		√				√
	Urban landscaping for recreation and city beautification: Walkability improvement Streetscaping Restoration of heritage buildings	Public safety, traffic, dust, noise, introduction of invasive species; use of wrong raw material for heritage conservation.  Increased pedestrian traffic and visitors mean more solid waste and higher maintenance during the operational stage.	B						√
<b>Greater Jaffna Improvements</b>									
<b>Rehabilitation of Ponds and Drains</b>									
	Rehabilitation of Ponds and Drains	Desilting, deepening, clearing of reservations, embankment protection, rehabilitation of pond's gate and pumping station if any	A					√	

		Desilting, disposal of silt. During the operational phase maintenance dredging would be required which will also require careful disposal of material.						
	urban upgrading and cultural heritage, including the enhancement of selected streetscapes and public spaces, restoration and adaptive reuse of historic and landmark buildings	Public safety, traffic, dust, noise, introduction of invasive species.  Increased pedestrian traffic and visitors mean more solid waste and higher maintenance during the operational stage.	B					√
	connectivity improvements such as rehabilitation of link roads and traffic management measures	Land acquisition, road widening, construction activities will cause dust, noise, traffic, public safety, access restriction, soil erosion and water stagnation, air pollution from bituminous materials.	B					√
	Preparation of Drainage Master Plan		C					

**Annex 6** provides a description of the different EA tools used in the table above

### **4.2.3 Screening Method**

Preparation of the screening reports will be conducted in four distinct stages, namely (i) field visits, data collection and stakeholder consultation; (ii) data analysis and interpretation; (iii) impact identification; and (iv) filling the screening including recommendations for next steps. The methodologies for each of these steps are explained briefly below. The proposed screening report format is given in Annex 3.

#### **Data collection and stakeholder consultations**

Data for this study will be primarily collected through field visits, discussion with stakeholder agencies and literature reviews. In addition, supportive tools such as GIS based mapping using GPS coordinates covering the sub project sites, where ever possible is encouraged.

Literature Survey will broadly cover the following aspects and attributes necessary for environmental screening:

- Project details/ Reports/ Maps/ documents including design details available with the implementing agencies
- Literature on flora/ fauna/ biodiversity/land use/soil/geology/ hydrology/ climate /socio economic profiles and environmental planning collected from GOSL agencies
- Hydrological/ rainfall/ drainage datasets

#### **Field Visits:**

Each sub-project sites will be visited by the expert/s filling the screening form together with representatives from the implementing agency to assess the existing environment (physical, biological and socio economic environment) and gather information with regard to the proposed sites and scale of the proposed sub projects and any prevalent issues. During these visits rapid reconnaissance surveys will be conducted in order to record the faunal, floral diversity, where necessary, to verify and support information gathered through the literature survey.

#### **Focus Group Discussions/ Meetings:**

Focus group discussions will be carried out with other stakeholder agencies (as the expert will represent the project proponent sub-project related technical discussions are expected to take place internally) and local authorities to discuss pertinent issues. In addition, the public will be consulted (at least 5 such consultations in each site) to record their views and opinions about the proposed SCDP and the given site-specific investments.

#### **Data Analysis and Interpretation**

Data collected from field visits and stakeholder discussions will be analyzed by the expert and discussed with the technical team of the project proponent for feedback.

#### **Impact identification**

This will be carried out by the project proponent's expert through discussion with the technical team.

#### **Filling screening reports**

The screening report will be filled with details on the proposed project intervention, physical/ecological baseline conditions of the site, assessment of potential impacts,

feedback from public consultations and recommendations for the type of environmental assessment required. If the findings confirm that anticipated impacts are not significant enough for a stand-alone EA and that an EMP would suffice to mitigate the likely impacts, the screening exercise would be completed with the preparation of a site specific EMP. If the likely impacts are significant and would require greater environmental analysis, the screening report would recommend the appropriate assessment type for the implementation agency to carry out before designs are finalized. **Annex 3** provides guidelines for EMP preparation.

### 4.3 Mitigation of potential environmental impacts

As highlighted above, environmental impacts from majority of sub-projects under SCDP will be associated with general construction related activities which can be effectively mitigated with good construction planning, site management, debris disposal and public safety practices. For such impacts, environmental best practices (relevant to the sub-project) as highlighted in the table below would be sufficient where impacts of a particular activity are minor and easily arrested. As for, specific impacts such as those that could potentially arise from dredging, dredge material disposal and construction on landside sensitive zones will need specific guidelines to plan mitigation. For specific impacts of dredging, the subsequent section presents a technical framework for planning dredging and dredge material disposal for sites proven to be contaminated.

#### 4.3.1 Environmental best practices for constructional impacts

Type of Impact	Mitigation measures	Standards applied
Dust	<ul style="list-style-type: none"> <li>Regular watering of roads for dust suppression in urban, residential areas and in areas with sensitive receptors</li> <li>Covering of excavated soil temporary stored on site</li> <li>Daily cleaning of tires of vehicles</li> <li>covering up any vehicle transporting materials and spoil to and from construction sites</li> <li>Daily cleaning of streets and pathways in vicinity of construction site that are affected by soil and dust</li> <li>Imposing speed controls for construction vehicles</li> </ul>	ICTAD Publications: SCA/5; SCA/3/1
Air pollution	<ul style="list-style-type: none"> <li>Employ construction machines with low emissions to reduce pollution, arranging sources of emission far from people's houses and public places</li> <li>All construction machines and vehicles should meet the standard on emissions and have passed the emission test</li> <li>No burning of wastes on site</li> <li>Limit traffic congestion through proper planning and operating of traffic diversions</li> <li>Do not let machines idle when not necessary</li> </ul>	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3; CEA Air quality standards;
Noise and Vibration	<ul style="list-style-type: none"> <li>Apply appropriate schedule to avoid any works that may cause noise and vibration during 10 pm – 6 am. Any nighttime activities should be done using noise reducing means or low-noise technologies</li> </ul>	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2;



Type of Impact	Mitigation measures	Standards applied
	<ul style="list-style-type: none"> <li>• Use vehicles and equipment that meet standards for noise and vibration in Sri Lanka.</li> <li>• Publishing and registering working time of construction machines with local authorities and strictly compliance therewith.</li> <li>• Restricting use of noisy machines near sensitive receptors such as schools and hospitals, use noise-reducing means for construction machines, if required.</li> </ul>	SCA/3/3; CEA noise & vibration standards
Solid waste (demolition, construction and excavation)	<ul style="list-style-type: none"> <li>• Work sites should be cleared of residual solid waste and wastewater before work commences</li> <li>• Temporary storage of solid wastes shall be done with appropriate containment to avoid spreading of waste, odor and avoid dust</li> <li>• Temporary storage of solid waste should be done to avoid interfering with traffic obstacles and aesthetics</li> <li>• Sites for collecting solid waste in each sub-project area should be determined prior to commencement of construction. These sites must be suitable with the transport, in order not to obstruct the activities of human beings and the waste must be transported during the day</li> <li>• Construction wastes should be removed as much as possible within 24 hours from the site to ensure public safety in urban areas</li> <li>• All waste should be collected and disposed in compliance with the local and national laws, in sites identified by the respective LA</li> <li>• Excavated soil, if suitable, should be used for leveling and backfilling</li> <li>• No solid waste can be burned at the site</li> <li>• Clean the construction site of solid wastes, wastewater etc. before its closing</li> </ul>	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3;CEA guidelines on Solid Wastes
Domestic waste	<ul style="list-style-type: none"> <li>• Construction camps should be sited appropriately with consent from the necessary public authority or the implementing agency,</li> <li>• Labour camps shall be provided with adequate and appropriate facilities for disposal of sewage and solid waste</li> <li>• Domestic solid waste shall be collected and disposed of daily at the LA designated site or given for collection by the LA</li> <li>• Discharge and disposal domestic waste from worker camps into water sources should be strictly avoided</li> <li>• Burying and burning domestic waste in the project site should also be strictly avoided</li> </ul>	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3; CEA guidelines on Solid Wastes, Code of practices by SLSI

Type of Impact	Mitigation measures	Standards applied
	<ul style="list-style-type: none"> <li>• Avoid construction workers staying overnight in the construction sites</li> </ul>	
Dredge material disposal	<ul style="list-style-type: none"> <li>• Dredge material identified as contaminated will need special handling, transportation and disposal. For contaminated sites, confirmed by the on-going sediment quality analysis, a dredge material disposal plan will need to be prepared.</li> <li>• The contractor should be trained and made aware of the requirements prior to commencement of the sub-project. Special guidelines for handling of contaminated dredge material should be prepared and published by the PMU.</li> <li>• Dredge material that are uncontaminated should be either dumped on-site for canal/lake bank stabilization or removed to landfill/dumpsite designated by the LA/CEA as appropriately.</li> </ul>	ICTAD Publications: SCA/3/3; EPA guidelines on dredged materail
Oil and lubricant waste	<ul style="list-style-type: none"> <li>• Oil and lubricant waste should not be buried or burnt in the project site, but collected and stored in proper oil-cans and disposed for re-use or LA approved designated sites.</li> </ul>	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3
Soil erosion	<ul style="list-style-type: none"> <li>• Earthwork should be carried out during dry weather periods and all exposed surfaces should be covered with suitable grass species (turf) to prevent siltation in canal/lake beds</li> <li>• Stockpiling of earth should be done a safe distance away from waterways</li> <li>• Other construction materials containing small/ fine particles shall be stored in a place not subjected to flooding and in such a manner that these materials will not be washed away by runoff.</li> <li>• If necessary, silt/sedimentation traps should be used to prevent soil particles from getting into drains and canals</li> </ul>	ICTAD Publications: SCA/5; SCA/3/1,SCA/7
Extraction of earth and quarry	<ul style="list-style-type: none"> <li>• All quarry/burrow sites operated by the contractor should be licensed with the LA/CEA/GSMB, as appropriate.</li> <li>• All burrow pits /areas shall be rehabilitated at the end of their use by the contractor in accordance with the requirement of the EMP or as instructed by the Engineer of the IA</li> <li>• Establishment of burrow pits/areas and its operational activities should not endanger properties and cause a health hazard to the people.</li> <li>• At contract closing, all burrow/quarry sites should be fully rehabilitated</li> </ul>	ICTAD Publications: SCA/5; SCA/3/1;; SCA/3/3, GSMB guidelines

Type of Impact	Mitigation measures	Standards applied
	<ul style="list-style-type: none"> <li>If contractor would procure earth/quarry material, he should do so from sources that are operating with the required licenses</li> </ul>	
Traffic Congestion	<ul style="list-style-type: none"> <li>All sub-project should have a traffic management plan</li> <li>Temporary home and business accesses should be provided where necessary and transport along main roads during rush hours should be avoided where possible.</li> <li>Temporary access roads should be identified before construction begins and upgraded if necessary.</li> <li>All roads and access sites must be restored to their original state as soon as possible</li> <li>Speed limits and operating times for the construction vehicles should be imposed</li> <li>Travel route for construction vehicles should be designed to avoid areas of congestion.</li> <li>If project works occur after dark, a lighting system should be maintained such that vehicles and pedestrians can clearly see the construction area.</li> <li>One-way flow of traffic should be promoted whenever practical</li> <li>Contractor should supply traffic co-coordinators to manage traffic flow in areas that are subject to congestion.</li> <li>Project should maintain fences throughout construction areas. These fences should define clearly the construction boundary that does not occupy the remaining road and ensure traffic flow in residential areas</li> <li>Awareness programs can be conducted on safety and proper traffic behavior in densely populated areas near the construction sites.</li> </ul>	ICTAD Publications: SCA/5
Access roads	<ul style="list-style-type: none"> <li>Before construction, the pre-project state of site access roads should be recorded by the project/contractor</li> <li>During construction, site access roads should be inspected regularly and repairs made as required</li> <li>After construction, site access roads used by the Project should be inspected and compared to records taken during Pre-construction.</li> <li>If notable road quality differences exist, the road should be repaired to its original condition</li> </ul>	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3
Health and Safety	SEE SEPARATE SECTION ON HEALTH AND SAFETY BELOW	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3, Guidelines of

Type of Impact	Mitigation measures	Standards applied
		Department of Labour IFC General Environmental, Health and Safety Guidelines
Impacts on flora and fauna	<ul style="list-style-type: none"> <li>• A compensatory tree planting program should be developed to replant native species wherever available space beside the proposed project.</li> <li>• Workers should be instructed to protect flora and fauna including aquatic life as well as their habitats.</li> <li>• Hunting and poaching should be strictly prohibited.</li> <li>• Washing, maintenance and service of vehicles and machinery should not be done closer to the freshwater habitats.</li> </ul> <p>Solid waste, construction debris should not be dump into wetlands.</p>	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3; SCA/7, CEA, Department of Wildlife and IUCN guidelines
Impacts on Mangrove Ecosystems	<ul style="list-style-type: none"> <li>• Direct loss of mangrove habitats due to construction activity should be avoided as much as possible by considering alternative designs and construction traces.</li> <li>• If the selected construction ROW includes conversion of mangrove areas, re-planting and restoration of degraded mangrove areas in the vicinity as a compensatory measure should be considered. If so, restoration should be done according to a proper scientifically prepared plan.</li> <li>• There should be no diking/impounding/flooding of mangrove areas that will permanently cut off tidal circulation or submerge its roots causing trees to die.</li> <li>• Sedimentation and slippage of earth fills near mangrove areas should be strictly controlled as impacts can lead to burial of its breathing roots.</li> <li>• Burning of vegetation debris cleared from the construction ROW should not be done near mangrove habitats</li> </ul>	
Impact on water resources	<ul style="list-style-type: none"> <li>• Identification of the reliable water resources and obtain necessary approvals from the relevant authorities to extract water prior to commencement of construction work.</li> <li>• Contractor should not obstruct or prevent water flow when working closer to water bodies.</li> <li>• Silt traps and erosion control measures should be used where the construction carry out closer proximity to the water bodies to avoid entering of construction materials which cause turbidity and sediments.</li> <li>• Construction material and stock piles should be covered to avoid wash off to water bodies.</li> </ul>	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3, Mahaweli, Irrigation Department guidelines

Type of Impact	Mitigation measures	Standards applied
Worker camps	<ul style="list-style-type: none"> <li>• Mobilizing maximum capacity of skilled and unskilled labour force from the surrounding project area</li> <li>• Identify location of camps with consultation of LA.</li> <li>• Camps should not be located near water ways, human settlements or near drinking water intakes.</li> </ul>	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3 Code of practices by SLSI

### 4.3.2 Health and Safety Guidelines

Health and safety of workers and the public should be designed into constructions, before and during and after the building phase. It is cheaper and easier to control risks in construction to workers as well as the public before work starts on site by proper planning, training, site induction, worker consultation and incorporating strict safety procedures in construction plans. The proposed project interventions will mostly involve small to medium scale construction sites. As such, extreme dangers posed by working in environments such as great heights, deep water and involving dangerous chemicals and radioactive material will not be present. Potential dangers associated with SCDP sites will include falling from moderate heights, vehicle/pedestrian accidents, falling into trenches, being buried in tunnels/excavations, breathing dust and other air pollutants, back aches caused by handling heavy material, suffering hearing loss from noise etc and can be mitigated with following safety guidelines.

EA for each site should mandatorily include a risk assessment as to what are the hazards involved in the work site, who might be harmed and how seriously, how likely this harm might happen and what actions are required to eliminate or reduce the risk and incorporate such measures in the EMP and clearly set out in the tender documents. All sub-projects must observe health and safety regulations, hence during implementation it is important to check if these control measures are put in place and are meeting the legal requirement.

#### Training

- Ensure constructors carry out suitable training programs on occupational health and safety for workers prior to commencement of construction.
- Ensure only experienced and well trained workers are used for the handling of machinery, equipment and material processing plants
- Ensure all persons, including managers, are trained and able to carry out their work without risk to the safety or health of themselves, other workers or the public

#### Personal Protective Equipment

- Ensure appropriate safety equipment, tools and protective clothing are provided to workers and that safe working methods are applied. A safety inspection checklist should be prepared taking into consideration what the workers are supposed to be wearing and monitored.
  - Any person who works or operates in an area where there is a risk of flying objects, such as splinters, should wear safety goggles at all time. These should be securely fitted to the face. Welders should protect the entire face from hot sparks and bright rays by using a welding mask.

- Any person exposed to high levels of dust or hazardous gases (when working in tunnels) should wear respiratory protection in the form of disposal masks or respiratory masks which fit more snugly around the nose and mouth.
- Any person working in an area where there is the risk of being struck on the head by a falling or flying object should wear a hard hat at all times. These should be well maintained in order to be fully effective, and any helmets or hard hats that are damaged or cracked should immediately be replaced.
- All workers will be required to wear shoes or strong boots to prevent sharp objects from penetrating or crushing the foot. Those working in muddy conditions and in canals with polluted water should avoid hand/foot contact with water and should never wear slippers.
- Road workers should wear reflective vests to avoid being hit by moving vehicular traffic.

### **Site Delineation and Warning Signs**

- Ensure delineation devices such as cones, lights, tubular markers, orange and white strips and barricades are erected to inform oncoming vehicular traffic and pedestrians in the area about work zones.
- Ensure all digging and installing work items that are not accomplished are isolated and warned of by signposts and flash lamps in nighttime.
- Ensure dangerous warning signs are raised to inform public of particular dangers and to keep the public away from such hazards.
- Ensure rehabilitation of trenches progressively once work is completed.
- The safety inspection checklist must look to see that the delineation devices are used, whether they are appropriately positioned, if they are easily identifiable and whether they are reflective.

### **Equipment safety**

- Work zone workers use tools, equipment and machinery that could be dangerous if used incorrectly or if the equipment malfunctions. Inspections must be carried out to test the equipment before it is used, so that worker safety can be secured. Inspections should look for evidence of wear and tear, frays, missing parts and mechanical or electrical problems.

### **Traffic management**

- Ensure traffic control plans and procedures are in place when work zone is set up and how to handle full or partial road closure, blocked intersections, sidewalk closure etc
- Ensure installation of transport signs and lighting systems in conspicuous places to assure transport safety. Transport signs should be installed at places where accidents may be easily happened (populated centers, schools, hospitals, commercial areas etc )

### **Material management**

- Ensure easily flammable materials are not be stored in construction site and that they are transported out of project site

### **Emergency Procedures**

- Ensure an emergency aid service is in place in the work zone.

- Ensure all site staff is properly briefed as to what to do in the event of an emergency, such as who to notify and where to assemble for a head count. This information must be conveyed to employees by the site manager on the first occasion a worker visits the site.

#### **Construction camps**

- Ensure installation of adequate construction camps and sanitation facilities for construction workers to control of transmission of infectious diseases.

#### **Information management**

- Develop and establish contractor's own procedure for receiving, documenting and addressing complaints that is easily accessible, culturally appropriate and understandable to affected communities.
- Provide advance notice to local communities by way of information boards about the schedule of construction activities.

#### **Worker consultation**

- Consulting the workforce on health and safety measures is not only a legal requirement, it is an effective way to ensure that workers are committed to health and safety procedures and improvements. Employees should be consulted on health and safety measures and before the introduction of new technology or products.

#### **4.3.4 Mitigation of environmental impacts caused by the disposal of dredge material**

The potential environmental effects of dredging are generally two-fold, firstly as a result of the dredging process itself and secondly as a result of the disposal of the dredged material. During the dredging process impacts may arise due to the excavation of sediments at the bed, loss of material during transport to the surface, whilst loading and during transport to the designated location and will include removal of benthic communities, short-term changes in the water quality with increased turbidity and the possible release of organic matter, nutrients and or contaminants (depending upon the nature of the material in the dredging area), smothering of fish and other fauna by settling suspended matter etc.

The second is the impact of dredged material disposal which largely depends on the nature of the dredged material (inorganic, organically enriched, acidic, and contaminated) and the characteristics of the disposal area (geology of the land, accumulative or dispersive areas in the case of open sea dumping). Dredging would generate large volumes of sediments and sludge, the quality of which would determine how and where it can be disposed to. Haphazard disposal of contaminated dredge material can lead to many adverse environmental and public health risks, and as such the project must adopt a cautious approach and undertake adequate assessments, as highlighted in the guidelines given below.

In considering the environmental effects of dredging and disposal, the potential benefits of these operations should not be overlooked. Dredging helps clear clogged waterways which is causing flooding and poor drainage and remove nutrient rich and/or contaminated sediments. The result is improved flow, lower nutrient concentrations, less algae production, prevention of eutrophication in the water bodies leading to an overall improvement in drainage and water flow quality.

The canals and urban drains in the city of Galle, which are proposed to be dredged to improve depth and water flow and thus lower the risk of inundation, are heavily polluted with sewage directed to them from the catchment area. The primary use of these canals is drainage and given the current state they do not score much on eco-system and aesthetic value. Also, it is considered unlikely that the dredged sediments would be hazardous but this can be verified only through sampling and analysis.

The process of dredging has several key steps and they are outlined below

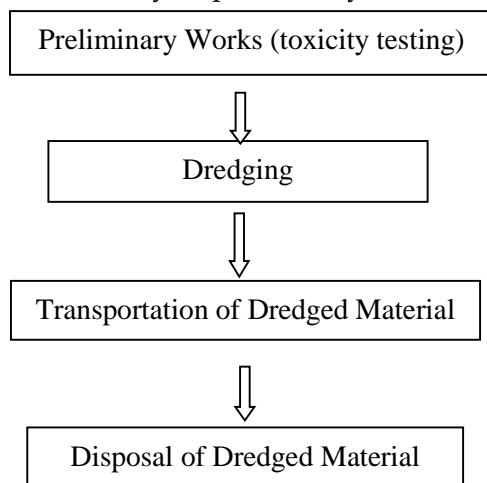


Figure 12: Key steps in a Dredging Operation

**Preliminary Work**

**(i) Cleaning**

Dredging has to be preceded by few preliminary works to clean up the water body enabling the machinery to be used safely. The first such work would be to remove the floating and sunken debris from canals identified for dredging. These need to be removed to have a smooth operation and a self-propelled grab digger is usually used for such cleaning. The other activity is the removal of the sunken barges from the water body, however, this is not expected in the canals under consideration.

**(ii) Evaluation of Sediment Quality**

Since there is inadequate sediment quality data the project would be required to develop a Sediment Sampling and Analysis Plan (SAP) for the canals within Galle city to determine the environmental acceptability of dredged sediments to be disposed off-site. The SAP would provide the technical framework for sampling and analysis for each identified location and would determine the presence/absence of potential toxic chemicals. In the case of a negative determination the project can commence dredging activity any time as there would be no specific restriction on the disposal of dredged material. A TOR for SAP is presented under Chapter 7 of the EAMF.

As such, it is required that the implementing agency, which is the Provincial Irrigation Department (PID) for Southern Province, conducts the necessary field sampling and laboratory testing through a competent authority hired in order to perform this exercise. The test data should



be reviewed together with the World Bank and regulatory agencies such as the CEA and/or CCD, as the need be, and the method of disposal should be discussed.

### **Evaluation of dredge material management and disposal alternatives**

Depending on the degree of toxicity, disposal options could be decided. In the case of a positive determination, disposal would be carefully planned and the project would need to prepare a Dredge Material Disposal Plan (DMDP). Classification of the sediment according to the level of contamination detected and quantification of the dredged material would be pre-requisites to preparing this plan. This is important to check the suitability of the sediments for different alternative disposal/use options. While Sri Lanka does not have any standards for sediment quality or regulations to control disposal of such material, several countries have developed useful guidelines/references. Under the World Bank funded Metro Colombo Urban Development Project (MCUDP), a similar process was carried out and after a careful review of available sediment quality standards internationally, the project selected (together with the CEA and World Bank) the Australian/New Zealand Interim Sediment Quality Standard for comparison of its sediment test data (see Annex 11). The SCDP could use MCUDP as a reference to follow the same.

As such, establishing sediment quality is of paramount importance and the project will have to determine the most suitable disposal alternative based on the results from the SAP prior to dredging and disposal. For contaminated sediments, some of the commonly used alternative options are;

- **Open Sea Disposal**

The open-water disposal is the placement of dredged material in rivers, lakes, estuaries or oceans via pipelines or release from hopper dredges or barges. Here the potential for environmental impacts is affected by the physical behavior of the open-water discharge, most importantly including the hydrodynamics of the disposal site. While this method has been used to dump dredged material from Beira and the Port of Colombo (and most likely Galle harbor, open sea disposal would be too complex and costly for the kind of canal dredging envisaged to take place under SCDP.

- **Incineration**

In the case of thermal destruction only Geo-cycle, a subsidiary of the Holcim Cement group, is capable of incinerating toxic or hazardous material under licensed approval from the CEA. They could collect such dredged material and transport to Puttlum, Palavi to mix them with their fuel (coal) to burn in their cement kiln. The kiln maintains a temperature of 1400°C which is high enough to degrade all toxic material present in the dredged material. Even the bottom ash that remains can be mixed as an inert material with cement without any leaching out of toxic metals. However when the dredged material contains high levels of Mercury or Arsenic it may not be possible to go for thermal destruction as they become volatiles and may cause air pollution. However, this too is not a suitable solution for SCDP given the long-distance transport and the associated costs.

- **Confined Disposal**

Confined disposal is the placement of dredged material within a confined disposal facility (CDF). The CDFs may be constructed particularly for the purpose of depositing contaminated dredged material which can be later covered and converted to a different land-use.

- **Disposal at an engineered sanitary landfill sites**

Sri Lanka has two small semi-engineered landfills in Nuwara Eliya and Mawanella operated by the Nuwera Eliya Urban Council and the Mawanella Pardheshiya Sabha respectively and a newly constructed fully-engineered landfill in Dompe. These are located considerable distances away from Galle and may not be practical options. A regional engineered landfill which has been planned by the CEA for the Southern Province is planned to be constructed in 2015 in Rathgama which is only about 15 Km from Galle city. The site has been acquired with considerable investments to construct an access road and a large composting facility. The design for the engineered landfill is underway and is expected to be completed in 2014. If the dredged sediments from the canals require careful disposal, the excess sediments (aft using onsite as much as possible for backfilling) could be kept in a confined area in the present dumping site used by the Galle Municipal Council (GMC) until final disposal can be made at the regional landfill once it is commissioned. This option would need to be carefully considered.

#### **Environmental Monitoring Program (EMP)**

Dredging and the process of bringing the dredge material to the surface of the canal, loading, transporting and unloading all can lead to various water/air/land contamination which would ideally require monitoring. However, the canals and urban drains under consideration are heavily organically polluted (which violates water quality standards for any use), not used for anything other than urban drainage and do not have much of an ecological value. As such, close environmental monitoring during the post-dredging period is not considered necessary. However, DMDP could assess if there is any need to conduct environmental monitoring in the post-dredging period and if so specify the requirement.

#### **(iv) The Regulatory Process**

Under National Environmental Protection and Quality regulation (Scheduled Waste Management Guidelines) any project that involves the disposal of hazardous waste that belongs to the prescribed categories should obtain CEA clearance. Dredged material is not a separately prescribed category and as such during consultations for MCUDP it was determined that the CEA clearance is not required for disposal of dredged material.

#### **(v) Project planning and Information management**

The SAP and the DMDP should be closely linked to the project work plan and effectively communicated to key stakeholders directly involved, so that proper sequencing and scheduling of activities as well as implementation and monitoring of control measures can take place effectively. The Dredging Proponent together with the PMU should ensure this.

#### **4.4 Landslide hazard mitigation**

The LHZ map prepared by the NBRO for Kandy city classifies land into following 5 zones

1. Known danger of landslides where there is a perennial threat to life and property
2. Landslides most likely to occur where danger exists

3. Landslides to be expected where a moderate danger exists
4. Modest level of landslide danger exists where a slight danger exists
5. Landslides not likely to occur where there is no visible sign of slope instability

In zones 1 and 2 the landslide risks are high and as such new constructions and changes to land use are recommended to be restricted. In zones 3 and 4 new constructions and additions are recommended to be regulated while in zone 5 no blanket limitations are proposed.

For SCDP intervention areas;

- a. existing landslide hazard should be assessed using the LHZ map
- b. where risk is moderate to high, NBRO should be consulted early in the design phase
- c. selection of site specific mitigation measures must be discussed and all technical designs should be vetted by the NBRO
- d. NBRO recommendations should be incorporated into the final technical designs
- e. NBRO's supervision during project implementation must be obtained

**Examples of site specific remedial measures:** As landslides are very localized phenomena, site specific mitigation measures are needed for slope stabilisation such as geotechnical structural measures that include soil reinforcement, soil nailing, rock bolting, surface protection, slope modification, retaining walls, gabion walls, breast walls, soil removal works, steel pile works, etc. In selecting appropriate landslide stabilization measures, three dominant factors need to be considered: cost, constructability, and factor of safety. Ideally, through simulation and advanced modeling, the effect of slope stabilization methods needs to be assessed prior to implementation.

Reduction of pore water pressure by draining out water from strata or soil column is also considered as an important mitigation strategy to stabilize unstable slopes. Water infiltration in the overburden during heavy rains and consequent increase in pore pressure within the overburden, reduces the strength of the material and causes sliding of the landmass. This can be minimized by reducing infiltration and by providing an adequate drainage network.

## CHAPTER 5: INSTITUTIONAL FRAMEWORK FOR SAFEGUARDS MANAGEMENT

In order to ensure environmental and PCR safeguard requirements of the SCDP are satisfactorily complied with, it is necessary to have a well-defined institutional and implementation mechanism for identifying, appraising, managing and monitoring safeguards at all level. The focus of this chapter is to lay out the roles, responsibilities of various parties and the due diligence process that will need to take place from the preparation of an investment through implementation completion.

### 5.1 Overall project implementation arrangements

The project will be implemented and managed by a self-standing and ring-fenced Project Management Unit (PMU) which is being established under the Ministry of Megapolis and Western Development (MoM&WD). The PMU will operate under the oversight of a Steering Committee, chaired by MoM&WD's Secretary and composed by UDA, CC&CRMD, KMC, GMC, DS, the Ministry of Local Authorities and Provincial Councils, the Ministry of Irrigation, Ministry of Highways and Roads. Other ministries and agencies will be identified as stand-by members, to join the steering committee when relevant issues need to be dealt with (e.g. Central Environmental Authority).

The PMU will be responsible towards the Bank for the overall fiduciary and safeguard aspects of the project, for monitoring the agencies' compliance with the project's environmental and social safeguards and for overall project monitoring and evaluation (M&E) against results indicators. It will play a critical role in coordinating all the numerous agencies involved in project implementation, ensuring overall quality and timeliness of investments and providing administrative services to the various agencies involved in the project. In order to be more effective at local level and closer to project implementation at city level, *Local PMU offices* will be established in Kandy, Galle and Jaffna, headed by Deputy Project Directors and staffed with core fiduciary, safeguards and technical specialists.

Implementation responsibilities will be assigned to the *Project Execution Agencies* (PEAs), assisted when needed by consultants for detailed designs and construction supervision. The key responsibilities of the project agencies are as follows:

- Select subprojects, prepare implementation plans and carry out detailed designs of the subprojects. When the PEAs have no capacity for design and supervision, the project will make available Design and Supervision consultants to work with the PEAs to carry out these tasks.
- Supervise implementation of subprojects and report to the PMU on progress and quality.
- Ensure compliance with the project's environmental and social safeguards.
- Commit for future operation and maintenance (O&M) of delivered infrastructures.
- Carry out M&E activities.

A project *Coordination and Consultative Committee* will be established both in Kandy and Galle, chaired by the respective Mayors, with the aim of ensuring effective coordination between the PMU, PEAs and other key stakeholders at local level (including, without being limited to, other government line agencies, private sector, civil society, other donors active at city level).

The proposed implementation arrangements reflect discussion and agreement with the GoSL, who expressed preference for an implementation model that ensures delegation and assignment of all critical implementation responsibilities to the PEAs, while centralizing the administrative/fiduciary functions in a PMU. The following flowchart summarizes the implementation arrangements.

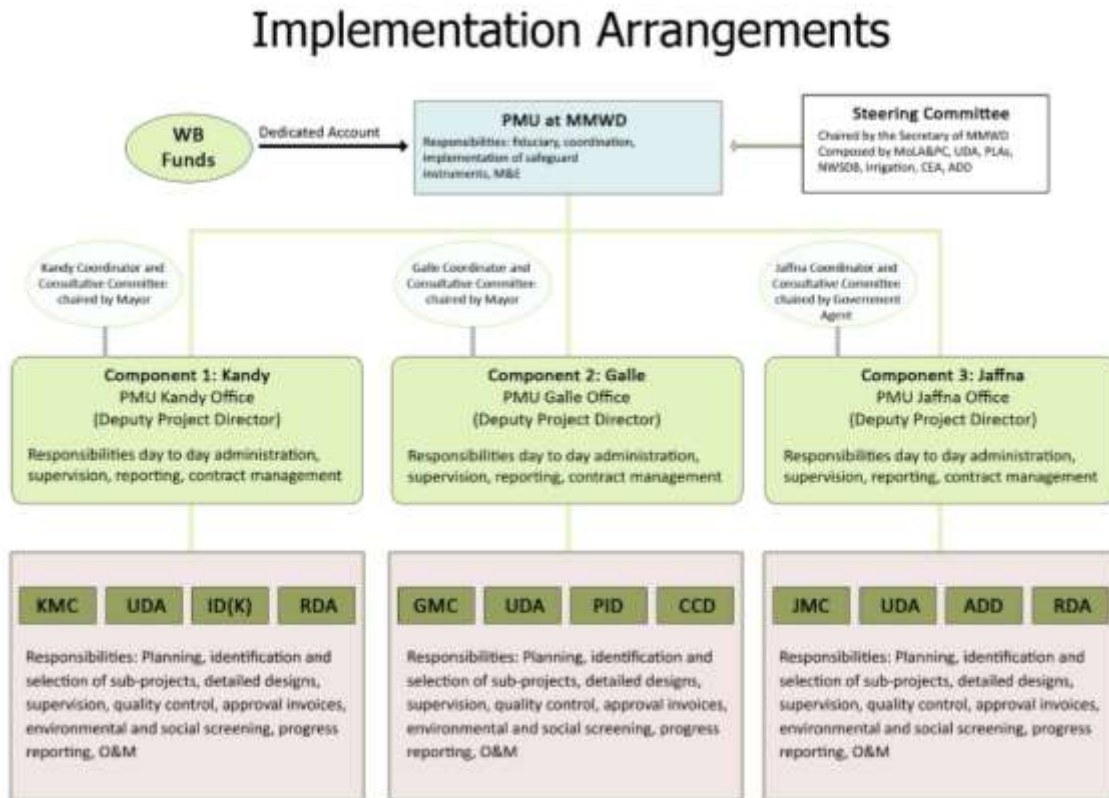


Figure 13: Institutional Arrangement of SCDP

## 5.2 Implementation arrangements for environmental safeguards and PCR

Planning, implementation and supervision of environmental safeguards will take place at three levels;

- MoM&WD (through main PMU)** - The overall responsibility of ensuring compliance with environmental and other safeguards requirements of the project will be borne by the main PMU. It will be supported by a full-time Deputy Project Director (environmental) who is suitably qualified and experienced in managing urban environmental issues and a physical cultural resources specialist, both directly reporting to the Project Director. Among its key tasks, the PMU will be responsible for providing the overall policy direction, technical assistance, review and endorsement of screening reports, environmental assessment and management plans, capacity building for effective safeguards management to the implementing agencies, monitoring of environmental compliance and progress reporting to the World Bank. In addition, they will support technical components of the project such as SWM, natural area management and heritage conservation.

- **Project Execution Agencies (through the local PMUs)** - The responsibility of day to day planning, implementation and supervision of environmental safeguards specific to sub-projects will be borne by the PEAs. Given the workload of each PEA, it is not practical for each PEA to have its own environmental officer, hence the local PMU office will recruit an Assistant Project Director (environment) for each city supported by another Environmental Officer for each city who will ensure timely and sound application of the EAMF to the planned investments. The PEAs will draw on his/her expertise during the design/implementation stages to complete safeguards work. He/she will work under and report to the PMU.
- **Contractor** - Implementation of EMPs will largely be the contractor's responsibility (apart from those provisions relating to technical designs and other specified tasks indicated in the EMPs) and for this the contractor will nominate a safeguard officer (as requested in the EMP) as the focal person who will be directly responsible for ensuring compliance with the EMP during construction.

### 5.3 Illustration of the environmental safeguards due diligence process (screening, review and approval) at the sub-project level

	Key steps in a sub-project cycle (in chronological order)	Responsibility			
		PMU	PEA	Contractor	WB
1	Identification of sub-project ; Application preparation and its submission to PMU		X		
2	Review of sub-project application; Endorsement/rejection	X			
3	Completion of environmental screening		X		
4	Review and endorsement of screening report and decision Category B and C type Category A type	X			X
5	EA/EMP financing and preparation (if determined by screening outcome)	X Finance consultant, if needed	X preparation		
6	Review and clearance of EA/EMP	X In prescribed projects the PMU will submit documents to CEA and obtain approval			X
7	Obtain clearances from local environmental/regulatory authorities and Department of Archaeology	X			
8	Implement sub-project in line with EMP		X	X	
9	Monitor environmental compliance based on EMP	X sample basis	X	X	

10	Reports to PEAs on EMP compliance			X	
11	Reports to PMU on EMP compliance		X		
12	Maintaining records of safeguards documents for all sub-projects		X		

#### 5.4 Key roles and responsibilities of various parties involved in environmental management safeguards

<b>Deputy Project Director (Environment) - Project Management Unit / Ministry of Megapolis and Western Development</b>	
	<ul style="list-style-type: none"> <li>• Provide overall policy and technical direction for environmental safeguards management under the SCDP (as defined by this framework).</li> <li>• Ensure suitably qualified and experienced personnel are in place in the local PMUs for Kandy, Galle and Jaffna.</li> <li>• Co-ordinate closely with the Assistant Project Director (Environment) and Environmental Officers in the local PMUs in planning and managing the EA cycle in relation to the project implementation schedule; and provide necessary technical assistance to facilitate the implementation, management and monitoring of environmental safeguards</li> <li>• Review and endorse environmental screening reports, site specific environmental assessment and management plans prepared for each Category B and C sub-project ; Obtain concurrence from the environmental safeguards specialist in the World Bank team for Category A type of sub-projects</li> <li>• Ensure that applicable measures in the EMP are included in the design, and condition on compliance with EMP is included in the bidding documents</li> <li>• Develop, organize and deliver environmental training programs and workshops for the staff of PEAs, contractors, field supervision staff and other implementing agency officials (responsible for the supervision of Maintenance works), as needed, on safeguard requirements and their management</li> <li>• Develop programs to build long-term capacity in the PEAs for improved urban environmental management, heritage conservation etc and monitoring</li> <li>• Prepare additional technical guidelines, if necessary, to support the EAMF in order to strengthen the implementation of environmental safeguards</li> <li>• Obtain clearances from local environmental/archaeological/other regulatory authorities, where applicable.</li> <li>• Report to WB and MoM&amp;WD on the overall environmental performance of the project as part of PMU's periodic progress reporting.</li> <li>• Maintain close cooperation with PEAs to monitor the O&amp;M during the operation of the project;</li> <li>• Hold regular review meetings with the environmental officers of the local PMUs and visit selected construction sites to monitor implementation of the EMP by the Contractors</li> </ul>

- Promote community participation in the process of planning, management and monitoring of environmental impacts of sub-projects; provide guidelines on community participation in environmental monitoring to the PEAs
- Support technical components of the project such as SWM, natural area management and conservation and draft TORs for technical studies and consultancies, if the need arises.

**Assistant Project Director (PCR) - Project Management Unit / Ministry of Megapolis and Western Development**

- Provide overall policy and technical direction for PCR management under the SCDP (as defined by this framework).
- Work closely with the Environmental Officers in the local PMUs and provide technical support in identifying PCRs in the project area, assessing impacts and proposing mitigation measures in the EA process.
- Review and endorse PCR components in the environmental screening reports, site specific environmental assessment and management plans prepared for each sub-project
- Ensure that relevant PCR mitigation measures in the EMP are included in the design, and condition on compliance with EMP is included in the bidding documents
- Prepare additional technical guidelines, if necessary, to support the EAMF in order to strengthen the protection and conservation of PCRs from impacts during construction.
- Obtain necessary clearances from local authority, DoA, heritage committees where applicable.
- Report to WB and MoM&WD on the overall performance of the project in mitigating PCR impacts as part of PMU's periodic progress reporting.
- Maintain close cooperation with PEAs to monitor the O&M during the operation of the project;
- Hold regular review meetings with the environmental officers of the local PMUs and visit selected construction sites to monitor implementation of the PCR components of the EMP by the Contractors
- Draft necessary TORs for various technical components of the project in the environmental sector
- Support technical components of the project such as conservation of heritage assets in both cities and draft TORs for technical studies and consultancies, if the need arises.

**Assistant Project Director (Environment) - Local PMU offices**

- Ensure environmental screening is carried out for each sub-project as soon as conceptual technical design and scope have been defined; Closely co-ordinate with the PMU for review and endorsement of the screening decision and recommendation
- Ensure timely preparation of Environmental Assessments/Management Plans for sub-projects, as necessary (depending on screening outcome); co-ordinate with PMU for hiring technical assistance, where necessary, and for review and endorsement of these safeguard documents



<ul style="list-style-type: none"> <li>• Ensure consistency of safeguard documents with national environmental regulations; work with the PMU to obtain necessary clearances from local environmental/archaeological regulatory authorities for sub-projects, where applicable.</li> <li>• Ensure relevant EMP provisions are included in the design; and EMPs are included in the bid documents; and condition on compliance with EMP is included in the contractor's agreement.</li> <li>• Ensure compliance with EMPs during the construction period and maintain close co-ordination with the site engineer of the implementing agency and the Environmental focal point of the contractor.</li> <li>• Co-ordinate with PMU for planning and delivering short training programs and workshops for the contractors and field supervision staff on the project's safeguards requirements and procedures</li> <li>• Prepare and submit regular environmental monitoring and implementation progress reports to the PMU</li> <li>• Ensure adequate public consultation during environmental screening and EA/EMP preparation; encourage community participation in sub-project planning, management and monitoring</li> <li>• Ensure public complaints relating to nuisance and inconvenience caused by sub-project implementation are addressed with corrective action and adequately documented</li> <li>• Coordinate and guide Environment Officer attached to the Local PMU in screening, monitoring and surveying required at the field level.</li> </ul>
<p><b>Environmental Officer - Local PMU offices</b></p> <ul style="list-style-type: none"> <li>• Work with APDs for initial ESR preparation</li> <li>• Field work/ data collection for ESRs</li> <li>• Coordination with the project partner agencies</li> <li>• Collection of data, preparation of data base, analysis of data and preparation of waste management strategy with APDs. Base line data has to be supported by photographic evidence.</li> <li>• Involvement with Urban upgrading consultants in the field work, discussions on consideration of urban environmental improvements. (urban drainage / waste management/ landscaping)</li> <li>• Coordination, monitoring and progress reporting on Environmental safeguard work of all the works contracts with regard to specific city</li> </ul>
<p><b>Safeguard Officer - Contractor</b></p> <ul style="list-style-type: none"> <li>• Ensure implementation of relevant provisions of the EMP during sub-project implementation; prepare contractor's plan for implementing the EMP</li> <li>• Ensure close co-ordination with the Environmental Officer from the Local PMU offices and report progress on compliance on a regular basis</li> </ul>
<p><b>World Bank</b></p> <ul style="list-style-type: none"> <li>• Provide close supervision and necessary implementation support in the initial stages of the project in conducting screening, preparation of EAs and EMPs</li> </ul>

- Undertake prior review of screening reports, EA/EMPs for all Category A type projects and a sample of Category B type projects (in the initial stages to ensure quality of output and consistency with EAMF guidelines); Subsequently, undertake post review of sub-projects on a sample basis
- Ensure regular missions to review overall safeguards performance and provide further implementation support
- Share knowledge on technologies and best practices
- Provide training support on Bank’s safeguard policies and requirements of the project.

**Environmental Consultants**

The PMU will hire environmental consultants to provide technical support the PMU where specialized services are required. Some of the consultancies identified include:

- Preparation of EAs/EMPs for category A type projects
- Preparation of the sediment sampling analysis plan; carrying out environmental sampling; preparation of a dredge material disposal plans for sites proven to carry contaminated sediments
- Conducting annual independent environmental audits

**5.5 Environmental Monitoring**

The SCDP will focus strongly on effective environmental monitoring. As majority of the anticipated environmental impacts from the project are general in nature and related to construction and civil works, site management, worker/public safety etc, monitoring will be largely carried out in the form of compliance monitoring through regular site supervision by the responsible officers. A general monitoring checklist and a specific construction safety monitoring checklist to be used and filled during site supervision is provided in **Annex 9 and 10**. These lists should be updated and expanded to include PCR impacts which are mostly case-specific and other site-specific environmental impacts based on actions agreed in the EMPs.

Monitoring of environmental parameters (such as air, water, salinity, sediment quality, etc.) will be conducted based on the requirements specified in the individual EMPs. However, given the ambient levels of noise and emissions in the city, pollution in the waterways etc no significant impact on the city’s environmental quality is anticipated as a result of project activities. As such, the need for regular and systematic measuring of air, noise and water quality to monitor contribution to environmental degradation from the project per se is not considered essential.

The SCDP is essentially environmentally beneficial and it is expected to result in improved flood and drainage management, reduced disaster risk, reduced traffic congestion and improved water quality in waterways crossing the cities and conservation of heritage assets in the two cities. The overall project impacts will be monitored during project implementation through a number of selected indicators which reflect the positive environmental contribution from the project to the city’s environment. As such, no additional environmental indicators are proposed.

Most importantly, the project will support independent environmental audits on an annual basis throughout project implementation. The TOR for the proposed annual independent Environmental Audit is included in Chapter 7 of the EAMF.

**5.6 Progress Reporting**

Progress reporting on safeguards compliance will take place as indicated below.

1. Contractor's environmental compliance reports to the PEAs and local PMU office on a monthly basis
2. Local PMU's environmental progress reports to the PMU on a bi-monthly basis
3. PMU's environmental progress reports to the WB, Steering Committee and the MoM&WD on a quarterly basis (this will be part of the quarterly project progress report produced by the PMU)

## **5.7 Capacity Development Requirements**

For effective environmental safeguards management, the project agencies will require implementation support in three main areas; (i) dedicated staff and resources (ii) technical assistance and (iii) training and awareness. While (i) has been addressed above, the following section will specify assistance under (ii) and (iii)

### **5.7.1 Short-term training and awareness programs**

In order to ensure safeguard procedures, instruments and monitoring needs of the SCDP are well understood by the PMU and its implementing partners, short-term training and awareness workshops will be conducted targeting primarily project and contractor staff on (i) World Bank's safeguard policies (ii) national environmental regulations and (iii) safeguards planning, management and monitoring requirements of the SCDP as specified in the EAMF.

### **5.7.2 Technical assistance**

Where standalone Environmental Assessments and Environmental Impact Assessments are required as screening outcomes, the PMU will hire independent consultants. In addition, for contracts such as dredging in sites proven to be contaminated and for the subsequent disposal of such dredged material, the PMU will hire specialist services who will prepare disposal plans, carry out additional sampling (if needed) and site monitoring, conduct awareness for implementing agencies and contractors of disposal plan, monitor compliance and ensure control measures are adequately implemented.

### **5.7.3 Long-term capacity building**

The project will also explore the possibility of building long-term capacity, within the sector agencies and local authorities in urban environmental planning and management through a well-structured and modular training program. Urban environmental management requires both scientific and managerial expertise to plan spatial and other forms of urban intervention within the context of environmental carrying capacities and resources bases. As such it would be critically important for urban development officials, urban environmental planners, engineers in the sector agencies and municipal officials etc to upgrade and update their knowledge and skills in analyzing existing and emerging urban environmental issues as these cities transform into a strategic urban nodes and to learn appropriate strategies to minimize adverse effects caused by rapid urbanization. Some suggested training topics;

- **Urban Environmental Planning and Management**
- Overview of urbanization and associated environmental impacts, good governance and urban environment improvement, land use zoning, city beautification and clean city initiatives.
- **Integrated Urban Waste Management**

Urban waste control and minimization, solid waste management, wastewater management, technology choices for urban waste management, urban waste minimization measures.

- **Strategic Urban Environmental Management**

Strategic environmental planning, cross sectoral co-ordination for mainstreaming environmental plans and strategies etc

### 5.8 Operating requirements - Legislative/Regulatory Considerations

Following operating requirements have been identified for investments in the pipeline so far (*Note the final list of investments is still being compiled*) in order to comply with various national regulations. The sub-project proponent with the help of the PMU will ensure that the necessary consultations are made and clearances obtained prior to the commencement of these activities.

**Table 6: Operating Requirements**

Agency	Sub Project	Institutions Responsible For Clearances/Permits
ID	Improvements on the Kandy Water Intake at Getambe and Dunumadalawa	Clearance from Mahaweli Authority of Sri Lanka and the CEA.
RDA	Rehabilitation and widening of Dharmashoka Mawatha, Rehabilitation of Digana - Katugasthota road and Rehabilitation of Louis Peiris Mawatha	Clearance from Forest Department (FD) and the CEA. Technical clearance from the NBRO on landslide hazard management
UDA	Restoration of heritage buildings and monuments	Clearance from Department of Archaeology
GHF	Rehabilitation of "Skywalk" at Rampart Galle Fort	Clearances from Department of Archaeology and Coast Conservation and Coastal Resources Management Department
ADD	Rehabilitation of Ponds and Drains	Clearances from Agrarian Development Department and Irrigation Department Technical clearances from Water Resources Board

### 5.9 Timeframe for planning and carrying out safeguards assessment

Timely planning and execution of environmental screening and follow up assessments/plans for sub-project investments would be crucial in achieving the overall project implementation and completion targets. Any delay in obtaining relevant environmental approvals/clearances would hold back commencement of sub-project activities thus causing project implementation to be delayed. Such delays can be costly in terms of project time as well as resources. Hence, it is extremely important that the PMU initiates sub-project specific screening and follow up assessments as soon as the concept designs become ready. All environmental assessments/plans should be completed by the time of tendering and the EMPs should be a part of the bidding document so that the contractor is made duly aware of his commitments towards environmental safeguards management under each sub-project.

As a guide, the following table provides typical timelines for completing the safeguards cycle for different types of safeguard instruments. This timeline is intended to guide the PMU in planning screening and safeguards assessment ahead and to determine a realistic timeframe to commence the tender process for the sub-project investments. Please note the table below does not include time taken for procurement of consultancy services to conduct the EAs.

Stages in the process	EIA	IEE/ EA	EMP	Remarks
<b>Scenario 1: Sub-project which trigger OP 4.01 only</b>				
Environmental Screening	1 week	1 week	1 week	The need for follow on assessments will be determined by the screening outcome
Scoping and setting of TOR	2 weeks	1 week	1 week	
Report preparation	4 months	2 months	1 month	Length of time will be determined by the complexity of issues involved. What is considered here is an average based on the type of projects.
Report appraisal	2 weeks	1 week	1 week	
Public consultation	1 month	1 month	1 month	
Report Finalization	2weeks	2 weeks	1 week	
Clearance	Clearance will be provided within a week after review comments and public concerns have been adequately addressed in the report.			
Other GOSL clearance (DoA, NBRO, FD)	3 - 4 weeks			
<b>Tentative time for EA cycle (min - max)</b>	8 months	5.25 months	3-4 months	
<b>Scenario 2: Sub-projects which trigger both OP 4.01 and EIA under national regulations.</b> <i>NOTE: None of the sub-projects in the pipeline as of now are likely to require EIAs under the NEA. However, this section has been included to cover any sub-project that may be added to the pipeline in the future which would require NEA approval.</i>				
Provision of preliminary project information	1 week	1 week	-	
Scoping & determine IEE OR EIA and TOR preparation	1 month	2 weeks	-	WB will review TOR and provide consent/comment
IEE/EIA report preparation	NS*	NS*	-	One report to satisfy both local and WB requirements
Checking adequacy of IEE/EIA report	NS	NA	-	WB will review and submit comments
Provision of additional information if required	NS*	NA	-	
Public consultation	1 month	NA	-	If it's a category A project, WB safeguard policies will require a

		1 month under OP 4.01		period of 120 days public commenting period
Forwarding Comments to the PP	1 week	NA	-	
Responding to public comments	NS*		-	
Decision	1 month	3 weeks	-	WB clearance will be provided concurrently
Concurrence on the decision				
Appeal against rejection (If rejected)				
Final Decision				
<b>Tentative time for EA cycle</b>	12-15 months approx.	6-8 months approx.		

**Note:** The projects that have been prescribed by the DoA as requiring a full AIA are also prescribed by the NEA, hence for these projects AIA can be a part of the EIA process and can take place in parallel.

**5.10 Estimation of Environmental Safeguards implementation cost**

Activity	Quantity	Unit Rate in US\$	Total in US\$
Environmental Staff			
o Deputy Project Director	1	1,000	60,000
o PMU Assistant Project Director	1	700	42,000
Kandy PMU Assistant Project Director	1	700	42,000
Galle PMU Assistant Project Director	1	700	42,000
o PMU Assistant Project Director (PCR)	1	700	42,000
o Kandy PMU Environment Officer	1	450	27,000
o Galle PMU Environment Officer	1	450	27,000
o Jaffna PMU Environment Officer	1	450	27,000
<b>Sub-total</b>			<b>309,000</b>
Training and awareness programs (short-term and long-term)			
o Training on urban sector env management issues	1	40,000	40,000
o Training programs on env safeguards, monitoring for project staff, contractors etc	8	1500	12,000
Recruitment of consultants to prepare stand-alone EAs and EMPs			50,000
Consultancy for annual environmental audit	4	15,000	60,000
Environmental monitoring that includes sampling and laboratory testing	10	1300	13,000
-Sediment samples	10	150	1,500
-Water quality samples			10,000
- Unspecified			
Environmental screening and monitoring by project staff (will be part of transport and O/H budget of the SCDP)			75,000
<i>Costs associated with mitigation measures</i>			<i>Included in the construction costs</i>
Contingencies			20,000
<b>Sub-total</b>			<b>590,500</b>

## CHAPTER 6: STRATEGIC ENVIRONMENTAL PLANNING

### 6.1 Water quality improvement and monitoring in the Kandy Lake

The Kandy Lake which lies in the heart of the city is one of its most scenic tourist attraction. Unfortunately, its topographic setting and the unregulated urbanization in Lake Catchment along with the lack of an adequate waste disposal system has resulted in the disruption of its eco-system balance and pollution of water. The lake is eutrophic and is affected by the proliferation of blue-green algae from time to time resulting in low oxygen levels, fish kills and bad smells. Many research studies focusing on lake water quality studies, hydrodynamic and socio-economic factors that is contributing to pollution has been carried out in the past and made recommendations. While some of these measures have been carried out from time to time including lake dredging but a comprehensive plan to manage and continually improve lake water quality has hitherto not been implemented. At present, the lake receives a large quantity of silt from uphill areas, solid waste, black and grey water from its urbanized catchment and a reduced inflow of freshwater. One of the studies conducted has also identified no-flow areas in the lake bottom which is causing stagnation of polluted water. The ID, which took over management of the lake from the KMC in 1997, has proposed selected measures to improve the lake water quality under the SCDP as indicated in the preceding chapters. While these measures undoubtedly will contribute to water quality improvement, it would be important for such interventions to be part of a long-term strategic Kandy lake water quality management and monitoring plan that builds on the research work that has already been conducted into understanding the multiple facets of the problem. This plan should ideally integrate technology, community outreach, wastewater management, catchment land-use regulation and strong co-ordination among stakeholder agencies. Understand the trends of water quality degradation or improvement over time and how various interventions would help in achieving the desired objectives is an important part, hence, long-term water quality monitoring is essential.

### 6.2 Strategic Kandy/Galle City Development Strategy and Subsequent Integrated Master Plans

The SCDP will support improved city planning and development by financing a Strategic Development and Growth Plan and subsequently an integrated Master Plan for Greater Kandy and Greater Galle. This will be a major output and the road map for development of the two cities. It is recommended that **Strategic Environmental Assessments** are carried out to enhance the city development master plan with elements of sustainability and green city planning based on natural assets/ecology and carrying capacities to the. The role the SEA can play in lessening environmental risk and enhancing its outlook while facilitating economic development in future city development will be an important one.

### 6.3 Conservation of urban forest and wetland areas in the cities

As highlighted in chapter 3 Kandy city has 3 important urban forest patches, Udawattakale, Hantana and the Dunumadalwa range. Although protected or proposed to be protected as reserve forests, the urban sprawl that has been taking shape around these areas over the years has taken its toll on the extent and quality of these important green patches. Encroachment along and into the forests, dominance of invasive species and human-wildlife conflicts that has now become a problem bear testimony to the kind of anthropogenic pressure exerted on these forests, aggravated by poor enforcement of laws and policies. Given the economic importance of the environmental services these forest areas render to the Kandy city, it will be important to



recognize proper management of these forests habitats and the services they provide in improving the livability of the city.

Similarly, in Galle there are many urban wetlands associated with the Moragoda Ela basin which render an important service in terms of flood regulation and other co-benefits such as urban waste water treatment, climate regulation and carbon sequestration, not to mention the ecological niches it provides to urban wildlife. These need to be looked into as part of the flood mitigation plan for Moragoda Ela.

#### **6.4 Integrated Drainage Master Plan for Jaffna Municipal Council area including Ponds and adherence to ISEA-North**

As emphasized in several chapters of EAMF, it is critically important that integrated drainage master plan being prepared before enter into any rehabilitation of ponds and drains in Jaffna city. This is even highly emphasized by several scientific researches as there is no proper drainage master plan or any cross section of ponds in the city. Any rehabilitation of ponds can have an impact over limestone layer of geo-technical structure of the ponds which will be negatively impacted on aquifers or re-charge system.

In addition, it is also important that any development interventions take place in Jaffna or Northern Province should comply with ISEA opportunity map developed in October 2014. Accordingly, the Opportunity Map giving the areas available for development (white areas) in the Northern Province was developed based on information collated from the baseline data compilation and material gathered through the targeted studies carried out by relevant agencies to fill data and information gaps.

The process to arrive at the “Opportunity Map” included extensive dialogue between agencies in Colombo as well as in the field and a series of land use prioritization decisions. For example the Forest Department, Department of Wildlife Conservation and Geological Mines Bureau prioritize the lands relevant to them to identify the areas that needs to be conserved at any cost and the areas that can be released to development with minimum disturbance to the long-term conservation plans (CEA, 2014).

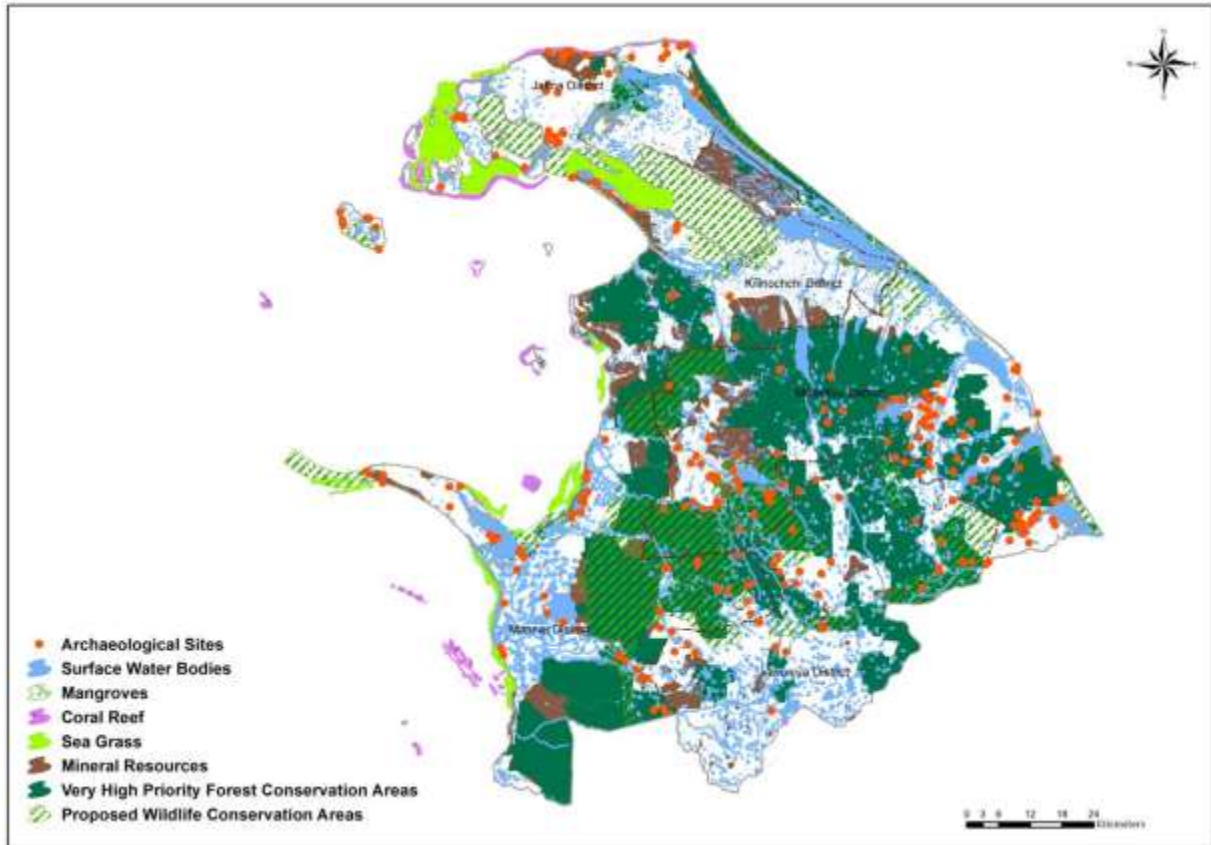


Figure 14: Opportunity Map Providing Areas with Minimum Environment Concerns

## CHAPTER 7: STAKEHOLDER CONSULTATION AND INFORMATION DISCLOSURE

For all types of environmental analyses conducted under the SCDP (including screening), communities in the project sites should be consulted within a structured and culturally appropriate manner. Further, environmental assessment documentation and EMPs should be made available to the public (in accordance with the World Bank's policy on Access to Information) by the PMU prior to tendering of works contracts through the website of the project and notices through media, as appropriate. In addition, it may be necessary to conduct discussions with the regulatory agencies (such as the CEA, CCCRMD on relevant issues) and other implementing agencies who would have a stake in the project due to various reasons. Consultation will enable the project implementing agency to understand the stakeholder's requirements and for the stakeholders to develop an understanding of the project so that potential conflicts could be eliminated or minimized.

The process of consultation should be documented and account taken of the results of consultation, including any actions agreed resulting from the consultation. Public disclosure of the relevant safeguards documentation will be a pre-requisite for tendering civil works contracts. The contract documents for each contract package will mandatorily include the relevant environmental mitigation provisions stipulated in the EMPs (which would have community concerns reflected, if any) for the given sub-projects in order to ensure contractor compliance with safeguards requirements.

Given below is a brief framework for planning consultation under SCDP. It has to be noted that only the appropriate consultation method will be applied to sub-projects during implementation and the responsibility of consultation lie primarily with the PEAs.

### 7.1 Objectives of stakeholder consultations

The prime objectives of stakeholder consultation are;

- Provide the stakeholders an opportunity to inform and influence the decision making process.
- partner with the stakeholders so as to make the project widely accepted and to lower the potential impacts

### 7.2 Elements of Effective Stakeholder Consultations

Some of the most concerned elements of effective consultations are as follows;

- well targeted
- early enough so as to make sure to get the stakeholder views adequately reflected in the project decisions
- transparent – provide all the information without hiding anything
- make the consultation process very simple and understandable so that clear answers and comments can be obtained
- ensure gender equity
- documentation of consultation
- based on the principle of "Two way Process"
- focus the consultation on Risks, impacts, mitigation measures and opportunities.

### **7.3 Suggested Methods**

Participatory workshops, focus group meetings and face to face and informal individual interviews are the three most commonly adopted methods of stakeholder consultations and a mix of these can be employed under SCDP, as determined by the requirement.

#### **7.3.1 Participatory workshops**

Participatory workshops are effective when a large number of stakeholders with different interests and specializations get involved. Conducting effective participatory consultation workshops should consist of following elements;

- (i) Orient the workshop towards a clear destination. In this connection it is necessary for the evaluator to present a very good project brief and the purpose of the consultation.
- (ii) The evaluator should be able to build bridges and consensus among stakeholders.
- (iii) Divide the participants into sub groups to represent adequate mixture of different interest groups and allow the sub groups to brainstorm among the group members and submit their views and comments as those of not individuals but of the sub groups.

This method is recommended for technical assistance sub-projects such the formulation of a city development strategy and integrated master plan for the two cities where mostly professionals (Town Planners, Architects, Engineers, Landscape Architects, and Environmental Planners), infrastructure provision institutions, NGOs and business people can get involved in.

#### **7.3.2 Focus Groups Discussions (FGDs)**

The focus group consultation meetings are relevant when the stakeholders have similar interest thus their objectives are focused towards one common objective. This kind of consultation meetings are recommended for projects that involve relocation of families or protection of natural resources etc.

#### **7.3.3 Stakeholder group meetings**

Stakeholder consultations are extremely useful in creating the right kind of understanding about the project among those it will likely affect or interest, and to learn how these external parties view the project and its attendant risks, impacts, opportunities and mitigation measures. During SCDP preparation, listening to stakeholder concerns and feedback can be a valuable source of information that can help improve project design and outcomes and help the project control external risks. The first round of stakeholder consultations have been carried out by the PMU so far, one in Galle and the other in Kandy, where the project team met with the city's political, religious, business and administrative leadership and discussed proposed interventions.

#### **7.3.4 Individual - face to face interviews**

When the stakeholders are not large in number and represent specialised areas of interest face to face interviews which are informal are very effective. This system is very flexible, permits in depth discussions to understand the issues and is low cost. However individual stakeholder consultations should be well planned as if not it may lead to "heavy focus on individual issues and interest". This method is recommended for the kind of consultation envisaged as part of sub-project screening as the sub-projects under SCDP as they are relatively small in size, potential impacts are very specific, and stakeholders are small in numbers.

The stakeholder consultation process should be continuous. However since practical difficulties exists for continued consultation, at least consultation needs to be carried out at three stages; project preparatory / design stage, project implementation stage and project end stage so as to make sure that stakeholder concerns, interest, comments are adequately built into the whole project management process.

#### **7.4 Consultations carried out in the preparation of the EAMF**

City wide consultations were carried out during the project planning stage for the cities of Kandy and Galle which included discussions on potential safeguard concerns and priority environmental issues in the region.

In Kandy, consultations have been carried out with key stakeholder agencies and in particular with the cultural committee that leads decisions on the city's heritage assets. No major environmental concerns relating to the project have been flagged and the sessions have been playing an information sharing role with local players. On city's environmental issues, SW has been flagged as the most critical issue.

In Galle too, similar consultations were carried out with the representatives pointing to SWM as the most critical issue faced by the city. No other concerns relating to safeguards of SCDP have been raised.

In Jaffna, two rounds of public consultations were held as part of project preparation that included discussions on safeguard issues as well. These consultations have been extremely important in terms of managing the many complex sensitivities with regard to Jaffna development. The participants welcome the project as urban Jaffna has not received any substantial development assistance for a long time. Discussions ranged from pond rehabilitation to urban upgrade to cultural heritage preservation proposals likely to be included under the AF.

On the ponds in Jaffna, many valuable ideas were shared which shed light on several grey areas which the project is trying to address. The ponds are required to be de-silted but level of de-silting needs to be carefully determined not to cause any irreversible damage to GW resources. This is one of the main recommendations that came out which is compatible with the approach the project has adopted so far. With regard to cultural resources rehabilitations, there was broad agreement on the proposed approach. Many participants voiced the need for Jaffna to be a green city with an approach that takes preserving its precious ground water resources as a key consideration.

## CHAPTER 8: SAMPLE TERMS OF REFERENCES

### 8.1 Terms of Reference for an Environmental Management Plan for a typical sub-project

The EMP should address the following sections in detail.

1. Introduction

2. Project concept and detailed designs as approved by the PMU and PEAs

*(The activities of the sub-project must be approved by the PMU for funding. Activities that need further studies should not be included into the EMP as it may mislead the outcomes. As the EMP would need to identify impacts and mitigation measures specific to the site and proposed interventions, detailed designs are of utmost importance to have been finalized at the time of EMP preparation)*

3. Project Implementation Schedule

*(It is indeed necessary to understand at what time the proposed measures are to be implemented. Hence implementation schedule is of paramount.)*

4. Significant Impacts and mitigation Measures

*(Identification of impacts and their mitigation measures must be highlighted.)*

5. Organization Chart, Responsibilities & Implementation Budget

*(Management commitment in accordance to organization chart is mandatory and also the allocated funds must be mentioned for each intervention so that it is the responsibility of the management to spend it as planned. Such costing particularly for mitigation activities must be highlighted)*

6. Operating Requirements

*(Application of related standard and regulations stipulated under the NEA and other legislation pertaining to environmental management should be highlighted. All the approvals needed for the project to go forward must be obtained with the EMP with copies of any written approval or permission by different authorities)*

7. Requirements of environmental monitoring and its frequency

*(It is obvious that proper monitoring requirements are worked out in order to realize the monitoring needs for the sub-project planned; including if necessary Baseline studies for air, water, noise, vibration, soil flora and fauna etc. as needed. The frequency of producing monitoring reports and its contents should be mentioned.)*

8. Frequency and type of training related to special issues

*(Training needs must be highlighted that will enable proper management of environment in which the sub-project is implemented.)*

9. Estimated budget for implementing the Environmental Management Plan.

*(Total cost of EMP must be worked out so that the amount mentioned can be kept aside without spending for main activities.)*

10. Conclusion and recommendations

*(Concrete conclusions and recommendations must be worked out so that they can be technically feasible and economically viable solutions for implementation.)*

Annex

- Name of those involved in the EMP preparation
- Any analytical reports
- Recommended name of a certified laboratory to analyze and complete monitoring report for the monitoring requirement

NOTE:

All the stakeholders should agree on the proposed interventions so that common goals could be achieved without much difficulty. Stakeholder consultation process is therefore an important integral step through which this goal is realized. If some stakeholders are not in agreement it is necessary to change the goals so that all are in agreement. EMP will therefore propose measures that are agreeable to all parties

EMP preparation guidelines are provided in the Annex 2

## **8.2 Terms of Reference for the Development of Sediment Sampling and Analysis Plan for Galle canals and urban drainage network**

### **1. Project Background**

To be filled

**2. Environmental risks** – The proposed project interventions are expected to generate many positive environmental and public health impacts through improved flood/drainage management and local services in the selected cities. However, achieving the desired outcomes and sustaining them in the long-term would also critically depend upon how the project will address environmental risks and challenges when planning and implementing sub-projects. One of the key environmental concerns associated with project interventions in Galle is the disposal of dredged material from canals and urban drains where sediment quality could be a concern that options for disposal would need to be carefully planned. The project has proposed the deepening of canals such as the Moragoda Ela along its entire length and other blocked secondary canals/drains to improve depth and flow so that the city can be safe from frequent flooding during rain. Currently there is no available data on sediment quality to use as a reference and it is considered necessary to assess the presence of potentially toxic chemicals in canal bottoms, where dredging is proposed to be carried out, which would require special disposal methods.

**4. Purpose of TOR and Scope of Work-** The purpose of this TOR is to design and develop a sediment sampling and analysis plan to assess the potential hazardousness of canal sediments in selected locations within the Galle drainage basin and to assess the possible environmental risks of disposing dredged matter in disposal areas.

The consultant shall submit a proposal consisting of a method statement for the development of a sediment sampling and analysis plan in order to achieve the objectives set out in section 4 above. It shall cover the following.

1. Specify the overall sampling strategy for the proposed project area that includes phasing, if any, spatially and temporally.
2. Identify sampling locations, in line with the proposed sampling strategy, within the Galle city drainage basin with the rationale for such selection explained in terms of site history, current site use, sources of contamination, industrial processes at or near the site (and hazardous substances used/generated), location of storm/wastewater drainage, proposed dredging locations under the SCDP etc. The locations should be marked on a map of the basin.
3. Specify sampling and analytical requirements for the selected locations in terms of sample type, number and frequency, sampling methodology, physical and chemical laboratory testing including grain-size analysis, organic/inorganic parameters to be tested, analysis methods, quality assurance requirements and other field measurements. Indicate testing laboratory and compliance of it with accreditation requirements.
4. Indicate the reference standards to be used for different sample types and any hazard level categorization for analyzed sediments.
5. Indicate a tentative time outline for the sampling, analysis, data evaluation and reporting for each phase. The first phase of the assignment should not be more than 2 months.
6. Identify potential risks based on test results and recommend practical and economically feasible disposal options to the PEA.

**5. Team** - The consultant shall specify the personnel involved with the assignment and their respective responsibilities.

**6. Deliverable** - The consultant shall deliver a full report on sediment characterization with data computed, evaluated and findings fully interpreted. The report shall also carry detail information on sampling strategy and methodology used, explained in its entirety, and recommendations on the suitability of the dredge material to be disposed on land or whether it would require special disposal methods based on risks identified.

### **8.3 Terms of Reference for the Annual Environmental Audit**

#### **1. Introduction to the project**

To be filled

#### **2. The Need for Environmental Assessment**

All sub-projects financed under SCDP are required to comply with World Bank Operational and Safeguard Policies triggered, in addition to conformity with the environmental legislation of GOSL. Thus all sub-projects are required to conform to:



- (a) the Environmental Assessment and Management Framework (EAMF) adopted by GOSL and accepted by the World Bank, and
- (b) the terms of the Central Environmental Authority (CEA) as mandated by the National Environmental Act (NEA) of Sri Lanka, **where it is applicable**.

According to the EAMF, each sub-projects needs to be subjected to an environmental screening using the recommended template. Based on the screening information and concerns of the public the need to pursue further stand-alone assessments and if so the type of assessment is determined. All screening forms are filled by environmental officers supporting the PEAs and reviewed and cleared by the PMU. For sub-projects with Category A type impacts a prior review of the screening is carried out by the World Bank. When standalone assessments and management plans are considered necessary, the project proponent is responsible for carrying them out while the PMU reviews and clears them.

According to CEA procedures, all sub-project requiring NEA approval need to fill in a Basic Environmental Information Questionnaire (BEIQ). Upon reviewing the BEIQ, the CEA will determine whether no further environmental analysis is required or whether the proponent is required to prepare an Initial Environmental Examination (IEE) or an Environmental Impact Assessment (EIA).

### 3. Objectives

The primary objective of this assignment is for the Consultant to carry out an environmental audit for SCDP. The consultant will review the application of the EAMF to the SCDP. In particular, the consultant will review a sample of (i) the screening forms prepared by each PEA (ii) standalone environmental assessments/management plans (iii) application of the NEA and its clearance procedures followed by the project, as the case be, and based on site visits ensure conformity with conditions, guidelines and comments stipulated in these and other related documents. The Consultant is expected to be familiar with the EAMF, the applicable safeguard policies of the WB, NEA and the approval procedure of the CEA.

### 4. Tasks of the Consultant

- Obtain the required information from the sub-project proponent, Local PMU offices and the main PMU, on the sub-project under implementation as well as under preparation of the SCDP. This may include, but not be limited to, relevant plans, drawings, screening reports, social analysis, standalone EA/EMP (if it has been necessary), comments of the World Bank.
- Review the above documents, discuss with the sub-project proponent as well as the surrounding community and visit the location and environs of the sub-project.
- Check for conformity of the sub-project in relation to the guidelines, conditions and comments stipulated in the item above.
- Examine monitoring reports and whether standards, procedures and controls are in place to respond to safeguards requirements stipulated in EAMF.
- Examine significant new risks and propose remedial actions
- Highlight any deviations from the guidelines, conditions and comments stipulated in the aforesaid documents and assist the sub-project proponent to improve the safeguard documents incorporating the necessary mitigatory measures.

- Document any adverse environmental impacts that were not anticipated in the screening and follow up assessments that may have occurred during project construction and implementation.
- Examine procedures of corrective action if monitoring parameters are out of monitoring limits and if such incidents are actually reported, investigated and followed up

Document and submit the environmental audit report which should include (i) an Executive Summary, (ii) Overall audit opinion on the level of compliance, (iii) for each sub-project reviewed (a) a description of the sub-project, (b) the list of documents reviewed and persons interviewed, (c) observations made at the site, (d) conformity and/or deviations to guidelines (CEA and EAMF), clearance conditions (World Bank and GOSL) and plans, (e) status of progress reporting and actions taken to address issues (f) actions need to be taken to respond to negative deviations, (g) new risks and recommendations to address the risks (mitigation actions), (h) any other relevant information to support the findings.

## **5. Application Procedure**

Qualified consultants may apply for the assignment listed above. Applications should be submitted using the format below:

- Title of assignment
- Name and address of the consultant/firm
- Name, designation and telephone number of contact person
- Brief consultant/company profile
- Key staff members of the firm (giving priority to assignment-specific staff; for each staff member provide name, position in the team, number of years in the firm, relevant qualifications and assignment-specific experience and proficiency in languages – read, write and speak)
- Relevant experience of the consultant/firm (Details of assignment-specific tasks undertaken during the past 10 years with client references)

Expressions of interest should focus on aspects relevant to the particular assignment, and reach the PMU by [Date].

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Gunapala, S.R, 2015. Environmental Impact Assessment of Sewerage Treatment Plant at Kallundai, Jaffna, Project Engineering and Institutional Consultancy, Jaffna-Kilinochchi Water Supply and Sanitation Project, Pp 259

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Mikunthan T., Vithanage M., Pathmarajah S., Ariyaratne R. and Manthrithilake H, 2013, Hydrogeochemical Characterization of Jaffna's Aquifer Systems in Sri Lanka, International Water Management Institute

T. Jeyaruba and M. Thushyanthy, 2009. The Effect of Agriculture on Quality of Groundwater: A Case Study, Department of Agric. Engineering, Faculty of Agriculture, University of Jaffna, Jaffna, Middle-East Journal of Scientific Research 4 (2): Pp110-114

### Web Sites:

[http://www.windfinder.com/windstatistics/jaffna\\_yazhpanam](http://www.windfinder.com/windstatistics/jaffna_yazhpanam)

**Annex 1: Summary of Environmental and Urban Development Legislation in Sri Lanka**

No.	Act/ Ordinance	Responsible Agency	Mandate
1.	<b>Marine Resources</b> a. Coast Conservation and Coastal Resources Management Act No.49 of 2011 (Amendment)	Coast Conservation And Coastal Resources Management Department  Prevention Authority	Responsible for prevention of Coastal erosion & management of the coastal zone  Oversee the management of marine fisheries resources
2	<b>Fresh Water Resources</b> a. Irrigation Ordinance Chapter 453  b. National Water Supply Drainage Board Act No. 02 of 1974  c. Water Resources Board Act No. 29 of 1964	Irrigation Department  National Water Supply & Drainage Board  Water Resources Board	Responsible for the development & maintenance of minor & major irrigation tanks, canals and schemes  Supply of Water for Drinking & industrial use  Responsible for the assessment, protection & development of water resources
3	<b>Fauna &amp; Flora (Forest &amp; Wildlife)</b> a. Fauna & Flora protection Ordinance Chapter 469 as amended by Act No.49 of 1993 and Act No. 22 of 2009 b. Forest Ordinance (including	Department of Wildlife Conservation  Department of Forest	of Protection of the protected areas and management of the same.  Conservation of Forest and

<b>Land Resources</b>		
a. Land Acquisition Act No. 9 of 1979	Land Commissioners Department District & Divisional Secretaries	Acquisition of lands for development projects and programmes Development of under develop lands
b. Land Development Ordinance Chapter 464	Land Commissioners Department District & Divisional Secretaries	Development of land for better purposes Settlement of peasants under village expansion and other development projects
c. State Lands Ordinance(Chapter 269)No. 8 of 1947	Land Commissioners Department District & Divisional Secretaries	To make provisions for the grant and disposition of state lands in Sri Lanka for the management and control of such lands and the fore shore and to regulate the use of water of lakes and public streams.
d. Urban Development Authority ActNo.41of 1978 as amended from time to time	Urban Development Authority	Responsible for the development of urban areas in a planned manner.

No.	Act/ Ordinance	Responsible Agency	Mandate
5	<b>Air</b> a. Motor Traffic Act No.14 of 1951 as amended from time to time	Motor Traffic Department, Department of Police	Monitor& control the vehicular emissions; prosecution of the violators of the law
6	<b>Cultural Heritage</b> a. Antiquities Ordinance Chapter 188 b. Cultural property Act of 1988	Department of Archeology -Do-	Preservation of historically and archeologically important sites -Do-
8	<b>Hazardous &amp; Other Substances</b> a. Cosmetic Devices & Drugs Act No. 27 of 1980  b. Poisons, Opium and Dangerous Drugs Ordinance Chapter 218	Department of Health Services  Department of Health Services	Regulate & monitor the release and use of drugs etc.  Control &monitor the release and use of dangerous drugs.
9	<b>Overall Environment</b> a. Constitution of the Democratic Socialist Republic of Sri Lanka  b. National Environmental Act No. 47 of 1980 as amended by Act No.56 of 1988, Act No.53 of 2000 and Act No. 53 of 2000  c. Local Authorities Act (Municipal Councils ActNo.19 of 1987,Urban Councils Act No. 18 of 1987)	The Government, Citizens of Sri Lanka  Ministry of Environment, Central Environmental Authority  Local Authorities	Constitutional provisions for Conservation of Environment  The protection, management & enhancement of the environment for the regulation, maintenance and control of the quality of the environment for the preservation, abatement & control of pollution  Provide the institutional opportunity for mobilizing all sections of the local community to address issues of environment affecting them directly.

## Annex 2: EIA/IEE Process in Sri Lanka

### The EIA Procedure

In the event that an EIA is required, the PAA in consultation with CEA, is responsible for subjecting the preliminary information to environmental scoping, in order to set the Terms of Reference (TOR) for the EIA. The TOR is prepared by a Technical Committee (TC) comprising experts in the relevant field, appointed by the PAA. In developing the TOR, the regulations provide for the PAA to consider the views of state agencies and the public.

Upon submission of the EIA by the proponent, the PAA is required to determine whether issues referred to in the TOR have been addressed and notify the proponent of any inadequacies within 14 days. In the event any inadequacies are identified, the proponent is required to make necessary amendments and resubmit the report. Once accepted, in addition to the EIA being forwarded to the CEA by the PAA, notice is also placed in the Government Gazette and in a national newspaper published daily in Sinhala, Tamil and English languages inviting the public to make written comments, if any, to the PAA within 30 days from the date of first appearance of the notice. According to the legislation, public consultation is mandatory is only at this stage of the EA process. Informal consultation with NGOs, interested groups and civil society may occur during early stages of the EA as determined by the PAA depending on the type of project and public interest in the project. The notification would specify the times and places at which the EIA would be available to the public. As a minimum the report would be available at the CEA, PAA and in a GOSL agency in the locality (Colombo and outstation) of the proposed project. The environmental regulations have provisions for public hearings on the project although it is not mandatory. The PAA can use its discretion and hold a public hearing if it would be in the interest of the public. The PAA is required to forward all comments, either written or raised during any public hearing, to the project proponent for review and response within 6 days of completion of the public comment period. The proponent is required to respond to all such comments in writing to the PAA.

The TC appointed by the PAA would then evaluate the EIA and require the project proponent to respond to any queries raised by the TC. The TC would also evaluate the adequacy of the proponent's response to any comments raised during the public comments period. Upon completion of the evaluation of the TC, the PAA with the concurrence of the CEA, would grant approval for the implementation of the proposed project subject to specified conditions or refuse approval for implementation of the project, with reasons for doing so. The notification must be made within 30 days of the receipt of responses from the proponent. The PAA is required to specify a period within which a the approved project should be completed. In the event the proponent is unable to complete the project within the specified period, written permission for an extension has to be obtained from the PAA, 30 days prior to the expiration date.

The PAA is responsible for forwarding a report which contains a plan for monitoring the implementation of the approved project, to the CEA, within 30 days from granting approval. It is also the responsibility of the PAA to publish in the Government Gazette and in one national newspaper published in Sinhala, Tamil and English languages, granting approval for the project. It is mandatory that the project proponent inform the PAA of any alterations to the project as approved and/or the abandonment of the project. The PAA shall, where necessary, obtain fresh

approval in respect of any such alterations that are intended to be made to the approved project. The PAA in consultations with the CEA, would also determine the scope and the format of the supplemental report required to be submitted for such alterations.

### **The IEE Procedure**

Upon review of the preliminary information provided by the proponent, if the PAA determines that the project would have no long-term adverse environmental impacts, an initial environmental examination (IEE) would be considered adequate. Under such circumstances, the proponent will be required to submit a detailed IEE for review and approval by the PAA. The IEE will identify potential environmental and social issues and the complexity of possible remedial actions. Upon reviewing the IEE, if the TC identifies any substantial environmental issues that may arise as a result of the proposed project, the proponent will be required to undertake a detailed EIA. In the event the IEE is considered adequate, then the project proponent is requested to prepare an Environmental Management Plan (EMP), to address any potential environmental and social issues as well as incorporate the PAA/CEA's approval conditions. The IEE review process is similar to the EIA review process, except for the level of detail and analysis involved, which is proportionate to the anticipated environmental and social impacts. The CEA has developed a custom made IEE questionnaire for mini hydropower projects. The Environmental Questionnaire for Mini Hydro Projects is more detailed than the general IEE questionnaire and is designed to capture environmental issues specific to mini hydro projects. This questionnaire is used by the CEA/PAA to determine whether the potential project results in long term irreversible or complex environmental and social issues and if so, it warrants an EIA. If no EIA is required, the proponent is required to prepare an EMP which contains remedial measures to address adverse environmental and social issues. The IEE is not required by law to be opened for the public for comments and does not go through the public consultation process required for an EIA.



### Annex 3: Guidelines for Preparing EMPs

Having identified the potential impacts of the relevant sub-component, the next step of the EA process involves the identification and development of measures aimed at eliminating, offsetting and/or reducing impacts to levels that are environmentally acceptable during implementation and operation of the project (EMP). EMPs provide an essential link between the impacts predicted and mitigation measures specified within the EA and implementation and operation activities. World Bank guidelines state that detailed EMP's are essential elements for Category A projects, but for many Category B projects, a simple EMP alone will suffice. While there are no standard formats for EMPs, it is recognized that the format needs to fit the circumstances in which the EMP is being developed and the requirements, which it is, designed to meet. EMPs should be prepared after taking into account comments from both the PAA and IDA as well as any clearance conditions. Annex C of OP 4.01 of the World Bank safeguards outlines the important elements of the EMP and guides its preparation. Given below are the important elements that constitute an EMP.

#### *a. Identification of impacts and description of mitigation measures*

Firstly, Impacts arising out of the project activities need to be clearly identified. Secondly, feasible and cost effective measures to minimise impacts to acceptable levels should be specified with reference to each impact identified. Further, it should provide details on the conditions under which the mitigatory measure should be implemented (ex; routine or in the event of contingencies) The EMP also should distinguish between type of solution proposed (structural & non-structural) and the phase in which it should become operable (design, construction and/or operational).

#### *b. Enhancement plans*

Positive impacts or opportunities arising out of the project need to be identified during the EA process. Some of these opportunities can be further developed to draw environmental and social benefits to the local area. The EMP should identify such opportunities and develop a plan to systematically harness any such benefit.

#### *c. Monitoring programme*

In order to ensure that the proposed mitigatory measures have the intended results and complies with national standards and donor requirements, an environmental performance monitoring programme should be included in the EMP. The monitoring programme should give details of the following;

- Monitoring indicators to be measured for evaluating the performance of each mitigatory measure (for example national standards, engineering structures, extent of area replanted, etc).
- Monitoring mechanisms and methodologies
- Monitoring frequency
- Monitoring locations

*d. Institutional arrangements*

Institutions/ parties responsible for implementing mitigatory measures and for monitoring their performance should be clearly identified. Where necessary, mechanisms for institutional co-ordination should be identified as often monitoring tends to involve more than one institution.

*e. Implementing schedules*

Timing, frequency and duration of mitigation measures with links to overall implementation schedule of the project should be specified.

*f. Reporting procedures*

Feedback mechanisms to inform the relevant parties on the progress and effectiveness of the mitigatory measures and monitoring itself should be specified. Guidelines on the type of information wanted and the presentation of feedback information should also be highlighted.

*g. Cost estimates and sources of funds*

Implementation of mitigatory measures mentioned in the EMP will involve an initial investment cost as well as recurrent costs. The EMP should include costs estimates for each measure and also identify sources of funding.

*h. Contract clauses*

This is an important section of the EMP that would ensure recommendations carried in the EMP will be translated into action on the ground. Contract documents will need to be incorporated with clauses directly linked to the implementation of mitigatory measures. Mechanisms such as linking the payment schedules to implementation of the said clauses could be explored and implemented, as appropriate.

#### Annex 4: Descriptions of Major Sites of Physical Cultural Importance

##### Kandy

##### The Dalada Maligawa Complex

Constructed in the 18th century, the Dalanda Maligawa and its surrounding Palace Complex was built King Narendra Sinha and his predecessors. The octagonal Patthirippuwa and moat which connects to the Kandy Lake was added during the reign of Sri Vikrama Rajasinha. The Dalada Maligawa is a living monument where a ritualistic practice in veneration of the Sacred Tooth Relic of Lord Buddha is conducted even today. This includes the Esala Perahera festival, which is conducted during the Months of July-August, and consists of a night time procession along the streets of the grid city over a course of ten days. The complex includes the Royal Palace, the royal audience hall and "Mahamaluwa" as well as the four "Sathara Devala" temple complexes. The temple sustained a bombing in 1995, and been fully restored thereafter.



##### The Malwatta and Asgiriya Monastic Complexes

Situated on banks of the Kandy Lake and below Rajapihilla Mawatha, overlooking the Dalada Maligawa the Malwatta Monastic complex. It consists of two sections, the "Uposatha Viharaya" (Ordination Hall) on the right, popularly known as "Poyamalu Viharaya" and the other "Pushparama Viharaya" popularly known as "Malwatu Viharaya" which is seen today with a newly built octagon.



Asgiriya Monastic Complex was built by Commander Siriwardhana of Parakramabahu IV in Kurunegala era (1305-1335 A.D.). Located in Asgiriya, to the west of the grid city, it houses monasteries where priests from the Asgiri Chapter reside. A number of small temples and historic buildings are found within the complex, which has been in operation for centuries.



All religious rituals throughout the year, expositions of the sacred Tooth Relic and other matters relating to the Dalada Maligawa are conducted under the jurisdiction of the head priests of these two temples. The head priests reside in the two respective monasteries as well. Over the years, the two monasteries have grown in stature and significance and both play equal roles in the religions activities of the Dalada Maligawa.

### **Kandy Lake and Surrounding Area**

A decorative wall, called Walakulu wall, runs for 2060 feet along the banks of the Kandy Lake. In the middle of the lake is a man-made island housing the Royal Summer House. On the opposite side of the road from the Temple of the Tooth Relic is the Royal Bathhouse, which is used by the king's wives and concubines as a bathhouse. The British added one more story to the structure to house a library. There are also a number of historic buildings and monuments along the perimeter of the lake, such as the Royal Spout.



### **Peradeniya Botanical Garden**

Extending over 147 acres, the Royal Botanical Gardens was established during colonial times. Situated about 5km west to the city center at Peradeniya, it is a major tourist destination with visitation rates at over 2 million individuals per year and is the largest botanical garden on the island. Over 4000 species of tropical plants are housed at the gardens and it is also home to the National Herbarium.

### **Wales Park**

Wales Park, of the Royal Place Park, is a small park overlooking the Kandy Lake and grid city area located on Rajapihilla road. The park is landscaped in to the hilly contours that connect the lake round area and Rajapihilla road. There are many historic monuments housed within Wales Park of which the Japanese field gun which was captured by the British 14th Army in Burma during World War II and presented to the city of Kandy by Lord Mountbatten, who was the Supreme Allied Commander for the South East Asia Theatre at the time, is one of key importance. This site is visited both by local and foreign tourists daily as it offers unique views of the surrounding locality.

### **University Campus at Peradeniya**

The university is located on the Peradeniya - Galaha Road and was established in 1942. It is noted as the oldest and the most picturesque university campus in the country. Sprawling gardens and tree lined pathways of Peradeniya are well known around the world. All disciplines ranging from Humanities and Arts to the Sciences, Engineering, Medical Science and IT are thought at the University.



**Annex 5: Format for the questionnaire to be filled for screening sub-projects**

**Environmental Screening Report**

**1. Project Identification**

Project title	
Project Proponent	

**2. Project Location**

Location <i>(relative to the nearest town, highway)</i>	
Definition of Project Area <i>(The geographical extent of the project &amp; areas affected during construction)</i>	
Adjacent land and features	

**3. Project Justification**

Need for the project <i>(What problem is the project going to solve)</i>	
Purpose of the project <i>(what is going to be achieved by carrying out the project)</i>	
Alternatives considered <i>(different ways to meet the project need and achieve the project purpose)</i>	

**4. Project Description**

Proposed start date	
Proposed completion date	
Estimated total cost	
Present land ownership	
Description of the project <i>(with supporting material such as maps, drawings etc attached as required)</i>	
Project Management Team	Agency -  Contact person -  Nature of consultation and input received

**5. Description of the existing environment**

<b>5.1 Physical features - Ecosystem components</b>	
Topography and terrain	
Soil <i>(type and quality)</i>	
Surface water <i>(sources, distance from the site, local uses and quality)</i>	
Ground water <i>(sources, distance from the site, local uses and quality)</i>	
Flooding	
Air quality <i>(any pollution issues)</i>	
Noise level and vibration <i>(Any anticipated issues)</i>	
<b>5.2 Ecological features - Eco-system components</b>	
Vegetation <i>(trees, ground cover, aquatic vegetation)</i>	
Presence of wetlands	

Fish and fish habitats	
Birds ( <i>waterfowl, migratory birds, others</i> )	
Presence of special habitat areas ( <i>special designations and identified sensitive zones</i> )	
<b>5.3 Physical Cultural Resources (PCR)</b>	
PCR resources in the area ( <i>recorded or potential to exist</i> )	
Type of PCR	
Distance from the project site	
Ownership	
Protection status	
National/regional/local significance	
<b>5.4 Other features</b>	
Residential/Sensitive Areas ( <i>Eg, Hospitals, Schools</i> )	
Traditional economic and cultural activities	

**6. Public Consultation**

Public consulted	Consultation method	Date	Details/Issues raised

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**7. Screening for Potential Environmental Impacts**

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
1	Will construction and operation of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc)				
2	Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?				
3	Will the Project produce solid wastes during construction or operation?				
4	Will the Project release pollutants or any hazardous, toxic or noxious substances to air?				
5	Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?				
6	Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater or coastal waters?				
7	Will the project cause localized flooding and poor drainage during construction  Is the project area located in a flooding location?				
8	Will there be any risks and vulnerabilities to public safety due to physical hazards during construction or operation of the Project?				
9	Are there any transport routes on or around the location which are susceptible to congestion or which cause environmental problems, which could be affected by the project?				



10	Are there any routes or facilities on or around the location which are used by the public for access to recreation or other facilities, which could be affected by the project?				
11	Are there any areas or features of high landscape or scenic value on or around the location which could be affected by the project?				
12	Are there any other areas on or around the location which are important or sensitive for reasons of their ecology e.g. wetlands, watercourses or other water bodies, mountains, forests which could be affected by the project?				
13	Is the location within or adjacent to the coastal zone? If so, what is the distance to the coast?				
14	Are there any areas on or around the location which are used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, migration, which could be affected by the project?				
15	Are there mangrove, coral reef, sea grass bed, turtle beach habitats etc within close proximity?				
16	Is the project located in a previously undeveloped area where there will be loss of green-field land				
17	Will the project cause the removal of trees in the locality?				
18	Can any of the identified historic or culturally importance sites on or around the location be affected by the project?				
19	Are there existing land uses on or around the location e.g. homes, gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining or quarrying which could be affected by the project?				
20	Are there any areas on or around the location which are densely populated or built-up, which could be affected by the project?				
21	Are there any areas on or around the location which are occupied by sensitive land uses e.g. hospitals, schools, places of worship, community facilities, which could be affected by the project				

22	Are there any areas on or around the location which contain important, high quality or scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries, tourism, minerals, which could be affected by the project?				
23	Are there any areas on or around the location which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, which could be affected by the project?				
24	Will the project involve dredging, If so to what degree and where, please indicate under comments				

**8. Project operating requirements**

		<b>Yes</b>	<b>No</b>
24	Does the project belong to a prescribed category of the National Environmental Act		
25	Does the project need to obtain clearances from the following agencies:		
26	a. Department of Archaeology		
27	b. National Building Research Organization		
28	c. Coast Conservation Department		
29	d. Forest Department		
30	e. Department of Wildlife Conservation		
31	f. Any other: If so, describe		

**9. Conclusion and Screening Decision**

**Summary of environmental effects:**

Assuming that all mitigation measures are implemented as proposed, the following effects can be predicted

	N/S - Effect not significant, or can be rendered insignificant with mitigation
	SP - Significant positive effect
	SN - Significant negative effect
	U - Outcome unknown or cannot be predicted, even with mitigation

**10. Screening Decision Recommendation (check one):**

Environmental assessment is still underway, and not final.

	<p>All potentially adverse effects can be classified as general construction related impacts and are mitigatable with known technology. Public concern does not warrant further assessment.</p> <p>Therefore, standalone Environmental Assessment not required, an Environmental Management Plan would be suffice.</p>
	<p>Potential adverse impact are significant, hence, standalone Environmental Assessment and Management Plan needed before the project can proceed</p>
	<p>Potential adverse impact are significant, hence project cannot be justified</p>

**11. Details of Persons Responsible for the Environmental Screening**

<p><b>Screening report completed by</b></p>  <p><i>Name/Designation/Contact information</i></p>	<p><b>Date</b></p>  <p><i>Signature</i></p>
<p><b>Screening report reviewed by</b></p>  <p><i>Name/Designation/Contact information</i></p>	<p><b>Date</b></p>  <p><i>Signature</i></p>
<p><b>Approved by</b></p>  <p><i>Name/Designation/Contact information</i></p>	<p><b>Date</b></p>  <p><i>Signature</i></p>



9. Environmental Management Plan

GENERIC ENVIRONMENTAL MANAGEMENT PLAN

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility		
				Implement	Supervision	
<b>1.0 Construction Phase</b>						
<b>1.1</b>	<b>Earthwork and Soil Conservation</b>					
	<b>1.1.1</b>	<b>Site Clearance and Land Development</b>				
		<p>Prevention of removal of trees as far as possible. However, total of 93 trees will have to be removed during site clearance. This includes XX trees identified on the border of XX Forest (chainage XXX).</p> <p>The contractor shall inform the Forest Department on tree removal timeframe in advance.</p> <p>During removing, attention should be paid to maintain minimum disturbances to soil cover and also care should be taken not to damage adjoining trees.</p> <p>It is recommended to plant trees along the possible stretches of roadside in order to enhance the environment.</p> <p>Water spraying should be done at a regular interval to avoid/mitigate dust generation due to site clearance (refer sections 1.2.1 below on prevention of dust generation)</p>	<p>Applicable throughout the road</p> <p>Location, variety &amp; size of trees to be removed are given in Annex - X</p>	Engineering cost	Contractor	SC, PMU, FD
	<b>1.1.2</b>	<b>Disposal of Debris and Spoil</b>				

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(a)	All debris and residual spoil material including any left earth shall be disposed only at locations approved by the engineer for such purpose and subjected to the clauses 2.1.2.b and 2.1.2.c.	Disposal sites identified by the contractor and approved by Engineer are subjected to approval of DS, LA & Engineer	Engineering cost	contractor	PMU, LA, SC
(b)	If directed by the engineer the contractor shall obtain the approval from the relevant Local Authority (LA) such as Pradeshiya Sabha, Municipal Council and other government agencies (as required) for disposal and spoil at the specified location.	-Do-	-	-do-	
(c)	The debris and spoil shall be disposed in such a manner that; (i) waterways and drainage paths are not blocked (ii) the disposed material should not be washed away by runoff and (iii) should not be a nuisance to the public	All water bodies within this section of road including small streams.	Engineering cost	-do-	PMU, LA, SC
(d)	If directed by the engineer the debris and residual spoil material including any left earth shall be used, to refill the burrow areas as directed by the engineer, subjected to laying of topsoil as per EMP clause. Refer section on burrow material	All burrow sites (licensed sites) identified by contractor and approved by Engineer.	do	-do-	-do-
(e)	Excavated earth materials and all debris materials shall be disposed on a daily basis (or as necessary given the waste quantities generated and onsite stockpiling space) without allowing to stockpile onsite, at identified locations for debris disposal, recommended by the engineer. During transportation, dispose materials should be covered with tarpaulin.	Applicable throughout the road / working area	do	-do-	-do-

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(f)	If consented by the engineer, contractor can dispose construction debris and excavated earth as land filling material provided that the contractor can ensure that such material is used for legally acceptable purposes and is disposed in a manner that will not be harmful to the surrounding environment.	In identified filling sites subjected to the approval of engineer	-	-do-	-do-
(g)	The contractor shall maintain a waste register in the site office which will keep records of types and quantities of wasted removed from the site and places of disposal. The waste registry will be monitored by the PMU staff during project implementation.		do	-do-	-do-
<b>1.1.4</b>	<b>Protection of Ground Cover and Vegetation</b>				
(a)	Construction vehicle, machinery and equipment shall be used and stationed only in the areas of work and in any other area designated/ approved by the engineer. Ad-hoc and scattered parking and placement of machinery should be avoided to minimize harm to roadside ground cover..	Within the road section	-	Contractor	PMU/LA/ CEA,SC
(b)	Contractor should provide necessary instructions to drivers, operators and other construction workers not to destroy ground vegetation cover unnecessarily. Designated vehicle parks and maintenance yards must be informed to labour force.	-Do-	-Do-	-do-	-do-
<b>1.1.5</b>	<b>Burrowing of Earth</b>				
(a)	Earth available from excavation for roadside drains as per design, may be used as embankment materials, subject to approval of the engineer.	All excavation areas and embankments	-	-do-	-do-
(b)	Contractor shall comply with the environmental requirements/guidelines issued by the Central Environmental Authority (CEA) and the respective local authorities with respect	Selected borrow sites	-	-do-	-do-

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
	of opening burrow areas and with regard to all operations related to excavation and transportation of earth from such sites.				
(c)	Burrow areas shall not be opened without having a valid mining license from the GSMB. The location, depth of excavation and the extent of the pit or open cut area shall be as approved by the engineer.				
(d)	Contractor can also find suitable soil materials for shoulder formation and / or road filling from currently operated licensed burrow pits in the surrounding area, subject to approval of the Engineer	All burrow sites identified by the contractor.			
(e)	All burrow pits/areas should be rehabilitated at the end of their use by the contractor in accordance with the requirements/guidelines issued by the CEA/GSMB and the respective local authority.	All burrow sites identified by the contractor	Engineering cost	-do-	-do-
(f)	Establishment of burrow pits/areas and its operational activities shall not cause any adverse impact to the properties and shall not be a danger or health hazard to the people living around.	All excavation areas, slopes and burrow sites	-	-do-	-do-
(g)	Contractor shall take all steps necessary to ensure the stability of slopes in burrow pits. Please refer a general guideline for burrow pit management in annex X.	All excavation areas, slopes and burrow sites	Engineering cost	-do-	-do-
<b>1.1.6</b>	<b>Prevention of soil erosion</b>				
(a)	The work, permanent or temporary shall consist of measures as per design or as directed by the engineer to control soil erosion, sedimentation and water pollution to the satisfaction of the engineer. Typical measures include the use of berms, dikes sediment basins, fiber mats, mulches, grasses, slope drains and other devices. All sedimentation and pollution control works and	Applicable throughout the road. Locations of culverts, leaderways	Engineering cost	Contractor	PMU,SC



Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
	maintenance thereof are deemed, as incidental to the earthwork or other items of work and no separate payment will be made for their implementation.	(directly connected to streams / water bodies), toe walls & silt traps to be erected			
	(b) Debris material shall be disposed in such a manner that waterways, drainage paths would not get blocked, both onsite and offsite. Disposal of loose soil shall not be done within 100m of any waterway.				
	(c) During rehabilitation/reconstruction of roadside drainage, temporary drainage paths must be erected to drain rain water properly and to avoid on-site ponding.  These temporary drains should include silt traps or any other sediment trapping measures to minimize silt carrying runoff generated from the site.				
	(d) To avoid siltation in the waterways crossing the project site, temporary drainage paths from construction sites will not be directly sent to the streams that cross the road at chainages XX and XXX closer to XXX without passing through a silt trap.				
	(e) Barricades such as humps will be erected at excavated areas for culverts, toe walls, filling and lifting with proper sign boards, as some work in these sections will have to be stopped during heavy rains due to heavy erosion. To prevent soil erosion in these excavated areas, proper earth drain system with measures for silt trapping should be introduced during work implementation.	List & locations of culverts, toe walls, covered built up leader ways, silt traps to be erected	Engineering cost	Contractor	PMU,SC

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(c)	Embankment slopes, slopes of cuts, etc shall not be unduly exposed to erosive forces. These exposed slopes shall be graded and covered by grass or geotextile as per the specifications. All fills, backfills and slopes should be compacted immediately to reach the specified degree of compaction and establishment of proper mulch.	Within this road section	Engineering cost	Contractor	PMU,SC
(d)	Work that lead to heavy erosion shall be avoided during raining season. If such activities need to be continued during rainy season prior approval must be obtained from the Engineer by submitting a proposal on actions that will be undertaken by the contractor to prevent erosion.	-Do-	-	-do-	-do-
<b>1.1.7</b>	<b>Contamination of soil by fuel and lubrications</b>				
(a)	Vehicle/machinery and equipment servicing and maintenance work shall be carried out only in designated locations/ service stations approved by the engineer	Service yards to be used for vehicle servicing	Engineering cost	Contractor	PMU, LA, CEA,/SC
(b)	Approval from CEA in the form of an Environmental Protection License (EPL) should be secured by the contractor if he intends to establish his own vehicle servicing yard	-Do-	-	-do-	PMU,/SC
(c)	Waste oil, other petroleum products and untreated wastewater shall not be discharged on ground so that to avoid soil pollution. Clean up measures shall be taken against pollution of soil by spillage of petroleum/oil products from storage tanks and containers. All waste petroleum products shall be disposed of in accordance with the guidelines issued by the CEA or the engineer.	Servicing yards to be used for vehicle servicing and locations along this highway section where vehicles will be temporarily stationed	Engineering cost	-do-	PMU, LA, CEA,/SC

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(d)	Sites used for vehicle and plant service and maintenance shall be restored back to its initial status. Site restoration will be considered as incidental to work.	New servicing yards developed by the contractor for the project	Engineering cost	-do-	-do-
<b>1.1.8</b>	<b>Disposal of harmful construction wastes</b>				
(a)	Contractor prior to the commencement of work shall provide list of harmful, hazardous and risky chemicals/ material that will be used in the project work to the Engineer. Contractor shall also provide the list of places where such chemicals/ materials or their containers or other harmful materials have been dumped as waste at the end of the project, via the waste register.	Locations identified to store chemicals and waste disposal	-	Contractor	PMU, LA, CEA,/SC
(b)	All disposal sites should be approved by the engineer and approved by CEA and relevant local authority.	-Do-	-	-do-	PMU,/SC
(c)	The contractor shall clean up any area including water-bodies affected/contaminated (if any) as directed by the engineer at his own cost.	All affected water bodies close to material storage and waste disposal sites	Engineering cost	-do-	-do-
<b>1.1.9</b>	<b>Quarry operations</b>				
(a)	The contractor should utilize existing quarry sites available in the project influential area as much as possible which are approved by GSMB with valid EPL and Industrial Mining Licences (IML);  Selected quarry sites should have proper safety measures such as warnings, safety nets etc., and third party insurance cover to protect external parties that may be affected due to blasting.	All, quarry sites which will be used during construction phase.	Engineering cost	Contractor	PMU, GSMB, CEA, LA,/SC

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
	If new quarries are to be opened, prior approval should be obtained from GSMB, CEA and local authorities.				
	(b) It is recommended not to seek material from quarries that have ongoing disputes with community.	-Do-	-	-do-	-do-
	(c) The maintenance and rehabilitation of the access roads in the event of damage by the contractors operations shall be a responsibility of the contractor.	-Do-	Engineering cost	-do-	-do-
<b>1.2</b>	<b>Storage and handling of construction material</b>				
	<b>1.2.1</b>	<b>Emission of dust</b>			
	(a)	Storage locations of sand, metal, soil should be located away from settlements and other sensitive receptors and covered (with artificial barriers or natural vegetation). No stockpiling or storage activities are allowed within chainage XXXX km stretch.  Measures given under clauses 1.5.1 (c), (d), (e) should be considered within material storage site to minimize dust during handling of material.  All access roads within the storage site should be sprinkled with water for dust suspension.	At all material storage locations (stock piles of sand, metal)	Engineering cost	Contractor  PMU,/SC
	<b>1.2.2</b>	<b>Storage of fuel, oil and chemicals (avoid fumes and offensive odour)</b>			
	(a)	All cement, bitumen (barrels), oil and other chemicals should be stored and handled on an impervious surface (metal sheet, concrete slab) above ground level.  Storage facility of cement, bitumen (barrels), oil and other chemicals should be an enclosed structure ensuring that no storm water flows in to the structure.	At all material storage locations (cement, bitumen, fuel, oil and other chemicals used for construction activities)	Engineering cost	-do-  -do-

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
	<p>Alternatively, if the storage is not enclosed a ridge should be placed around the storage facility to avoid runoff getting in to the structure.</p> <p>Adequate ventilation should be kept to avoid accumulation of fumes and offensive odour that could be harmful to material handlers.</p> <p>Measures given under clause 1.9 should be considered to avoid any accidents and risks to worker population and public.</p>				
	<b>1.2.3 Transportation of material</b>				
	(a) The contractor should avoid over loaded trucks to transport material to construction sites. During transportation, materials should be covered with tarpaulin. Please refer section 1.9.2 on traffic management for transport routes and times of the day that transport of construction material to the site is allowed.	Within this road section	-	Contractor	PMU/,SC
<b>1.3</b>	<b>Water - Protection of Water Sources and Quality</b>				
	<b>1.3.1. Loss of minor water sources and disruption to water users</b>				
	(a) Contractor should make employees aware on water conservation and waste minimization in the construction process.	Within this road section and at worker camps	-	Contractor	PMU,SC
	(b) Arrange adequate supply of water for the project purpose throughout the construction period. Do not obtain water for project purposes, including for labour camps, from public or community water supply schemes without a prior approval from the relevant authority.	Applicable throughout the road  Applicable throughout the road			

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
	Do not extract water from ground water or surface water bodies without the permission from Engineer & relevant authority. Obtain the permission for extracting water prior to the commencing of the project, from the relevant authority.				
(c)	<p>Contractor shall protect the public well used by community for bathing etc in chainages XXkm, and the natural freshwater streams at change XXXkm and XXXkm from any contamination and disruption to supply. Avoid/ minimize construction works near/ at these drainage locations during heavy rain seasons.</p> <p>A buffer zone (minimum 10 meters) shall be maintain between the construction boundary and the water sources at all times possible, with any other mitigation, as deemed necessary, to avoid contaminated runoff from getting in.</p> <p>In case the closure of such sources is required on a temporary basis contractor shall provide alternative arrangement for supply. Alternative sources such as wells thus provided should be within acceptable distance to the original sources and accessible to the affected community.</p>	Wells and other public water sources locations within this road section	Engineering cost	-do-	PMU, LA,SC
(d)	Contractor shall not divert, close or block existing streams in a manner that will adversely affect downstream uses. If diversion or closure or blocking of the streams is required for the execution of work (such as putting culverts), contractor must obtain the engineers approval in writing. Contractor shall also obtain the approval from the local authority or Divisional Secretary depending on the operating agency. Contractor shall restore the drainage path back to its original status once the need for such diversion or closure or blockage ceased to exist.	Waterways within this road section	Engineering cost	-do-	RDA/PMU, LA/ NWS&DB/ DS, SC
(e)	In case the contractor's activities going to adversely affect the quantity or quality of water, the contractor shall serve notice to the	Within this road section	Engineering cost	-do-	-do-

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
	relevant authorities and downstream users of water sufficiently in advance. Contractor should establish a buffer zone of minimum 100m at all the time his activities will have an impact on the water quality and quantity.				
(f)	Apply best management practices to control contamination of run-off water during maintenance & operation of equipment. Maintain adequate distance between stockpiles & the water bodies in the site referred under 1.3.1 (c) to control effects to natural drainage paths.				
<b>1.3.2</b>	<b>Siltation into water bodies</b>				
(a)	Contractor shall take measures to prevent siltation of the XX streams referred under 1.3.1 (c) as a result of construction work including, construction of temporary / permanent devices to prevent water pollution due to siltation and increase of turbidity. These shall include the measures against erosion as per EMP 1.1.6.	All water bodies located within this section of road	Engineering cost	Contractor	PMU, LA, Irrigation Dept, Agrarian Development Dept, SC
(b)	Construction materials containing small / fine particles shall be stored in places not subjected to flooding and in such a manner that these materials will not be washed away by runoff.			-do-	-do-
(c)	Temporary soil dumps should be placed at least 200m away from the public well and the two streams in the site,			-do-	-do-
(d)	If temporary soil piles are left at the site for a long time those piles should be covered with thick polythene sheets			-do-	-do-
(e)	All fills, back fills and slopes should be compacted immediately to reach the specified degree of compaction and establishment of proper mulch			-do-	-do-
<b>1.3.3</b>	<b>Alteration of drainage paths</b>				

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(a)	Contractor shall not close or block the existing streams permanently. If diversion or closure or blocking of canals and streams is required for the execution of work (e.g. for construction of, culverts), contractor must first obtain the Engineers approval in writing. Contractor shall carry out an investigation and report to the Engineer, if an investigation is requested by the Engineer. Contractor shall also obtain the approval from the relevant agencies such as Department of Irrigation (ID)/ Divisional Secretary (DS) prior to such action is taken. Contractors shall restore the drainage path back to its original status once the need for such diversion or closure or blockage is no longer required.	All drainage paths crossed by the road within this road section.	Engineering cost	Contractor	PMU, DI/DS/ASD,SC
(b)	Debris and spoil shall be disposed in such a manner that waterways and drainage paths are not blocked.			-do-	-do-
<b>1.3.4.</b>	<b>Contamination of water from construction wastes</b>				
(a)	The work shall be carried out in such a manner that pollution of natural water courses located across the road section is avoided. Measures as given in 1.1.6., 1.1.7, 1.1.8, 1.3.2 and 1.3.6 clauses shall be taken to prevent the wastewater produced in construction from entering directly into wells and streams.	At all water courses located adjacent to the road trace	Engineering cost	Contractor	PMU, LA, CEA,SC
(b)	Avoid / minimize construction works near / at such drainage locations during heavy rains seasons.	-do-	-	-do-	-do-
(c)	The discharge standards promulgated under the National Environmental Act shall be strictly adhered to. All waste arising from the project is to be disposed in a manner that is acceptable to the engineer and as per the guidelines/instructions issued by the CEA. Refer xx and xx hazardous waste section and waste disposal section	-do-	Engineering cost	-do-	-do-
<b>1.3.5.</b>	<b>Contamination from fuel and lubricants</b>				



Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(a)	All vehicle and plant maintenance and servicing stations shall be located and operated as per the conditions and /or guidelines stipulated under the EPL issued by CEA. In general, these should be located at least 200m away from water bodies and wastewater shall not be disposed without meeting the disposal standards of the CEA. Wastewater from vehicle and plant maintenance and servicing stations shall be cleared of oil and grease and other contaminants to meet the relevant standards before discharging to the environment.	Vehicle and plant maintenance and servicing centers	Engineering cost	Contractor	PMU, LA, CEA, SC
(b)	Vehicle, machinery and equipment maintenance and re-filling shall be done as required in EMP clause 1.1.6. to prevent water pollution as well.	Yards, servicing centers	Engineering cost	-do-	-do-
<b>1.3.6.</b>	<b>Locating, sanitation and waste disposal in construction camps</b>				
(a)	Locations selected for labour camps should be approved by engineer and comply with guidelines/ recommendations issued by the CEA/Local Authority (LA). Construction of labourer camps shall not be located within 200m from waterways (onsite or offsite) or near to a site or premises of religious, cultural or archaeological importance and school.	Within this road section, Sensitive locations such as Temples, Kovils, Churches, Schools, etc.,	Engineering cost	Contractor	PMU, LA, CEA, DWLC, DoF, SC
(b)	Labour camps shall be provided with adequate and appropriate facilities for disposal of sewerage and solid waste. The sewage systems shall be properly designed, built and operated so that no pollution to ground or adjacent water bodies/watercourses takes place. Garbage bins shall be provided the camps and regularly emptied. Garbage should be disposed off in a hygienic manner, to the satisfaction of the relevant norms. Compliance with the relevant regulations and guidelines issued by the CEA/LA shall be strictly adhered to.	At all labour camps	Engineering cost	-do-	-do-
(c)	Contractor shall ensure that all camps are kept clean and hygienic. Necessary measures shall be taken to prevent breeding of vectors	-Do-	Engineering cost	-do-	-do-

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(d)	Contractor shall report any outbreak of infectious disease of importance in a labour camp to the engineer and the Medical Officer of Health (MOH) or to the Public Health Inspector (PHI) of the area immediately. Contractor shall carry out all instructions issued by the authorities, if any.	Within this road section with special attention near to labour camps		-do-	-do-
(e)	Contractor shall adhere to the CEA recommendations on disposal of wastewater. Wastewater shall not be discharged to ground or waterways in a manner that will cause unacceptable surface or ground water pollution.	At all labour camps		-do-	-do-
(f)	All relevant provisions of the Factories Act and any other relevant regulations aimed at safety and health of workers shall be adhered to.	-Do-		-do-	-do-
(g)	Contractor shall remove all labour camps fully after its need is over, empty septic tanks, remove all garbage, debris and clean and restore the area back to its former condition.	-Do-	Engineering cost	-do-	-do-
<b>1.3.7.</b>	<b>Wastage of water and waste minimization</b>				
(a)	The contractor will minimize wastage of water in the construction process/operations by reusing water as much as possible, utilizing only the required amount of water for the construction works etc. The contractor shall maintain a record of usage of water for various purposes and sources tapped.	Within this road section and labour camps		Contractor	PMU, LA, CEA,SC
<b>1.3.8.</b>	<b>Extraction of water</b>				
(a)	Refer section xx and xx  The contractor is responsible for arranging adequate supply of water for the project purpose throughout the construction period. Contractor shall not obtain water for his purposes including for labour camps from public or community water supplies without approval from the relevant authority.	Within this road section and at labour camps	Engineering cost	Contractor	PMU, LA,SC

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
	Such extraction (if approved) should be under direct supervision of the engineer				
	(b) Extraction of water by the contractor for the project purposes shall comply with the guidelines and instructions issued by relevant authority. The Contractor shall not extract water from groundwater or from surface water-bodies without permission from the Engineer.	-do-		-do-	-do-
	(d) The Contractor may use the natural sources of water subject to the provision that any claim arising out of conflicts with other users of the said natural sources of water shall be made good entirely by the contractor. Should any conflict or social protects arises, the contractor shall seek alternative sources	At all natural water sources used for construction works		-do-	PMU, LA,SC
<b>1.4.</b>	<b>Flood Prevention</b>				
	<b>1.4.1.</b>	<b>Blockage of drainage paths and drains</b>			
	(a) Contractor's activities shall not lead to flooding conditions as a result of blocked drainage paths and drains. The contractor shall take all measures necessary or as directed by the Engineer to keep all drainage paths and drains clear of blockage at all times.	Along this road section where road will be placed on embankment, at locations where bridges and culverts are to be repaired / reconstructed.	Engineering cost	Contractor	PMU,SC
	(b) If flooding or stagnation of water is caused by contractor's activities, contractors shall provide suitable means to (a) prevent loss of access to any land or property and (b) prevent damage to land and property. Contractor shall compensate for any loss of income or damage as a result.	-Do-	-Do-	-do-	-do-

Environmental Issues	Protection and preventive measures		Locations/ Project phase	Mitigation cost	Institutional Responsibility	
					Implement	Supervision
<b>1.5</b>	<b>Air Pollution</b>					
	<b>1.5.1.</b>	<b>Generation of Dust</b>				
	(a)	The contractor shall effectively manage the dust generating activities such as ground clearing, topsoil removal, handling and transporting sand, rubble, bitumen, and cement during periods of high winds or during more stable conditions with winds directed towards adjacent residences and other facilities.	Within this road section where earth work will take place, storage locations of sand, rubble, bitumen, cement and all sub roads used for material transportation, paying special attention to sensitive locations.	Engineering cost	Contractor	PMU,SC
	(b)	All stockpiles shall be located sufficiently away from sensitive receptors such as Temples, Schools, streams crossing the road, common well, Forests, water logging area, etc .			-do-	-do-
	(c)	All vehicles delivering materials shall be covered to avoid spillage and dust emission.			-do-	-do-
	(d)	The Contractor should avoid, where possible and take suitable action to prevent dirt and mud being carried to the roadway (particularly following wet weather).			-do-	-do-
	(e)	The contractor should enforce vehicle speed limits to minimize dust generation.			-do-	-do-
	(f)	The Contractor shall employ a water truck to sprinkle water for dust suppression on all exposed areas as required (note: the use of waste water / waste oil for dust suppression is prohibited)			-do-	-do-
	(g)	All cleared areas shall be rehabilitated progressively.			-do-	-do-
	(h)	All earthwork shall be protected in a manner acceptable to the minimized generation of dust.			-do-	-do-
	(i)	All existing roads used by vehicles of the contractor, or any of his sub-contractor or supplies of materials or plant and similar roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres.			-do-	-do-

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(j)	Clearance shall be affected immediately by manual sweeping and removal of debris, or, if so directed by the Engineer, by mechanical sweeping and clearing equipment. Additionally, if so directed by the Engineer, the road surface will be hosed or sprinkled water using appropriate equipments.			-do-	-do-
(k)	Plants, machinery and equipment shall be handled (including dismantling) so as to minimize generation of dust.			-do-	-do-
(l)	The contractor shall take every precaution to reduce the level of dust emission from the hot mix plants and the batching plants up to the satisfaction of the Engineer in accordance with the relevant emission norms.			-do-	-do-
(m)	The hot mix plant be sited in accordance with CEA guidelines and operated with an EPL. The hot mix plants shall be fitted with the requirements of the relevant current emission control legislation.			-do-	-do-
<b>1.5.2</b>	<b>Emission from Hot-Mix Plants and Batching Plants</b>				
(a)	The hot mix plants and batching plants shall be sited in accordance with CEA guidelines. It is recommended that hot mix plants and batching plants to be located sufficiently away from sensitive receptors such as vulnerable habitats, religious and cultural sites, residential areas, schools and industrial areas	Locations at which hot mix plant/s and concrete batching plant/s to be located		Contractor	PMU, CEA,SC
(b)	The exhaust gases shall comply with the requirements of the relevant current emission control legislation. All operations at plants shall be undertaken in accordance with all current rules and regulations protecting the environment as well as the conditions given in the EPL.	-Do-		-do-	-do-
<b>1.5.3.</b>	<b>Odour and offensive smells</b>				

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(a)	Contractor shall take all precautions such as storing all chemicals used for construction works in properly closed containers with good ventilations to prevent odour and offensive smell emanating from chemicals and processes applied in construction works or from labour camps. In a situation when/where odour or offensive smell does occur contractor shall take immediate action to rectify the situation. Contractor is responsible for any compensation involved with any health issue arisen out of bad odour and offensive smells.	Within this road section including all sites used for store all chemicals and places where chemical reactions take place.	Engineering cost	Contractor	PMU, CEA, LA,SC
(b)	The waste disposal and sewerage treatment system for the labour camps shall be properly designed, built and operated so that no odour is generated. Compliance with the regulations on health and safety as well as CEA and LA guidelines shall be strictly adhered to.	At all labour camps	Engineering cost	-do-	-do-
<b>1.5.4.</b>	<b>Emission from construction Vehicles, Equipment and Machinery</b>				
(a)	The emission standards promulgated under the National Environment Act shall be strictly adhered to.	All plants, machinery and vehicles used for construction	-	Contractor	PMU, CEA, LA,SC
(b)	All vehicles, equipment and machinery used for construction shall be regularly serviced and well maintained to ensure that emission levels comply with the relevant standards.	-Do-	Engineering cost	-do-	-do-
(c)	Contractor should obtain the certificate issued by the Vehicular Emission Test (VET) for all construction vehicles, plants and other machineries and it should be renewed annually. Submit all the details to the engineer.	-Do-	-Do-	-do-	-do-
<b>1.5.5.</b>	<b>Air Pollution from Crusher</b>				

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(a)	Crusher plants should operate under an EPL and shall confirm to relevant dust emission levels as stated in the EPL. Only the quarries approved by GSMB and holding current EPL shall be used for material extraction. If the Contractor is planning to establish a crusher plant, EPL should be obtained from the CEA to operate the crusher plant.	Quarry sites operated for material extraction for the project	-	Contractor	PMU, CEA, LA,SC
(b)	Crushing plants shall be sited sufficiently away from sensitive receptors such as houses, place of worships and outdoor recreation areas or as required by the Engineer.	Locations where quarry sites will be operated	-	-do-	-do-
(c)	Sprinkling of water (through a sprinkler system) for dust suppression.	-Do-	Engineering cost	-do-	-do-
<b>1.6. Noise Pollution and Vibration</b>					
<b>1.6.1</b>	<b>Noise from Vehicles, Plants and Equipment.</b>				
(a)	All machinery and equipment should be well maintained and fitted with noise reduction devices in accordance with manufacturer's instructions. Generally - noise and vibration can't exceed 75 dB day time	All machinery and vehicles used for road construction works	-Do-	Contractor	PMU, LA,SC
(b)	In construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing and batching, mechanical compaction, etc., will be stopped between 20.00 hours to 06.00 hours. . Near noise sensitive sites, such as the school and temples noisy equipment shall not be used during noise sensitive times of the day. Near Schools at chainage XXXXkm, drilling, compacting activities will be restricted during school hours.	Within this road section, Sensitive locations;	-	-do-	-do-
(c)	All vehicles and equipment used in construction shall be fitted with exhaust silencers. During routine servicing operations, the	Within this road section	Engineering cost	-do-	-do-

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
	effectiveness of exhaust silencers shall be checked and if found to be defective shall be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of sound emission. Non-compliant plant shall be removed from site.				
(d)	Noise limits for construction equipment used in this project (measured at one meter from the edge of the equipment in free field) such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB(A).	All equipment, machinery and vehicles used for road construction works	-	-do-	-do-
(e)	Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the Engineer, to keep noise from these at a minimum.	-Do-	Engineering cost	-do-	-do-
(f)	Workers in vicinity of strong noise, and workers working with or in crushing, compaction, batching or concrete mixing operations shall be provided with protective gear. Refer safety section xx and xx	Within this road section, quarry, crusher plants	Engineering cost	-do-	-do-
<b>1.6.2</b>	<b>Vibration</b>				
(a)	Contractor shall take appropriate action to ensure that construction works do not result in damage to adjacent properties due to vibration.	Within this road section	-	Contractor	PMU,SC
(b)	Prior to commencement of excavation, blasting activity, the Contractor shall undertake a condition survey of existing structures within the zone of influence, as agreed with the relevant government agencies and the engineer.	Within this road section where construction works will commence	-	-do-	-do-



Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(c)	If dynamite blasting is required, Contractor shall carry out monitoring at the nearest vibration sensitive receptor during blasting or when other equipments causing vibration are used.	Within this road section where construction works will commence	-	-do-	-do-
(d)	The contractor shall modify the method of construction until compliance with the criteria, if vibration levels exceed the relevant vibration criteria.	Within this road section where construction works will commence and at quarry and burrow sites	-	-do-	-do-
(e)	Contractor shall pay due consideration on vibration impacts of blasting on adjoining structures. Explosive loads shall be determined so that excessive vibration can be avoided and blasts shall be controlled blasting in nature. Notwithstanding to these provisions contractor is liable for any damage caused by blasting work. This is only if dynamite blasting is required. Otherwise this section will not apply.	Within this road section where construction works will commence and at quarry sites	-	-do-	-do-
<b>1.6.3</b>	<b>Noise from Blasting or Pre splitting Operations</b>				
(a)	If dynamite blasting is needed, Blasting shall be carried out during fixed hours as permitted by the Engineer. The timing should be made known to all the people within 500 m (200 m for pre-splitting) from the blasting site in all directions. People, except those who actually light the fuse shall be excluded from the area of 200 m (50 m for pre-splitting) from the blasting site in all directions at least 10m minutes before the blasting.  If dynamite blasting is not required, this section will not apply.	At quarry sites	-	Contractor	PMU, GSMB,SC
<b>1.7.</b>	<b>Impacts to Flora</b>				

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
1.7.1	<b>Loss or Damage to Trees and Vegetation</b>				
(a)	<p>All works shall be carried out in a manner that the destruction to the flora and their habitats is minimized. Trees and vegetation shall be felled / removed only if that impinges directly on the permanent works or necessary temporary works. In all such cases contractor shall take prior approval from the Engineer.</p> <p>Refer section above - we have identified XX trees which are impinging on the design. Anything extra has to be approved.</p>	<p>Throughout the road section 93 trees reservation have to be removed near / within the existing road and at its reservations.</p> <p>Location, variety &amp; size of trees to be removed at the XXX boundary are given in Annex - X.</p>	-	Contractor	PMU, DS, DoF, CEA,SC
(b)	Contractor shall make every effort to avoid removal and/or destruction of trees of religious, cultural and aesthetic significance. If such action is unavoidable the Engineer shall be informed in advance and carry out public consultation and report on the same should be submitted to the Engineer.	-Do-	-	-do-	-do-
(c)	Contractor shall adhere to the guidelines and recommendations made by the Central Environmental Authority and the Forest Department, if any with regard to felling of trees and removal of vegetation.	-Do-	-	-do-	-do-
(d)	Removed trees must be handed over to the Timber Corporation.	Throughout the road section	-	-do-	-do-

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(e)	<p>The contractor shall plant double the number of trees (minimum of XXX) felled in native tree species suitable for the location as identified by the Engineer.</p> <p>The contractor shall build hardy structures around the trees for protection.</p> <p>The contractor shall be responsible for ensuring the well-being of the trees/plants until the end of the contract</p>	<p>Indicative number of trees / plants and indicative number of planting structures necessary are to be identified by the contractor. Planting should take place prior to completing centre median and sidewalks</p>	-	Contractor	PMU, DS, DoF, CEA,SC
<b>1.7.2</b>	<b>Chance found important Flora</b>				
(a)	<p>During construction, if a rare/threatened/endangered flora species is found, it shall be immediately informed to the PMU by the contractor. All activities that could destroy such flora and/or its habitat shall be stopped with immediate effect. Such activities shall be started only after obtaining the Engineer's approval. Contractor shall carry out all activities and plans that the Engineer instructed him to undertake to conserve such flora and/or its habitat.</p>	Applicable throughout the road section	-	Contractor	PMU, DoF, DWLC,SC
<b>1.8.</b>	<b>Impact on Fauna</b>				
<b>1.8.1.</b>	<b>Loss, Damage or Disruption to Fauna</b>				

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(a)	All works shall be carried out in such a manner that the destruction or disruption to the fauna and their habitats is minimum.	Applicable throughout the road section, especially to the road section	-	Contractor	RDA/PMU, SC
(b)	Construction workers shall be instructed to protect fauna including wild animals and aquatic life as well as their habitats. Hunting, poaching and unauthorized fishing by project workers is not allowed.	Applicable throughout the road section, especially to the road section	-	-do-	-do-
(d)	Siting of all hot mix plants, crushing plants, workshops, depots and temporary worker camps and storing of toxic and hazardous materials at approved locations, and recycling and dumping of solid waste matter at locations approved by local authorities, maintenance of vehicles and equipment in good operable condition, ensuring no leakage of oil or fuel and the fitting of proper exhaust baffles.	Locations selected for erecting the asphalt, crusher and concrete batching plants and workshops	Engineering cost	-do-	-do-
<b>1.8.2</b>	<b>Chance found important Fauna</b>				
(a)	During construction, if a rare/threatened/endangered fauna species is found, it shall be immediately informed to the PMU by the contractor. All activities that could destroy such fauna and/or its habitat shall be stopped with immediate effect. Such activities shall be started only after obtaining the Engineer's approval. Contractor shall carry out all activities and plans that the Engineer instructed him to undertake to conserve such fauna and/or its habitat.	Applicable within this road section	-	Contractor	PMU, DWLC/Do FSC
<b>1.9.</b>	<b>Disruption to Users</b>				
<b>1.9.1</b>	<b>Loss of Access</b>				

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(a)	At all times, the Contractor shall provide safe and convenient passage for vehicles, pedestrians and livestock to and from side the road and property accesses connecting the project road. Work that affects the use of side roads and existing accesses shall not be undertaken without providing adequate provisions to the prior satisfaction of the Engineer.	Applicable within this road section	Engineering cost	Contractor	PMU/SC
(b)	The works shall not interfere unnecessarily or improperly with the convenience of public or the access to, use and occupation of public or private roads, and any other access footpaths to or of properties whether public or private.	-Do-	-	-do-	-do-
(c)	On completion of the works, all temporary obstructions to access shall be cleared away, all rubbish and piles of debris that obstruct access be cleared to the satisfaction of the Engineer.	-Do-	Engineering cost	-do-	-do-
(d)	Providing advance information to the public about the planned construction works and activities causing disruption to access highways, and the temporary arrangements made to give relief to public in order to avoid any inconveniences due to the construction activities.	-Do-	-Do-	-do-	-do-
(e)	Use of flagmen and/or temporary traffic lights to control traffic flows at constricted sites, including safe crossing for pedestrians especially at town areas and near schools.	-Do-	-Do-	-do-	-do-
<b>1.9.2</b>	<b>Traffic Jams and Congestion</b>				
(a)	Detailed Traffic Control Plans shall be prepared and submitted to the Engineer for approval 5 days prior to commencement of works on any section of the road. The traffic control plans shall contain details of temporary diversions, details of arrangements for construction under traffic details of traffic arrangements after cessation of work each day, transport routes and times for construction vehicles.	Applicable within this road section	-	Contractor	RDA/PMU, LA/Police

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
	In order to ease traffic within the city, transport of construction material and machinery will be done prior to 6.00 am and after 6.00 pm. If directed by the Engineer the contractor shall obtain the consent for the traffic arrangement from the Local Police.				
(b)	Temporary diversion of traffic to facilitate construction work shall have the approval of the Engineer. If directed by the Engineer the contractor shall obtain the consent for the traffic arrangement from the Local Police.	-Do-	-	-do-	-do-
(c)	Special consideration shall be given in the preparation of the traffic control plan to the safety of pedestrians and workers at night.	-Do-	-	-do-	-do-
(d)	The contractor shall ensure that the road surface is always properly maintained, particularly during the monsoon so that no disruption to the traffic flow occurs.	Within this road section	Engineering cost	-do-	-do-
(e)	The temporary traffic detours shall be kept free of dust by frequent application of water.	-Do-	-Do-	-do-	-do-
(f)	Personnel used for traffic control by the contractor shall be properly trained, provided with proper gear including communication equipment, luminous jackets for night use. All signs, barricades, pavement markings used for traffic management should be to the standards and approved by the Engineer/ Police.	-Do-	-Do-	-do-	-do-
(g)	The manual of traffic control devices of RDA Should be followed during construction period in order to ensure the safety and traffic control.	-Do-	-	-do-	-do-
<b>1.9.3</b>	<b>Traffic Control and Safety</b>				
(a)	The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as	-Do-	Engineering cost	Contractor	RDA/PMU, LA

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility		
				Implement	Supervision	
	may be required by the Engineer for the information and protection of traffic approaching or passing through the road under improvement. The provision of traffic safety measures shall be considered incidental to work and follow The Institute for Construction Training and Development (ICTAD) guidelines and instructions given by the Police, if any.					
	(b) Informing the public through newspapers/ announcements/ radio/ TV etc. about the construction activities in order to avoid any inconveniences due to the construction activities.	Project influence area	Engineering cost	-do-	-do-	
	Provide information and boards at each road entry and exit point as specified in the social document. Basic info - times of closure, diversion routes etc	Project influence area	Engineering cost	-do-	-do-	
<b>1.10.</b>	<b>Accidents and Risks</b>					
	<b>1.10.1</b>	<b>Public and Worker safety</b>				
	(a)	All reasonable precautions will be taken to prevent danger of the workers and the public from accidents such as fire, explosions, blasts, falling rocks, falling to excavated pits, chemical sprays, unsafe power supply lines etc.	Within this road section, material storage and worker camps	Engineering cost	Contractor	SC/PMU
	(b)	The Contractor shall comply with requirements for the safety of the workmen as per the international labor organization (ILO) convention No. 62 and Safety and Health regulations of the Factory Ordinance of Sri Lanka to the extent that those are applicable to this contract. The contractor shall supply all necessary safety appliances such as safety goggles, helmets, masks, boots, etc., to the workers and staff. The contractor has to comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, excavations, trenches and safe means of entry and egress.	-Do-	Engineering cost	-do-	-do-
	<b>1.10.2</b>	<b>Prevention of Risks of Electrocutation</b>				

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(a)	All electrical wiring and supply related work should confirm to British Standards (BS) or relevant Sri Lankan Standards. Adequate precautions will be taken to prevent danger of electrocuting from electrical equipment and power supply lines including distribution boards, transformers, etc. Measures such as danger signboards, danger/red lights, fencing and lights will be provided to protect the public and workers. All electric power driven machines to be used in the construction shall be free from defect, be properly maintained and kept in good working order, be regularly inspected and as per BS provisions and to the satisfaction of the Engineer.	Within this road section, material storage and worker camps	-Do-	Contractor	SC/PMU
<b>1.10.3</b>	<b>Risk at Hazardous Activity</b>				
(a)	All workers employed in hazardous activities shall be provided with necessary protective gear. These activities include mixing asphalt material, cement, lime mortars, concrete etc., welding work, work at crushing plants, blasting work, operators of machinery and equipment such as power saws, etc.	Within this road section, quarry site and burrow pits	Engineering cost	Contractor	SC/PMU
(b)	The use of any toxic chemical shall be strictly in accordance with the manufacturer's instructions. The Engineer shall be notified of toxic chemicals that are planned to be used in all contract related activities. A register of all toxic chemicals delivered to the site shall be kept and maintained up to date by the Contractor. The register shall include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product.	Within this road section	-Do-	-do-	-do-
<b>1.10.4</b>	<b>Lead Pollution</b>				



Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(a)	No paint containing lead or lead products will be used except in the form of paste or readymade paint. Facemasks shall be supplied to workers who are working in spray painting or scraping lead paints.	Workshops, yards where spray painting is done	-	Contractor	SC/PMU
<b>1.10.5</b>	<b>Handling of Explosives</b>				
(a)	Except as provided in the contract or ordered or authorized by the Engineer, the Contractor shall not use explosives. Where the use of explosives is so provided or ordered or authorized, the Contractor shall comply with the requirements of the following Sub-Clauses of this Clause besides the law of the land as applicable.	All locations where blasting activities will commence	-	Contractor	SC/PMU, LA/CEA
(b)	The Contractor shall at all times take every possible precaution and shall comply with relevant laws and regulations relating to the importation, handling, transportation, storage and use of explosives. Contractor shall obtain Ministry of Defense (MoD) approval for importing and handling explosives and keep the Local Police informed of the same.	-Do-	Engineering cost	-do-	SC/PMU, MoD
<b>1.11.</b>	<b>Health and Safety</b>				
<b>1.11.1</b>	<b>Prevention of Vector based Diseases</b>				
(a)	Contractor shall take necessary actions to prevent breeding of mosquitoes at places of work, labour camps, plus office and store buildings. Stagnation of water in all areas including gutters, used and empty cans, containers, tyres, etc shall be prevented. Approved chemicals to destroy mosquitoes and larvae should be regularly applied. All burrow sites should be rehabilitated at the end of their use by the contractor in accordance with the requirements/guidelines	At worker camps, stores, yards	Engineering cost	Contractor	SC/PMU, LA

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
	issued by the Central Environmental authority and relevant local authorities				
	(b) Contractor shall keep all places of work, labour camps, plus office and store buildings clean devoid of garbage to prevent breeding of rats and other vectors such as flies.	-Do-	-Do-	-do-	-do-
	<b>1.11.2 Workers Health and Safety</b>				
	(a) Contractor shall comply with the provisions in Health and Safety regulations under the Factory Ordinance with regard to provision of health and safety measures and amenities at work place(s).	Within this road section, workshops and worker camps	-	Contractor	SC/PMU
	<b>1.11.3 First Aid</b>				
	(a) At every workplace, first aid kit shall be provided as per the regulations. At every workplace an ambulance room containing the prescribed equipment and nursing staff shall be provided.	Within this road section, quarry, crusher, concrete batching plants, workshops and worker camps	Engineering cost	Contractor	SC/PMU, LA
	<b>1.11.4 Potable Water</b>				
	(a) In every workplace and labour camps portable water shall be available throughout the day in sufficient quantities.	Within this road section (work sites), quarry, crusher, concrete batching plants, workshops and worker camps	-Do-	-do-	-do-
<b>1.12</b>	<b>Protection of Archaeological, Cultural and Religious Places and Properties</b>				
	<b>1.12.1 Prevention of damage to Cultural and Religious Places and Properties</b>				

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
(a)	During construction activities the contractor should take all necessary and adequate care to minimize impacts on cultural properties which includes cultural sites and remains, places of worship. Workers should not be allowed to trespass in to such areas.	Near to places of worships near to the road trace	-Do-	Contractor	SC/PMU, Dpt. Of cultural affairs, LA, Religious leaders
<b>1.12.2</b>	<b>Chance found Archaeological property</b>				
(a)	All fossils, coins, articles of value of antiquity and structures and other remains or things of geological or archaeological interest etc. discovered on the site and/or during construction work shall be the property of the Government of Sri Lanka, and shall be dealt with as per provisions of Antiquities Ordinance of 1940 (Revised in 1956 & 1998)	Within this road section	-	Contractor	SC/PMU, DoA
(b)	The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and shall, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same, awaiting which all work shall be stopped within 100m in all directions from the site of discovery.	-Do-	Engineering cost	-do-	-do-
(c)	If directed by the Engineer, the Contractor shall obtain advice and assistance from the Department of Archaeological of Sri Lanka on conservation measures to be taken with regard to the artifacts prior to recommencement of work in the area.	-Do-	Engineering cost	-do-	-do-
<b>1.13</b>	<b>Environmental Enhancement</b>				
<b>1.13.1</b>	<b>Roadside Landscape</b>				
(a)	Roadside landscape plantation, re-vegetation of road embankments and other slopes, edge treatment of water bodies	Within this road section, and all	-Do-	Contractor	SC/PMU

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
	shall be taken up as per either detailed design or typical design guidelines given as part of the Bid Documents. The contractor also shall remove all debris, piles of unwanted earth, spoil material, away from the roadsides and from other work places and disposed at locations designated or acceptable to the Engineer or as per Clause 2.1.1.	locations used for quarry sites, burrow pits, asphalt plant, concrete batching plants, workshops and labour camps			
	(b) On completion of the works, the temporary structures shall be cleared away in full, all rubbish burnt, waste dumps and septic tank shall be filled and closed and roadsides, workplaces and labour camps, cleared and cleaned.	-Do-	-Do-	-do-	-do-
	<b>1.13.2 Utilities and Roadside Amenities</b>				
	(a) Contractor shall replace all amenities such as bus shelters that were removed/ relocated during the construction unless the Engineer directed the contractor not to do so.	Places where bus shelters are located along the road	-Do-	Contractor	SC/PMU
<b>1.14</b>	<b>Handling Environmental Issues during Construction</b>				
	(a) The Contractor will appoint a suitably qualified Environmental safeguard Officer following the award of the contract. The Environmental Safeguard Officer will be the primary point of contact for assistance with all environmental issues during the pre-construction and construction phases. He/ She shall be responsible for ensuring the implementation of EMP.	Within this road section during construction period	-	Contractor	SC/PMU
	(b) The Contractor shall direct the safeguard officer responsible for community liaison and to handle public complaints regarding environmental/ social related matters. All public complaints will be entered into the Complaints Register. The Environmental safeguard Officer will promptly investigate and review	-Do-	-	-do-	-do-

Environmental Issues	Protection and preventive measures	Locations/ Project phase	Mitigation cost	Institutional Responsibility	
				Implement	Supervision
	environmental complaints and implement the appropriate corrective actions to arrest or mitigate the cause of the complaints. A register of all complaints is to be passed to the Engineer within 24 hrs they are received, with the action taken by the Environmental safeguard Officer on complains thereof.				
(c)	Contractor shall develop suitable method to receive complaints. The complaint register shall be placed at a convenient place, easily accessible by the public.	Within this road section during construction period At local authority and divisional secretary offices	-	-do-	-do-
(d)	Contractor shall prepare detailed Environmental Method Statement (EMS) clearly stating the approach, actions and manner in which the EMP is implemented at the time of bidding. It is required from the contractor to prepare the EMS for each work site, if work will be carried out at more than one site at once and time plan for implementation. The EMS shall be updated regularly and submit for Engineers review.	Throughout the project construction period	-	-do-	-do-

### 10. Conclusion and Screening Decision

<b>Project Activity</b>	<b>Safeguard Category based on Environmental impact</b> A – Significant, irreversible and widespread impacts B – Impacts anticipated but less significant than A and can be mitigated with known technology C – No or minimal impacts
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### 11. Screening Decision Recommendation (check one):

<b>Key recommendations</b>	<ul style="list-style-type: none"> <li>• All potentially adverse effects can be classified as general construction related impacts and are mitigatable with known technology. Public concern does not warrant further assessment.</li> <li>• Therefore, a stand-alone Environmental Assessment will not be required; an Environmental Management Plan would be sufficed.</li> <li>• Potential adverse impact are significant, hence, stand-alone Environmental Assessment and Management Plan needed before the project can proceed</li> <li>• Potential adverse impact are significant, hence project cannot be justified</li> </ul>
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### 12. Details of Persons Responsible for the Environmental Screening

<b>Screening report completed by</b>	<b>Date</b>
<i>Name/Designation/Contact information</i>	<i>Signature</i>
<b>Screening report reviewed by</b>	<b>Date</b>
<i>Name/Designation/Contact information</i>	<i>Signature</i>
<b>Approved by</b>	<b>Date</b>
<i>Name/Designation/Contact information</i>	<i>Signature</i>

## **Annex 6: Summary description of safeguards instruments that will be used in the project**

### **Environmental Management Tools**

The following sections aim to provide a description of the EA tools recommended in table 3.1 which are being extensively used in environmental assessments the world over to evaluate impacts of project interventions. Depending on the magnitude and importance of the resulting impact and the scale and extent of the spread of the impact one or more of these tools are selected.

The Environment Management tools aim to anticipate the environmental impact of decisions at the early stages of planning and decision-making, with respect to selection of environmental mitigation/technologies, identification and characterization of risks to the environment, health and safety, and planning environmental programs for cities and municipalities. Since the SCDP has been categorized as A under the World Bank O.P 4.01 during the design stages of investments we need to carefully screen the respective sub projects with regard to the impacts created by the activities.

### **Environmental Impact Assessment (EIA)**

EIA and IEE are effective tools for evaluating the environmental risks and opportunities of project proposals and improving the quality of outcomes. Ideally the EIA/IEE should be carried out at the end of the preliminary design phase so that the impacts of each planned activity can be evaluated and alternatives can be worked out for activities that have major impacts. The outcomes of the EIA/IEE should then be used to finalize the project design which should ensure that the impacts of the given project are minimal. The importance of this management tool as means of foreseeing potential environmental impacts caused by proposed projects and its use in making projects more suitable to the environment has been highly effective. Since its introduction in 1969 in the US, many countries and international organizations have accepted EIA as an important planning and environmental management tool.

As a decision making tool, EIA has its strengths and weaknesses. It plays a crucial role at the project level decision making. However, in the entire development process application of EIA as a tool to bring in environmental sustainability comes fairly at a late stage. At this point, it may be too late to change certain policy decisions and the choices are limited. With SEA, environmental decisions can be moved further upstream where better alternatives to environmentally unsustainable policies and programs can be sought at a broader strategic level. See the section below for a comparison between SEA and EIA.

### **Strategic Environment Assessment (SEA)**

Development agencies have years of experience in using environmental impact assessment (EIA) to integrate environmental concerns into their funding programmes. EIA procedures, methods and techniques, used to address environmental impacts of development projects, will continue to be applied. However, EIA has limited utility when applied to the more strategic levels of development assistance such as policies, plans and programmes, as these are also influenced by political bargaining in addition to technical criteria. Further, significant indirect or secondary environmental effects can arise as a result of changes in people's behavior induced by policy

reforms. But these changes, and their environmental consequences, are extremely difficult to predict. For these reasons, SEA has been developed and is being increasingly used as a tool to be applied at the level of policies, plans and programs.

**Table 1: Comparison between SEA and EIA**

	<b>EIA</b>	<b>SEA</b>
1	Applied to specific and relatively short-term (life-cycle) projects and their specifications	Applied to policies, plans and programmes with a broad and long-term strategic perspective
2	Takes place at early stage of project planning once parameters are set	Ideally, takes place at an early stage in strategic planning
3	Considers limited range of project alternatives.	Considers a broad range of alternative scenarios
4	Usually prepared and/or funded by the project proponents	Conducted independently of any specific project proponent
5	Focus on obtaining project permission, and rarely with feedback to policy, plan or programme consideration	Focus on decision on policy, plan and programme implications for future lower-level decisions
6	Well-defined, linear process with clear beginning and end (e.g. from feasibility to project approval)	Multi-stage, iterative process with feedback loops
7	Preparation of an EIA document with prescribed format and contents is usually mandatory. This document provides a baseline reference for monitoring	May not be formally documented
8	Emphasis on mitigating environmental and social impacts of a specific project, but with identification of some project opportunities, off-sets, etc	Emphasis on meeting balanced environmental, social and economic objectives in policies, plans and programmes. Includes identifying macro-level development outcomes
9	Limited review of cumulative impacts, often limited to phases of a specific project. Does not cover regional scale developments or multiple projects	Inherently incorporates consideration of cumulative impacts

An SEA is not an alternative to EIA and it does not replace the need to do project specific environmental assessment. A good SEA can reduce the scope of EIAs within its geographical scope and make it limited to specific project level issues. The SEA ideally will identify opportunities to minimize the range of environmental issues that will have to be dealt at the project level.

At present SEA is not mandatory in Sri Lanka. However, all Ministries, Departments and Authorities who are responsible for implementing a new policy, plan or programme should carry out a SEA prior to the implementation of the said policy, plan or program and submit a copy of the SEA report to the CEA for review. To facilitate this process a document has been developed by the CEA titled "A Simple Guide to Strategic Environmental Assessment (SEA)" that can be downloaded from the CEA website.



### **Environmental Management Plan (EMP)**

Certain activities will have explicit impacts on the natural environment and thus require a specific plan to institute and monitor mitigation measures and take desired actions as timely as possible. An Environmental Management Plan (EMP) must be kept as simple as possible, clearly describing adverse impacts and mitigation actions that are easy to implement. The scale of the subproject will determine the length of the EMP. A small-scale subproject's EMP can be elaborated in a few paragraphs or in tabular format, keeping it as simple as possible with concrete mitigation actions, timelines and responsible persons.

The basic elements of an EMP are;

- a. A description of all possible significant adverse impacts that are likely to arise due to the project that the EMP is intending to deal with;
- b. A description of planned mitigation measures, and how and when they will be implemented;
- c. A programme for monitoring with measurable indicators that will allow determining the effectiveness of the mitigation actions
- d. A description of who will be responsible for implementing the EMP
- e. A cost estimate and source of funds

It is essential to involve local communities during the development of the EMP since they are likely to be the most affected parties due to the proposed development. Further, most of the local knowledge is important in identifying, designing and planning the implementation. In addition, the success of the implementation of the EMP will depend on community support and action.

### **Environment Audits**

Most of the development projects go through the SEA and EIA process and develop EMP's that are not implemented at the end which will render the entire process an exercise in futility. Therefore, monitoring of the project during the construction and implementation phase is a must to ensure environmental compliance of a project. This could be achieved through regular environmental audits.

The purpose of the environmental audit is to;

- Collect, analyze and interpret monitoring results to detect changes related to implementation and operation of specific activities
- To verify the monitoring parameters are in compliance with national set standards
- To compare the predicted impacts with actual impacts and evaluate the accuracy of predictions
- To evaluate the effectiveness of implementation of the EMP
- To identify shortcomings in the EMP if any and incorporate it into the EMP if deemed necessary
- To identify and report if there is noncompliance with the EMP
- The auditors must first develop a structured questionnaire based on the EMP for the purpose of conducting the audit. Then during the site visit data can be collected using this questionnaire through interview surveys of officers responsible for implementation of the EMP and site records, logs etc., The audits can be carried out at regular intervals or on an ad hoc basis or when mitigation is not carried out as defined by the EMP leading to public concern.
- Expected outcomes of the Environment Audit are

- Ensure that EMP is implemented properly
- Ensure that the mitigation measures are effectively minimizing the identified impacts as well as identify new impacts that may have been excluded in the EMP that require mitigation. Then make necessary adaptive changes to the EMP to ensure that the all significant impacts are effectively mitigated.
- Identify non-compliance with EMP if any and provide recommendations as to how to deal with such non compliance

### **Environmental Checklists**

Environmental Checklists are forms containing a series of questions on environmental aspects, designed to screen potential environmental impacts of the proposed project. Environmental checklists can be used for an initial screening of impacts which is to be followed by a more detail analysis or in projects where the level of activity (as in the example of constructing a small to medium scale building in an already built up area) is not meant to cause much harm a checklist only would suffice.

### **Environmental Codes and Best Management Practices**

In addition to the above tools following environmental codes and best practices may be sufficient where impacts of a particular activity are minor and easily arrested.

## Annex 7: Procedures for Physical Cultural Resource Impact Screening, Assessment & Management

### Physical Cultural Resources Safeguard Processing Steps

Implementation of the PCR Safeguards requirements will follow the following steps closely linking with activity planning, design and implementation steps.

In addition to the Environmental Screening and Management Process, any proposed project intervention to be conducted either within or in close proximity to a heritage asset should follow the following procedure of due diligence outlined, as outlined in the project Environmental Assessment and Management Framework (EAMF).

### Due Diligence Procedure for PCRs within the SCDP

STAGE	PERIOD OF COMMENCEMENT	KEY OUTCOMES AND GUIDELINES TO FOLLOW	
		Key Out Come	Procedure to be followed
Step 1	At identification and finalization of proposed subproject	Preliminary Documentation of Site and PCR Screening	Section A of Screening Report to be completed as per the format provided in Form-1: PCR Profiling and Screening Report Format and Guidelines
	Once final design of intervention has been completed	Identification of Impacts Based on Proposed Projects	Section B of Screening Report to be completed as per the format provided in Form-1: PCR Profiling and Screening Report Format and Guidelines
Step 2	Once Step 1-screening and impact identification have been completed	Categorization of Impacts on OUV and Recommendations for Follow up Assessments Instruments	Form 2-Criteria for categorization of Impacts on OUV and Recommendations for Follow up Assessments Instruments should be used to deduce follow up assessment and should be indicated in screening report.
Step 3	Once impact categorization has been completed and follow up assessment instrument has been identified	Preparation of Mitigation and Conservation Plan (Adaptive Reuse planning/Heritage Impact Assessments to be included where applicable).	The generic scope of a PCR Specific Mitigation Plan, Conservation Plan/Adaptive Reuse Plan are presented in Form 3 and 4. For subprojects that require

			Heritage Impact Assessments a Terms of Reference (TOR) outlining requirements as per the recommendations of ICOMOS is provided in Form 5. All plans and assessments should be submitted to the World Bank task team for review and clearance.
	Clearance/Ownership of prepared plans from Relevant Authorities who will manage the heritage asset and subsequent implementation.	Written clearances from respective ,Heritage Committees of Cities, Department of Archeology where applicable	Copies of all relevant clearances, should be maintained in the project file.
Step 4	Monitoring implementation of Mitigation and Conservation Plan	Monitoring of field level implementation of respective plan (mitigation, conservation, adaptive reuse). The identification and management of implementation stage issues/ new issues that can come about during the lifetime of the subproject.	Form 6: Generic Monitoring Checklist of Mitigation and Conservation Plan should be completed on a monthly basis by the PMU safeguards team and submitted to the World Bank for review.

### **Key Terms in Physical Cultural Resource Management**

The following definitions of the major processes involved in safeguarding heritage are consistent with the Burra Charter (revised in 1992), Australia's International Committee on Monuments and Sites (ICOMOS) charter for the conservation of places of historic significance. Experts consider the Burra Charter one of the most comprehensive and up-to-date statements of conservation principles.

- *Conservation.* Encompasses all aspects of protecting a site or remains so as to retain its cultural significance. It includes maintenance and may, depending on the importance of the cultural artefact and related circumstances, involve preservation, restoration, reconstruction, or adaptation, or any combination of these.
- *Preservation.* Maintaining the fabric of a place in its existing state and retarding deterioration. It is appropriate where the existing fabric itself constitutes evidence of specific cultural significance, or where insufficient evidence is available to allow other conservation processes to be carried out. Preservation is limited to the protection, maintenance, and, where necessary, stabilization of the existing fabric.
- *Restoration.* Returning the existing fabric of a place to a known earlier state by removing accretions or reassembling existing components without introducing new materials. It is appropriate only (a) if there is sufficient evidence of the earlier state of the fabric, and (b) if returning the fabric to that state reveals the significance of the place and does not destroy other parts of the fabric.
- *Reconstruction.* Returning a place to a known earlier state, as nearly as possible. It is distinguished by the introduction of materials (new or old) into the fabric. Reconstruction is appropriate only where a place is incomplete through damage or alteration and could not otherwise survive. Reconstruction is limited to the completion of a depleted entity and should not constitute the majority of the fabric.
- *Adaptation.* Modifying a place for compatible use. It is acceptable where the adaptation does not substantially detract from its cultural significance and may be essential if a site is to be economically viable.
- *Maintenance.* The continuous protective care of the fabric, contents, and setting of a place. Maintenance is to be distinguished fro

Form 1-PCR Profiling and Screening Report Format and Guidelines

PHYSICAL CULTURAL RESOURCE PROFILING AND SCREENING SHEET		
	Assessment Date	Date the assessment was conducted on
	Name and Designation of Assessor	Name of individual conducting assessment
Profiling and Documentation of PCR Site		
1	Name of PCR (Names)	Clearly Indicate Name of the PCR being reviewed, include multiple names if used to address this property
2	Location	All subcategories under location should be noted for the geographic location of the site the PCR is found in.
	· GN Division	
	· DS Division	
	· City	
	· District	
	· Province	
	· Country	
	· GPS Coordinates'	
2	Salient Nature (movable or immovable; natural or manmade; registered or unregistered) List all applicable	Indicate if the site is of the following salient nature, denote all categories applicable: Further examples Page 15
		· Movable- can be moved from current location- ex- statue
		· Immovable- fixed to the location ex- building
		· Natural- naturally occurring structure
		· Manmade- made by man
	· Registered- has been recorded at local authority/archeological department/ has protected status	
	· Unregistered- not been recorded/new find	
3	Category (List all applicable) Archaeological, Paleontological, Colonial, Architectural, Religious/Sacred, Sites of Aesthetic Value, Cultural significance	Indicate if the site is of the following nature, denote all categories applicable.
		· Archeological-site has a historic value in relation to ancient civilizations
		· Paleontological-fossils, early human/anima remains, prehistoric site
		· Colonial-site has reference to Colonia era- Dutch, Portuguese, British (Indicate relevant era)
		· Architectural- site is known for its historic/cultural architectural uniqueness
		· Religious/Sacred- place of worship/religious ritual
		· Sites of Aesthetic Value- Site denoted for its pleasing appearance/ view point

		· Cultural Significance- Has a connection to a cultural practice, particular group of people of cultural ritual
4	Location (map reference) and Satellite Image Showing Aerial View	A map/satellite image indicating the geographic location of the site should be Annexed to the Screening Report. Indicate Annex Number hear.
5	Type of asset	Indicate What the asset is, in the event it serves two or more purposes use the relevant descriptive terms (Example-Archeological remains, manmade pond, palace, Buddhist temple, Hindu temple, colonial building, church, mosque, fort, rampart, monastery, landscape, Unique Human Settlements, Tombs, Burial Grounds, stone structure, Sacred Groves or Trees, natural asset (e.g.-waterfalls, mountains),
6	Photograph of Site (High Resolution Image, Front View, Back View)	Please annex clear photographs of site, taking the surrounding in to consideration, key features etc. Provide the Annex Number hear.
7	Date/Time Period Built	Indicate the date built, in some cases if dates are unknown, the Era is the minimum requirement
8	Statutory designation (e.g. on national or local register, World Heritage Site)	The site is a designated World Heritage Site, Nationally designated monument (Sacred City, Cultural Heritage Property etc.)- Indicate the type of designation and relevant dates
9	Brief description of Site	Describe the site as it visually appears
10	Brief description of surrounding area	Describe the locality in which the site is found, what land use patterns exist around the site
11	Brief history of site, including names, dates etc.	Indicate the history of the site, by whom it was built, for what purpose, any relevant folk law or tales, historic/religious and/or cultural significance of site to local people etc.
12	Condition (Based on Visual Assessment)	Indicate what the current condition of the site is, play close attention to aspects such as encroachments, current use, structural damage and deterioration etc.
14	Integrity (Has the Site been Modified?)	Has the site been modified in any way to its original form and purpose, is it being reused for any other purpose than that originally intended?

15	Inter-relationships (list) (Connection to other sites. Cultural and religious practices, people, festivals etc.)	Is the site part of a larger complex (ex archaeological remains of a temple within a monastic complex), connected to other PCRs or cultural practices, people or festivals (People conduct practices of worship, pilgrimages, cultural pageants etc. at this site)
16	Sensitivity (Describe observed external threats/risks to Site)	What external threats are seen to the site, are their encroachments, threats from industry-pollution etc.
17	Ownership/Management Responsibility	Indicate Institutions the national, regional, and local authorities and institutions with responsibility for the management of this PCR. Answer the following two key questions
		Who owns the land the PCR is located in?
		Who Manages and Maintains the PCR?
18	Capacity of Management Agency (High, Moderate, Low)	Indicate if the Agency in charge of managing and maintaining this PCR (Identified in Question-6) has the technical expertise to care for the PCR, ensuring it is impacted by the lack of conservation and protection practices.
<b>Identification of Impacts Based on Proposed Projects</b>		
19	Describe planned intervention proposed	Describe the nature of the proposed project intervention. For interventions that focus on the heritage indicated if the site will be demarcated and protected, rehabilitated, restored and/or used for adaptive reuse purpose
20	Status of Stakeholder Consultation	Indicate if stakeholder consultations have been undertaken for the proposed project, provide dates and place conducted and include minutes as Annex
21	Status of Management of Construction Stage Impacts	Will the construction stage impacts be managed via and EMP. If so indicate the date of expected completion of the EMP and indicate if PCR specific mitigation measures have been included in the EMP.
22	Project Implementation and Monitoring Responsibility	Who will implement the project intervention and monitor the implementation progress
23	Management and Operation Responsibility	Post completion of the project, who will be responsible for the management of the PCRs



		and the implementation of the Plans prepared as follow up assessments.
24	Value of PCR (Very High/High/Medium/Low/Negligible/Unknown Potential)	Follow ICOMOS Example Guide for Assessing Value of Heritage Assets-Appendix 3a- Indicate Categorization
25	Development magnitude of impact - construction (Major, Moderate, Minor, Negligible, No change)	Follow ICOMOS Example Guide for assessing magnitude of impact-Appendix 3b- -Indicate Categorization
26	Operational magnitude of impact (Neutral, Slight, Neutral/Slight, Moderate/Slight, Moderate/Large, Large/Very Large, Very Large)	Based on criteria provided in Annex-7
27	Status of Follow up Assessment Date of Commencement Date of Expected Completion Assessment Conducted By	Based on criteria provided in Annex-7. What Assessment has been proposed, provide dates of commencement and completion. Provide names of institutions working on the follow up assessment.

- **Data Sources Used:** List all data sources used
- **Supporting Documents:** Annex all Maps, meeting notes, minutes of stakeholder consultations photographs accordingly and provide a list of Annexes.

## ICOMOS Guide for Assessing Value of Heritage Assets

### Appendix 3A:

Due diligence mechanisms on WH properties will need to consider their international heritage value and also other local or national values, and priorities or recommendations set out in national research agendas. They may also need to consider other international values which are reflected in, for example, international natural heritage designations.

Professional judgment is used to determine the importance of the resource. The value of the asset may be defined using the following grading scale:

- Very High
- High
- Medium
- Low
- Negligible
- Unknown potential.

The following table is not intended to be exhaustive.

Grading	Archaeology	Built heritage or Historic Urban Landscape	Historic landscape	Intangible Cultural Heritage or Associations
<b>Very High</b>	<p>Sites of acknowledged international importance inscribed as WH property.</p> <p>Individual attributes that convey OUV of the WH property.</p> <p>Assets that can contribute significantly to acknowledged international research objectives.</p>	<p>Sites or structures of acknowledged international importance inscribed as of universal importance as WH property.</p> <p>Individual attributes that convey OUV of the WH property.</p> <p>Other buildings or urban landscapes of recognized international importance.</p>	<p>Landscapes of acknowledged international importance inscribed as WH property.</p> <p>Individual attributes that convey OUV of the WH property.</p> <p>Historic landscapes of international value, whether designated or not.</p> <p>Extremely well preserved historic landscapes with exceptional coherence, time depth, or other critical factors.</p>	<p>Areas associated with Intangible Cultural heritage activities as evidenced by the national register.</p> <p>Associations with particular innovations, technical or scientific developments or movements of global significance.</p> <p>Associations with particular individuals of global importance</p>

<p><b>High</b></p>	<p>Nationally-designated Archaeological Monuments protected by the State Party's laws</p> <p>Undesignated sites of the quality and importance to be designated.</p> <p>Assets that can contribute significantly to acknowledged national research objectives.</p>	<p>Nationally-designated structures with standing remains.</p> <p>Other buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade.</p> <p>Conservation Areas containing very Important buildings.</p> <p>Undesignated structures of clear national importance.</p>	<p>Nationally designated historic landscape of outstanding interest.</p> <p>Undesignated landscapes of outstanding interest.</p> <p>Undesignated landscapes of high quality and importance, and of demonstrable national value.</p> <p>Well preserved historic landscapes, exhibiting considerable coherence, time depth or other critical factors.</p>	<p>Nationally designated areas or activities associated with globally important Intangible Cultural Heritage activities .</p> <p>Associations with particular innovations, technical or scientific developments or movements of national significance</p> <p>Associations with particular individuals of national importance</p>
<p><b>Medium</b></p>	<p>Designated or undesignated assets that can contribute significantly to regional research objectives.</p>	<p>Designated buildings. Historic (unlisted) buildings that can be shown to have exceptional qualities or historical associations.</p> <p>Conservation Areas containing buildings that contribute significantly to its historic character.</p> <p>Historic townscapes or built-up areas with important historic integrity in their buildings, or built settings.</p>	<p>Designated special historic landscapes.</p> <p>Undesignated historic landscapes that would justify special historic landscape designation.</p> <p>Landscapes of regional value.</p> <p>Averagely well preserved historic landscapes with reasonable coherence, time depth or other critical factors.</p>	<p>Areas associated with Intangible Cultural heritage activities as evidenced by local registers.</p> <p>Associations with particular innovations or developments of regional or local significance.</p> <p>Associations with particular individuals of regional importance</p>

<p><b>Low</b></p>	<p>Designated or undesignated assets of local importance.</p> <p>Assets compromised by poor preservation and/or poor survival of contextual associations.</p> <p>Assets of limited value, but with potential to contribute to local research objectives.</p>	<p>“Locally Listed” buildings.</p> <p>Historic (unlisted) buildings of modest quality in their fabric or historical associations.</p> <p>Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings.</p>	<p>Robust undesignated historic landscapes.</p> <p>Historic landscapes with importance to local interest groups.</p> <p>Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations.</p>	<p>Intangible Cultural heritage activities of local significance</p> <p>Associations with particular individuals of local importance</p> <p>Poor survival of physical areas in which activities occur or are associated</p>
<p><b>Negligible</b></p>	<p>Assets with little or no surviving archaeological interest.</p>	<p>Buildings or urban landscapes of no architectural or historical merit; buildings of an intrusive character.</p>	<p>Landscapes little or no significant historical interest.</p>	<p>Few associations or ICH vestiges surviving</p>
<p><b>Unknown potential</b></p>	<p>The importance of the asset has not been ascertained.</p>	<p>Buildings with some hidden (i.e. inaccessible) potential for historic significance.</p>	<p>n/a</p>	<p>Little is known or recorded about ICH of the area</p>

ICOMOS Guide for assessing Magnitude of impact

Appendix-3B

Impact Grading	Archaeological attributes	Built heritage or Historic Urban Landscape attributes	Historic landscape attributes	Intangible Cultural Heritage attributes or Associations
<b>Major</b>	<p>Changes to attributes that convey OUV of WH properties</p> <p>Most or all key archaeological materials, including those that contribute to OUV such that the resource is totally altered.</p> <p>Comprehensive changes to setting.</p>	<p>Change to key historic building elements that contribute to OUV, such that the resource is totally altered.</p> <p>Comprehensive changes to the setting.</p>	<p>Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit and loss of OUV.</p>	<p>Major changes to area that affect the ICH activities or associations or visual links and cultural appreciation.</p>
<b>Moderate</b>	<p>Changes to many key archaeological materials, such that the resource is clearly modified.</p> <p>Considerable changes to setting that affect the character of the asset.</p>	<p>Changes to many key historic building elements, such that the resource is significantly modified.</p> <p>Changes to the setting of an historic building, such that it is significantly modified.</p>	<p>Change to many key historic landscape elements, parcels or components; visual change to many key aspects of the historic landscape; noticeable differences in noise or sound quality; considerable changes to use or access; resulting in moderate changes to historic landscape character.</p>	<p>Considerable changes to area that affect the ICH activities or associations or visual links and cultural appreciation.</p>

<p><b>Minor</b></p>	<p>Changes to key archaeological materials, such that the resource is slightly altered.  Slight changes to setting.</p>	<p>Change to key historic building elements, such that the asset is slightly different.  Change to setting of an historic building, such that it is noticeably changed.</p>	<p>Change to few key historic landscape elements, parcels or components; slight visual changes to few key aspects of historic landscape; limited changes to noise levels or sound quality; slight changes to use or access; resulting in limited change to historic landscape character.</p>	<p>Changes to area that affect the ICH activities or associations or visual links and cultural appreciation.</p>
<p><b>Negligible</b></p>	<p>Very minor changes to key archaeological materials, or setting.</p>	<p>Slight changes to historic building elements or setting that hardly affect it.</p>	<p>Very minor changes to key historic landscape elements, parcels or components; virtually unchanged visual effects; very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character.</p>	<p>Very minor changes to area that affect the ICH activities or associations or visual links and cultural appreciation.</p>
<p><b>No change</b></p>	<p>No change.</p>	<p>No change to fabric or setting.</p>	<p>No change to elements, parcels or components; no visual or audible changes; no changes in amenity or community factors.</p>	<p>No change</p>

## Examples of Common Physical Cultural Resources/ Heritage Assets

From Annex-3 of the World Bank Physical Cultural Resources Safeguard Policy Guidebook- Page 60

### EXAMPLES OF COMMON PHYSICAL CULTURAL RESOURCES

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#### Human-made

- Religious buildings such as temples, mosques, churches
- Exemplary indigenous or vernacular architecture
- Buildings, or the remains of buildings, of architectural or historic interest
- Historic or architecturally important townscapes
- Historic roads, bridges, walls, dams, fortifications, water works
- Archaeological sites (unknown or known, excavated or unexcavated)
- Commemorative monuments
- Historic sunken ships

#### Natural

- Holy waters and holy wells
- Sacred waterfalls
- Sacred groves and individual sacred trees
- Historic trees
- Sacred mountains and volcanoes
- Caves currently or previously used for human habitation or social activity
- Paleontological sites (ie., deposits of early human, animal or fossilized remains)
- Natural landscapes of outstanding aesthetic quality

#### Combined Human-made and Natural

- Sites used for religious or social functions such as weddings, funerals, or other traditional community activities
- Places of pilgrimage
- Burial grounds
- Family graves in the homestead
- Historic gardens
- Cultural landscapes
- Natural stones bearing historic inscriptions
- Historic battlegrounds
- Combined human and natural landscapes of aesthetic quality
- Cave paintings

#### Movable

- Historic or rare books and manuscripts
- Paintings, drawings, icons, jewelry
- Religious artifacts
- Historic costumes and fabrics
- Memorabilia relating to the lives of prominent individuals or to events such as historic battles
- Statues, statuettes and carvings
- Modern or ancient religious artifacts
- Pieces broken off from monuments or historic buildings
- Unregistered archaeological artifacts
- Antiquities such as coins and seals
- Historic engravings, prints and lithographs
- Natural history collections such as shells, flora, minerals

## Form 2-Criteria for categorization of Impacts on OUV and Recommendations for Follow up Assessments Instruments

Developed from ICOMOS Guidelines for Heritage Impact Assessment for Physical Cultural World Heritage Properties- 2011

Table 1: Categorization of Significance of Impact

VALUE OF HERITAGE ASSET/PCR	MAGNITUDE OF CHANGE/IMPACT				
	NO CHANGE	NEGLIGIBLE	MINOR	MODERATE	MAJOR
World Heritage Properties- Very High Attributes which convey OUV	<b>Significance of Impact</b>				
	Neutral	Slight	Moderate/ Large	Large/very Large	Very Large
For Other Heritage Assets or Attributes with Value not designated	<b>Significance of Impact</b>				
	VERY HIGH	Neutral	Slight	Moderate/Slight	Moderate/ Large
HIGH	Neutral	Slight	Moderate/Slight	Moderate/ Large	Large/very Large
MEDIUM	Neutral	Neutral/Slight	Slight	Moderate/Slight	Moderate/ Large
LOW	Neutral	Neutral/Slight	Neutral/Slight	Slight	Moderate/Slight
NEGLIGIBLE	Neutral	Neutral	Neutral/Slight	Neutral/Slight	Slight

For example:

- Total demolition of a key building which is the main conveyance of OUV for a WH property to make way for a new road would be a major adverse effect or overall major adverse impact.
- Removal of a later road from the immediate vicinity of a key building which conveys OUV and which is not directly related to its OUV attributes would be a major beneficial effect or overall impact.

Table 2: Required Assessments/ Further Processing Based on Significance of Impact

Significance of Impact	Assessments Required	Further Recommendations	Guidance Documents/Formats/TORs
Neutral	PCR Profiling	Profiling is part of the screening so that the site is documented for record purposes	Annex-1



Significance of Impact	Assessments Required	Further Recommendations	Guidance Documents/Formats/TORs
Neutral/Slight	PCR Profiling and documentation	Profiling is part of the screening so that the site is documented for record purposes	Annex-1
Slight	Mitigation and Conservation Plan	Adaptive reuse plan as an add on to the conservation plan can be taken up, if adaptive reuse is envisioned	Annex 1-3
Moderate/Slight	Mitigation and Conservation Plan	Adaptive reuse plan as an add on to the conservation plan can be taken up, if adaptive reuse is envisioned	Annex-1-3
Moderate/ Large			
Large/very Large	Heritage Impact Assessment (HIA)	Mitigation and Conservation Plans will be part of the HIA and if adaptive reuse is envisioned it will be included as well	Annex-1 and 6
Very Large			

- The management of atypical construction stage related impacts will be addressed via the Environmental Management Plan of the specific subproject.
- Stakeholder consultation requirements are presented in Annex-7

### **Form 3- Scope of PCR Specific Mitigation Plan**

If any negative impacts are identified during the screening, a mitigation plan must be outlined. A mitigation plan will be tailored to the unique conditions and cultural heritage value or interest of a given property.

Negative impacts on a cultural heritage resource(s) typically include, but are not limited to:

- Destruction of any, or part of any, significant heritage attributes or features
- Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance
- Shadows created that alter the appearance of a heritage attribute or change the viability of an associated natural feature or plantings, such as a garden
- Isolation of a heritage attribute from its surrounding environment, context or a significant relationship
- Direct or indirect obstruction of significant views or vistas within, from, or of built and natural features
- A change in land use (such as rezoning a church to a multi-unit residence) where the change in use negates the property's cultural heritage value
- Land disturbances such as a change in grade that alters soils, and drainage patterns that adversely affect a cultural heritage resource, including archaeological resources

The following list represents a summary of the more common types of mitigation that may be appropriate:

- Avoidance protocols to isolate development and land alterations to minimize impacts on significant built and natural features and vistas;
- Architectural design guidelines for buildings on adjacent and nearby lots to help integrate and harmonize mass, setback, setting, and materials;
- Limiting height and density of buildings on adjacent and nearby lots;
- Ensuring compatible lotting patterns, situating parks and storm water ponds near a heritage resource;
- Allowing only compatible infill and additions;
- Vegetation buffer zones, tree planting, site plan control, and other planning mechanisms;
- Heritage Designation, Heritage Conservation Easement;
- Opportunities to commemorate historical land uses, past owners, landscape and landform features through the naming of streets and other public assets such as parkettes and storm ponds; interpretative plaques may also be required.

**Form-4: Scope of Conservation Plan/Adaptive Reuse Plan.**

If a property is to be restored and reused to serve a purpose other than its original intended purpose, a follow-up Conservation/ Adaptive Reuse Plan may be recommended.

A Conservation/ Adaptive Reuse Plans will provide the following:

- Security requirements for the protection of the site and any antiquities housed within its premises, this includes types of stone, carvings, paintings, tiles etc.
- Restoration and replication measures required to return the property to a higher level of cultural heritage value or interest integrity, as required;
- Appropriate conservation principles and practices, and qualifications of contractors and trades people that should be applied;
- Longer term maintenance and conservation work intended to preserve existing heritage fabric and attributes;
- 'As found' drawings, plans, specifications sufficient to describe all works outlined in the Conservation Plan;
- An implementation strategy outlining consecutive phases or milestones;
- Cost estimates for the various components of the plan to be used to determine sufficient monetary amounts for letters of credits or other financial securities as may be required to secure all work included in the Conservation Plan; and
- Compliance with recognized Standards and Guidelines for the Conservation of Historic Places as per the Antiquities Act, World Heritage Convention and ICOMOS guidelines and other recognized heritage protocols and standards.
- Preliminary recommendations for adaptive reuse;
- Critical short-term maintenance required to stabilize the heritage and building fabric and prevent deterioration;
- Measures to ensure interim protection of heritage resources during phases of construction or related development;

## **Form 5: HERITAGE IMPACT ASSESSMENT**

### **GENERAL TERMS OF REFERENCE**

#### **Introduction**

A Heritage Impact Assessment (HIA) is a study to evaluate the impact the proposed development or site alteration will have on the physical cultural heritage resource(s) and to recommend an overall approach to the conservation of the resource(s). This analysis, which must be prepared by a qualified heritage conservation professional, will address properties identified in a specific City. It will include both listed and designated properties as well as any yet unidentified cultural heritage resource(s) found as part of the site assessment.

This study will be based on a thorough understanding of the significance and heritage attributes of the cultural heritage resource(s), identify any impact the proposed development or site alteration will have on the resource(s), consider mitigation options, and recommend a conservation strategy that best conserves the resource(s) within the context of the proposed development or site alteration.

The conservation strategy will apply conservation principles, describe the conservation work, and recommend methods to avoid or mitigate negative impacts to the cultural heritage resource(s). Minimal intervention should be the guiding principle for all work. Further, the conservation strategy recommendations will be in sufficient detail to inform decisions and direct the Conservation Plan.

Where there is the potential of impacting archaeological resources an Archaeological Assessment will be undertaken as an additional study.

#### **Qualified Parties for Preparing Heritage Impact Assessments**

- All heritage impact assessments, conservation and adaptive reuse plans, and/or related studies must be prepared by qualified professionals with applied and demonstrated knowledge of accepted standards of heritage conservation, historical research, identification, evaluation of cultural heritage value or interest, mitigation, and the like.
- Only a professional archaeologists may carry out archaeological assessments using specific provincial standards and guidelines.

#### **Required Information and Report Format**

The HIA will include, but is not limited to, the following information:

##### **(a) Introduction to Development Site**

- A location plan indicating subject property (Property Data Map depicting site vicinity, aerial view).
- A concise written and visual description of the site identifying significant features, buildings, landscape and vistas.
- A concise written and visual description of the cultural heritage resource(s) contained within the development site identifying significant features,

buildings, landscape, vistas and including any heritage recognition of the property (both National and International with existing heritage descriptions as available).

- A concise written and visual description of the context including adjacent heritage properties and their recognition (as above), and any yet unidentified potential cultural heritage resource(s).
- Present ownership, management and relevant contact information.

**(b) Background Research and Analysis**

- Comprehensive written and visual research and analysis related to the cultural heritage value or interest of the site (both identified and unidentified): physical or design, historical or associative, and contextual.
- A development history of the site including original construction, additions and alterations with substantiated dates of construction.
- Research material to include relevant historic maps and atlases, drawings, photographs, sketches/renderings, permit records, land records, assessment rolls, City of Toronto directories, etc.

**(c) Statement of Significance**

- A statement of significance identifying the cultural heritage value and heritage attributes of the cultural heritage resource(s). This statement will be informed by current research and analysis of the site as well as pre-existing heritage descriptions.
- Professional quality record photographs of the cultural heritage resource in its present state.

**(d) Assessment of Existing Condition**

- A comprehensive written description and high quality color photographic documentation of the cultural heritage resource(s) in its current condition.

**(e) Description of the Proposed Development or Site Alteration**

- A written and visual description of the proposed development or site alteration.

**(f) Impact of Development or Site Alteration**

- An assessment identifying any impact the proposed development or site alteration may have on the cultural heritage resource(s).
- Negative impacts on a cultural heritage resource(s) typically include, but are not limited to:
  - Destruction of any, or part of any, significant heritage attributes or features

- Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance
- Shadows created that alter the appearance of a heritage attribute or change the viability of an associated natural feature or plantings, such as a garden
- Isolation of a heritage attribute from its surrounding environment, context or a significant relationship
- Direct or indirect obstruction of significant views or vistas within, from, or of built and natural features
- A change in land use (such as rezoning a church to a multi-unit residence) where the change in use negates the property's cultural heritage value
- Land disturbances such as a change in grade that alters soils, and drainage patterns that adversely affect a cultural heritage resource, including archaeological resources

**(g) Considered Alternatives and Mitigation Strategies**

- An assessment of alternative options, mitigation measures, and conservation methods that may be considered in order to avoid or limit the negative impact on the cultural heritage resource(s).
- Methods of minimizing or avoiding a negative impact on a cultural heritage resource(s) include, but are not limited to:
  - Alternative development approaches
  - Isolating development and site alteration from significant built and natural features and vistas
  - Design guidelines that harmonize mass, setback, setting, and materials
  - Limiting height and density
  - Allowing only compatible infill and additions
  - Reversible alterations

**(h) Conservation Strategy**

- The preferred strategy recommended to best protect and enhance the cultural heritage value and heritage attributes of the cultural heritage resource(s) including, but not limited to:
  - A mitigation strategy including the proposed methods;
  - A conservation scope of work including the proposed methods; and
  - An implementation and monitoring plan.
  - Recommendations for additional studies/plans related to, but not limited to: conservation; site specific design guidelines; interpretation/commemoration; lighting; signage; landscape; stabilization; additional record and documentation prior to demolition; and long-term maintenance.

- Referenced conservation principles and precedents.
- For subprojects with adaptive reuse planned, the conservation should include an adaptive reuse plan as well.

**(i) Appendices**

- A bibliography listing source materials used and institutions consulted in preparing the HIA.

**Form 6: Generic Monitoring Checklist of Mitigation and Conservation Plan**

**Title of project** :

**Proponent** :

**Contractor's Name** :

**Monitoring Date** :

**Monitor's Name &** :

**Designation** :

#	Issue	Proposed mitigation measures/conservation measure Mitigation and Conservation Plan	Implementing Responsibility	Compliance Yes/No	Reason for non-compliance	Follow up Action

**Photo documentation of Issue Identified Above**

Issue # (from description above)	Date of photograph	Photograph depicting issue



**Form 7: Stakeholder Consultation Requirements**

- Stakeholders for this project include communities and individuals living in and around heritage sites, local officials responsible for safeguarding and the conservation of cultural property, such as local authorities, the department of archeology, heritage committees and clergy, heritage focused non-governmental agencies.
- In keeping with consultation requirements with Category B projects, the project will require to conduct extensive consultations with the stakeholder groups as part of project implementation in order to obtain a wide spectrum of views, ideas and concerns about conservation and management priorities with regard to PCRs. In addition, during implementation the relevant agencies will need to consult with such groups as necessary to address mandatory Environmental and Physical Cultural resource requirements.
- The PCR Specialist of the Project Management Unit responsible for coordinating with the Urban Upgrading team within the PMU in organizing stakeholder consultations for projects that have been categorized as SLIGHT or more under the Criteria for categorization of Impacts on OUV and Recommendations for Follow up Assessments Instruments, presented in Annex 2, post the PCR Screening. The stakeholders identified above need to be specifically consulted during such stakeholder engagements and minutes of meetings need to be annexed to the Screening Form accordingly.
- All HIAs, mitigation and conservation plans and/or adaptive reuse plans prepared for subprojects should be disclosed via the project website as per the requirements of the Environmental Assessment and Management Framework.

## Annex 8: Projects requiring Archaeological Impact Assessment under the Antiquities Act

### Archaeological Impact Assessment

The law in force in Sri Lanka in relation to Archaeological Impact Assessment Survey Process is as follows.

*(Information in regard to this is found in the orders made by the Minister of Cultural and Religious Affairs under the Section 47 read with Section 43(b) of the Antiquities (Amendment) Act No. 24 of 1998 and published in the gazette No. 1152/14 dated 04.10.2000. These orders are cited as Project Procedure Orders No. 01 o 2000.)*

Accordingly, written permission of the Department of Archaeology should be obtained before implementation of the Development Projects of every type mentioned below.

#### 1.

(a) For development of transport systems

1. Construction of national and provincial high ways.
2. Construction of Railways
3. Construction and expansion of airports and air craft run-ways.

(b) For development of irrigational projects

1. Construction and reconstruction of tanks
2. Construction or reconstruction of water ways and canals.

(c) Generation and transmission of electricity

(d) Development of agricultural projects

(e) Re-settlement of families

(f) Installation of industrial machinery or development of industries, estates and gardens.

(g) Development of entertainment industry.

(h) Reclamation of lands and wetlands

(i) Clearing of all lands exceeding 2 hectares on extent so that such lands and wet lands will be inundated with water.

#### 2.

(a) Construction of housing complexes for residence.

(b) Construction of hotels and all types of commercial buildings as decided by the Urban Development Authority established under the Urban Development Authority Act. No. 41 of 1978 passed by the National State Assembly.

(c) Combined multipurpose development activities including housing, industries and commerce infrastructure facilities.

3. Clearing of areas exceeding one hectare in extent.

4. Internal clearing of natural caves, rock caves and caves where the natural land exceeds 25 square meters in extent.

5. Excavations exceeding 500 meters in length for laying pipes and conduits for drainage, water, gas, electricity and telephone facilities.

6. Mining or quarrying for extracting stones, gravels, minerals or soil.
  - (a) Discovery of reserve areas exceeding 0.25 hectares on the surface of the ground within the county and mining.
  - (b) All mining and mineral extracting activities carried out off share.
7. Clearing of lands and damaging sea bottom for construction or expansion of seaport and harbour.

**Archaeological Impact Assessment Survey Programme is as follows;**

- Investor should inform the Department of Archaeology in writing about the proposed Development Project.
- On receipt of such information a form designed for the Archaeological Impact Assessment Surveys will be sent to the employer (Project Proposer)
- On receipt of the Employer's perfected application to the departments a copy of such application will be sent to the regional office of the department and a preliminary observation report on the place will be obtained.
- If there are no antiquities in the land according to the recommendation and observation report of the Regional Assistant Director, the said land will be released for the project concerned. If the preliminary observation report has proposed to carry out an archaeological impact assessment survey, steps will be taken to conduct the survey.
- Quotations will be invited from the 17 agencies which have registered in the department for conducting the archaeological impact assessment survey on the proposed development project.
- Quotations will be opened in the presence of the Apex Body. The Apex Body comprises the following members.
  1. Director General of Archaeology
  2. Director of Post Graduate Institute of Archaeology
  3. Director General of Central Cultural Funds
  4. President of Association of Archaeologist
- The competent agency for conducting the archaeological impact assessment will be selected by the Apex Body.

- The employer will be requested to deposit the sum quoted by the agency selected by the Apex Body, in favour of the Director General of Archaeology.
- The Department of Archaeology will inform the Agency concerned that its quotation has been selected.
- When the employees deposits the amount in favour of the Director General of Archaeology, that fact will be intimated to the Agency.
- The agency should submit its archaeological impact assessment survey before expiry of 06 weeks from the date of informing the agency. If otherwise the department has the right to stop payment and take legal action against the agency.
- On receipt of the archaeological impact assessment survey report, to the department will release the money to the agency.
- The next step is to send the archaeological impact assessment survey report to the Minister in charge of the subject for approval. On the recommendation of the Minister in charge of the subject, the Director General of Archaeology will make available his decision to the Project concerned.

**Annex 9: Environmental Monitoring Checklist for Construction Activities**

**Title of project** :  
**Proponent** :  
**Contractor's Name** :  
**Monitoring Date** :  
**Monitor's Name &** :  
**Designation**

Issue	Proposed mitigation measures (from the EMP)	Implementing Responsibility	Compliance Yes/No	Reason for non-compliance	Follow up Action

**Annex 10: Construction Safety Checklist**

<b>Date inspection conducted:</b>	<b>Location:</b>
<b>Name(s) of those participating in this inspection:</b>	
<b>INDICATE EITHERS:</b>	
<b>A = Acceptable/Yes; U = Unacceptable/No; N/A = Not Applicable</b>	

No.	Safety Title	A	U	N/A	Action Taken
<b>1</b>	<b>PERSONAL PROTECTIVE EQUIPMENT:</b>				
	Foot protection worn as required?				
	Hand protection used/worn as required?				
	Safety glasses and/or goggles available + being used?				
	Hearing protection worn where required?				
	Hard hats worn when falling object hazard is present?				
	Dust masks used when needed?				
	Traffic vests being worn where needed?				
<b>2</b>	<b>EMERGENCY ITEMS:</b>				
	Emergency phone numbers posted and known by all?				
	Emergency eyewash and/or shower units accessible?				
	First aid kit available at work site?				
<b>3</b>	<b>ELECTRICAL SAFETY ISSUES: if required</b>				
<b>4</b>	<b>CONSTRUCTION SAFETY &amp; HEALTH ISSUES:</b>				
	100% fall protection in place above 6-5... feet in height?				
	Excavation? Protection from cave-ins for >5 feet deep				
	Hand tools are kept in safe				
	Employees instructed in proper use of all power tools? If available				
	Employees below protected from falling objects?				

	Proper access provided for workers and surrounding community?				
	<b><i>Trenches Excavation and Shoring:</i></b>				
	Materials are stored at least two feet from trench?				
	Proper number of workers for each operation?				
5	<b>Job Information/Administrative:</b>				
	First aid kit stocked?				
	First aid kit available?				
	Work areas properly demarcated				
	Work areas properly barricaded?				
6	<b>Housekeeping:</b>				
	Work area neat?				
	Protected from projecting nail points (removed/bent over)?				
	Waste containers provided?				
	Waste containers used?				
7	<b>General:</b>				
	Toilet facilities available?				
	Toilet facilities maintained?				
	Drinking water available?				
	Visitor hard hats available?				
	Visitor hard hats used?				
	Record Maintaine at Site level:				
	Unsafe Acts or Practices Observed:				
	Comments:				
	Signature: _____ Date: _____				

## Annex 11: ANZDEC Interim Sediment Quality Standards

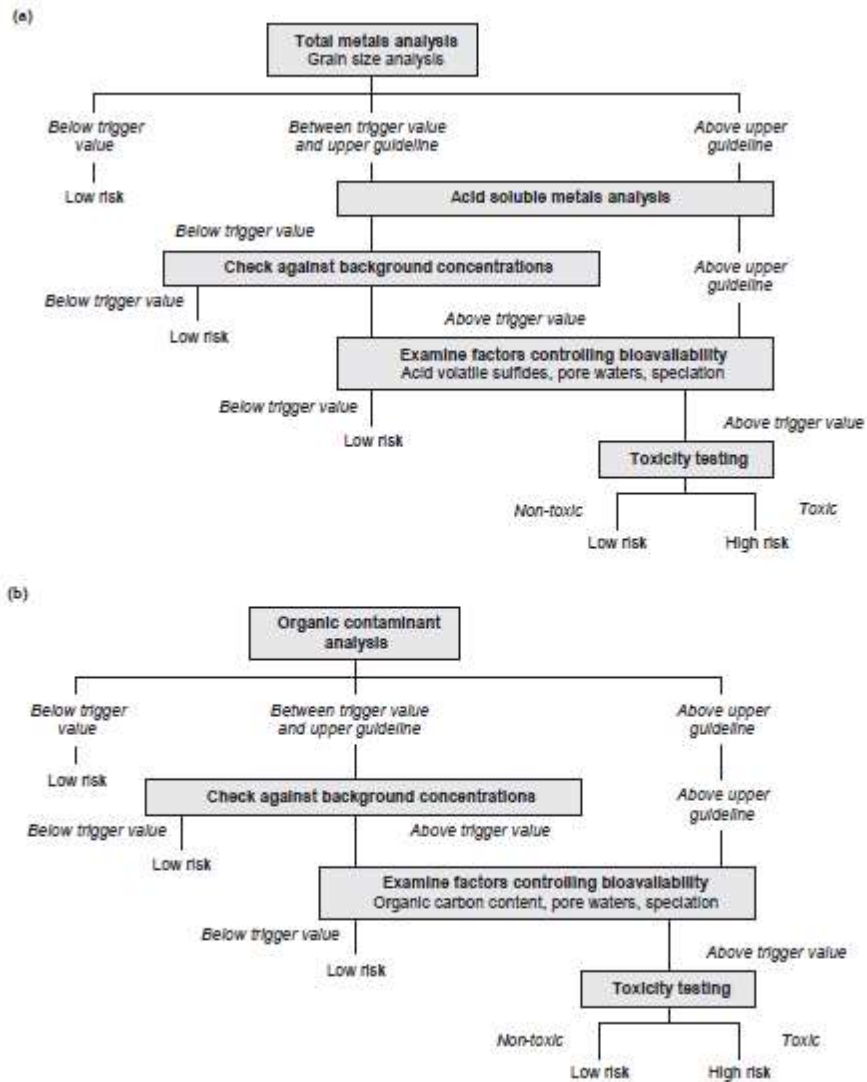
**APPENDIX 1. ANZECC/ARMCANZ INTERIM SEDIMENT QUALITY GUIDELINES**

Table A1. Recommended sediment quality guidelines (ANZECC/ARMCANZ, 2000a)

Contaminant	ISQG-Low (Trigger value)	ISQG-High
<b>METALS (mg/kg dry wt)</b>		
Antimony	2	25
Cadmium	1.5	10
Chromium	80	370
Copper	65	270
Lead	50	220
Mercury	0.15	1
Nickel	21	52
Silver	1	3.7
Zinc	200	410
<b>METALLOIDS (mg/kg dry wt)</b>		
Arsenic	20	70
<b>ORGANOMETALLICS</b>		
Tributyltin ( $\mu\text{g Sn/kg dry wt}$ )	5	70
<b>ORGANICS (<math>\mu\text{g/kg dry wt}</math>)<sup>a</sup></b>		
Acenaphthene	16	500
Acenaphthalene	44	640
Anthracene	85	1100
Fluorene	19	540
Naphthalene	160	2100
Phenanthrene	240	1500
Low Molecular Weight PAHs <sup>b</sup>	552	3160
Benzo(a)anthracene	261	1600
Benzo(a)pyrene	430	1600
Dibenzo(a,h)anthracene	63	260
Chrysene	384	2800
Fluoranthene	600	5100
Pyrene	665	2600
High Molecular Weight PAHs <sup>b</sup>	1700	9600
Total PAHs	4000	45000
Total DDT	1.6	46
p,p'-DDE	2.2	27
o,p'- + p,p'-DDD	2	20
Chlordane	0.5	6
Dieldrin	0.02	8
Endrin	0.02	8
Lindane	0.32	1
Total PCBs	23	-

<sup>a</sup>Normalised to 1% organic carbon; <sup>b</sup>Low molecular weight PAHs are the sum of acenaphthene, acenaphthalene, anthracene, fluorene, 2-methylnaphthalene, naphthalene and phenanthrene; high molecular weight PAHs are the sum of benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene and pyrene





**Figure 1.** ANZECC/ARMCANZ tiered framework (decision tree) for the assessment of contaminated sediments for (a) metals and (b) organics