

Environmental Management & Assessment Framework

Water Supply and Sanitation Improvement Project (WSSIP)



**Ministry of Urban Development, Water Supply and
Drainage**

April 2015

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Abbreviations

CBOs	Community Based Organizations
CKDu	Chronic Kidney Disease of Uncertain Etiology
CWSSP	Community Water Supply and Sanitation Project
DNCWS	Department of National Community Water Supply
DSUs	District Support Units
EA	Environmental Assessment
EIA	Environmental Impact Assessment
ESAMF	Environmental and Social Assessment and Management Framework
EWHCS	Estate Workers Housing Cooperative Society
GoSL	Government of Sri Lanka
HIES	Household Income and Expenditure Survey
IDA	International Development Association
IEE	Initial Environmental Examination
MDG	Millennium Development Goal
MLGPC	Ministry of Local Government and Provincial Council
MLRCD	Ministry of Livestock and Rural Community Development
MoFP	Ministry of Finance and Planning
MoH	Ministry of Health
MWSD	Ministry of Water Supply and Drainage
NWSDB	National Water Supply and Drainage Board
O&M	Operation and Maintenance
PDO	Project Development Objective
PO	Partner Organizations
PHDT	Plantation Human Development Trust
PMU	Project Management Unit
PSC	Project Steering Committee
RWS&S	Rural Water Supply and Sanitation
WASH	Water and Sanitation and Hygiene
WHO	World Health Organization
WSSIP	Water Supply and Sanitation Improvement Project

ENVIRONMENT MANAGEMENT FRAMEWORK FOR WATER SUPPLY AND SANITATION IMPROVEMENT PROGRAM (WSSIP)

1. Introduction

1.1 Background to the Project

Sri Lanka, with a population of 20.3 million and annual per capita income reaching over US\$ 3,000, is considered a lower middle income country. With the cessation of the three-decade long civil war in 2009, Sri Lanka is poised to accelerate its social and economic development, ensure provision of better quality public goods and services, and develop conflict-affected and other economically lagging districts of the country. The Government's vision, articulated in the document Mahinda Chinthana: Towards a New Sri Lanka, envisages that by 2020 every Sri Lankan family will enjoy decent and healthy living conditions. With economic growth of 7.3 per cent in 2013, Sri Lanka aims for a sustained and inclusive economic growth rate above 6 per cent per annum and per capita GDP of US\$ 4,000/year by 2016.

At the same time Sri Lanka faces several challenges such as: persistent inequalities and pockets of poverty in lagging regions, plight of vulnerable groups including displaced people and those working in the Plantation sector, persistent malnutrition across all segments of the population¹, and emergence of a new form of Chronic Kidney Disease of uncertain etiology (CKDu) with public health implications for the country².

Sri Lanka has high national coverage for access to improved water supply and sanitation. The country has achieved Target 7 of the Millennium Development Goals (MDG) to reduce by half the proportion of people without sustainable access to improved drinking water source and an improved sanitation facility. This is a significant achievement which is not matched by any other country in the region.³

However, these figures mask considerable disparities and the need for customized solutions in underserved geographic locations, including remote rural areas, the plantation sector, and pockets in the north and the east of the country. The table below (source: Household Income and Expenditure Survey (HIES) 2011) presents sector data according to 3 sub-sectors.

- Urban Sub-sector (primary and secondary cities/towns and communities with populations greater than 6,000)

¹ Malnutrition affects 22 percent of children under the age of five, and remains much higher in Sri Lanka than in other countries of similar income level.

² There is no conclusive report on causes of CKDu but it may be linked to low quality fertilizers and pesticides and its progress may be exacerbated by drinking water which is hard and high in fluorides.

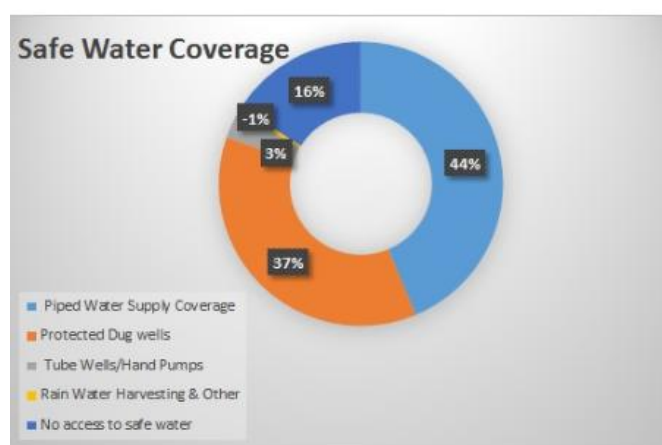
³ The Joint Monitoring Program (JMP) update in 2104, indicates that 93.8% of population has access to improved water and 92.0 % has access to latrines, nationwide.

- Rural Sub-sector (low density village areas)
- Estates Sub-sector (Plantations with small yet high density cluster communities).

It highlights the decreasing quality of service moving from urban to rural areas, and from rural to estates. Coverage in the estate sub sector, where over a million people reside, is 40% or more below that experienced by the urban population

Year	Water			Sanitation		
	Urban (%)	Rural (%)	National (%)	Urban (%)	Rural (%)	National (%)
1990	91.6	62.6	67.6	78.1	65.4	67.6
2000	95.0	76.4	79.3	80.3	78.4	78.7
2012	99.1	92.9	93.8	82.9	93.9	92.3

In addition, the percentage of schools with improved water sources ranges between 80-85% and while national data exists, it does not adequately take into account the continuous availability of water, or the quality of the water sources, even when schools or communities report access.



Indicators on end-use behavior and practices (washing hands with soap, environmental safety in disposing of human excreta, menstrual hygiene) are also limited, resulting in critical gaps in interventions.

Although policies are in place to promote access and quality, enforcement requires strengthening. Cost recovery remains an issue, as does the long-term maintenance of facilities, especially for community-based systems. In schools, authorities' lack the capacity to undertake "soft" components such as hygiene promotion.

Poor outcomes in the education and health sectors, particularly with regard to malnutrition, are closely linked with lack of access to good-quality water and sanitation. The spread of water-borne diseases due to bacteriological contamination or long-term exposure to suspected chemical contamination is an increasing concern in Sri Lanka. It has been reported that some areas where populations are still being resettled have up to 40 per cent of households who practice open defecation, contributing to heavy water pollution and water borne diseases.

In addition, the prevalence of disasters such as floods and droughts has increased sharply since 2010, placing more of a burden on institutions responsible for WASH service provision. Out of the 3.4 million people affected by natural disasters since 2005 in Sri Lanka, more than 2.6 million were affected between 2011 and 2013. Flooding in December 2012 alone contaminated more than 20,000 wells. Humanitarian partners are called to respond to repeated small emergencies with existing stocks, which are rapidly depleting.

1.2 Water Supply and Sanitation Improvement Project (WSSIP)

The proposed project will support development in the lagging regions and the estates sector where access to WS&S is lower and poverty level is higher compared to the national average. Thus the project will also support the World Bank Group Corporate Goals on poverty reduction (reduce the percentage of people living on less than \$1.25 a day to 3 percent by 2030) and shared prosperity (foster income growth for the bottom 40 percent of the population in every country).

The project will directly benefit an estimated 623,000 people (155,000 households) with safe piped water supply, of which approximately 26,300 households are in urban towns, 18,300 households in estates and the remaining 70,300 households are in rural areas. This will meet about 15% of the GOSL's national target of increasing piped water coverage from current 45% to 60% (additional 3 million people) by 2020. Furthermore, augmentation of some of the existing systems will improve service delivery in the project areas benefiting approximately 41,000 households. The sanitation programs benefit approximately 53,000 families to build their individual latrines in rural areas and estates. Management of fecal sludge is a growing problem in urban/small towns where on-site septic tank sanitation is the norm. The project will finance the construction of strategically located septage treatment facilities in each of the project District. This will improve sanitation for people in towns and the environmental conditions in the catchment area of these facilities.

Women and children will benefit significantly from project interventions, as they currently bear the burden of securing the daily drinking water needs of the family and disproportionately suffer the consequences of illnesses associated with poor access to water and sanitation.

The project has a strong poverty focus. There was found to be a strong correlation between poverty - measured by the poverty head count - and the level of access to water services. The selection⁴ of the seven high priority Districts was thus based on three criteria: (i) percentage of people with access to unimproved/unsafe water; (ii) percentage of households with access to non-piped water source; and (iii) Districts in the dry zones⁵. Introducing the Poverty Headcount Index directly into the process did not materially change the priority Districts.

1.3 Project Development Objective

The development objectives of the project will be to increase access to piped water services and improved sanitation, and to strengthen rural service delivery arrangements, in selected Districts.

⁴selected through an objective and transparent screening process in consultation with National Planning Department (NPD), MUDWSD and the NWSDB,

⁵There are 3 climatic zones in Sri Lanka: (i) Wet Zone, (ii) Intermediate Zone, and (iii) Dry Zone.

1.4 Project Description

Project Components

The project comprises of the following components.

- Component 1 - Water supply and sanitation infrastructure
- Component 2 – Strengthened Rural Service Delivery
- Component 3 - Sector Capacity Building
- Component 4 - Project Management

Component 1 – Water Supply and Sanitation Infrastructure

(\$141.57 million, IDA \$130.91 million)

This component would finance infrastructure investments to support expansion of piped water services in urban, rural and estate areas in the selected districts. Cost effective technical solutions will ensure that each unit of investment delivers the maximum service improvement. Decentralized schemes will be the norm, whether in rural water supply or urban sanitation. Within the urban sub-sector the focus will be on towns given that the Government has a number of projects already planned for the larger urban centers.

In urban small towns, the investments will be made for intake, pumping main, conventional water treatment plant and the distribution network for treated water. The per capita supply would range from 80 to 120lpcd depending on the availability and cost effectiveness of the delivery.

Rehabilitation of existing rural systems would be included based on agreed criteria and up to 15% of the rural sub-sector investment amount. Community contribution for rehabilitation of RWS schemes will be higher, ranging from 20% to 40%, with priority given to CBOs who will contribute higher % share of the cost. In cases where good performing CBOs request expansion, it can be included within this 15% allocation.

In Central Province investment will focus on piped water supplies and sanitation in estates and adjoining rural villages. From experience of earlier pilots in the estate sector some of the key issues to be considered include: (i) Capacity of the estate workers to manage the schemes, and alternatives in the event of low capacity/interest; (ii) Roles of the different parties in O&M – the Board, the plantation owners, the community, the PHDT and the Estate Workers Housing Cooperative Society (EWHCS).

According to GOSL practice the community contributions toward capital costs of the rural and estates schemes will be 15% (in cash and kind) of the total costs, including the cost of a meter and house connection. Payment modality will be decided at the community level. The rural and estate scheme design will include metered connections to all households who register to receive water. In addition the rural and estate programs will be implemented through a “Demand Responsive and Participatory Approach” and in close coordination with the Local Authorities, Pradeshiya Sabha.

In urban sanitation, the project will finance the construction of Septage Treatment Plants in each of the districts for the collection and treatment of septage. These will be strategically located to encourage maximum use of the facility. The proposed technology to be employed is primarily based on waste stabilization ponds and the discharge will be treated to prescribed standards. Each plant will be provided with at least one gully bowser for the collection of septage.

Rural sanitation improvements will use appropriate models in line with government policy. Latrine technology and specifications (at least for the sub-structure) and cost will be prepared and applied across project areas. An incentive grant of 80% of latrine cost will be provided to the poor and hardcore poor identified and listed by the Government's Samurdhi Program in each village⁶. To ensure full sanitation coverage, other households are encouraged to build hygienic latrines with 50% incentive grant. Identification and selection of beneficiaries will be done by the close coordination of CBO in coordination with the NWSDB District Units.

Hygiene *Education and Awareness Programs* are at the heart of any successful sanitation program. The PMU will support and organize intensive hygiene promotion programs to educate communities, in particular school children, on the socio-economic costs of lack of sanitation and the benefits of good hygiene and improved sanitation.

Component 2 – Strengthened Rural Service Delivery

(\$7.73 million, IDA \$7.73 million)

The project will support the operationalization of the DNCWS through the following activities.

- Assistance to build the capacity of DNCWS through: (a) institutional design of the department including organizational structure, staff numbers and skill sets, job descriptions and so on; (b) offices and equipment needed to set up the department in each districts; and (c) training for staff of the departments
- Design and implementation of sustainability financing and incentive framework to: clarify liability for repairs, rehabilitation and replacement costs; generate incentives for CBOs to manage schemes and sanitation facilities better; and encourage regular and reliable monitoring of scheme performance and sustainability.
- Design and implementation of a Monitoring and Evaluation (M&E) system to capture indicators of system functionality and CBO sustainability. This will include a baseline survey of all existing CBOs/WUAs. The system will include mobile phone monitoring systems that are simple and cost-effective.
- Designing and implementation of a systematic approach to use this M&E data to assess and enhance the performance of all CBOs. This will help ensure that schemes are functional for their full economic life through a range of initiatives including: (a) administrative backstopping to CBOs; (b) technical backstopping; and (c) a system of training and networking to help the CBOs solve problems on their own.
- Establishing a program for confirming the legal status of CBOs.
- Designing an approach to ensure long term sustainability in the estate water supply schemes through appropriate financing and institutional arrangements, including partnering with the PHDT, the plantation companies and the EWHCS.

⁶The Samurdhi program is the main social assistance program in Sri Lanka implemented since 2005, managed by the Government. The Samurdhi program is structured under two components: (i) Relief Program; and (ii) Empowerment Program. The benefits of the program depend on the size of the household. The eligibility criterion of Samurdhi depends on the income, although recently, the program is testing community-based methodologies on targeting.

Component 3–Sector Capacity Building

(\$5.94 million, IDA \$5.94 million)

1. The project will finance two capacity building activities:
 - *Preparation of a comprehensive Water Supply and Sanitation Sector Program*, in collaboration and consultation with the NPD, to improve water supply and sanitation across the island. This will allow GOSL to address the gaps and strategically invest in the sector through a programmatic approach which can be financed by local or foreign funds.
 - *National Program to develop a strategy to mitigate the aggravating effects of drinking water quality on CKD*. The root cause of CKD remains unclear but water supplies which are hard or fluoride contaminated appears to exacerbate the disease. The TA would include: (i) a Water Quality Mapping to map out the ground water quality assessments at the district levels, which help to identify possible risk areas in relation to the spread of CKDu and other diseases in the Island; and (ii) preparation of a National Strategy to enable NWSDB and other sector organizations to provide a comprehensive WSS response to the CKDu threat; which include developing a risk rating system (based on the water quality mapping), assessing different technical and cost effective approaches (e.g., Rain water harvesting, bowser supply, Reverse Osmosis (RO) Plants).

Component 4 - Project Management Support

(\$8.42 million, IDA \$5.43 million)

2. This Component will finance the entire administration and management of project implementation both at the head office of in the MUDWSD and at the district level.

1.5 Objectives of the EAMF

Projects and Programs prepared and managed by IDA need to comply with World Bank Operational and Safeguard Policies. Therefore, sub-projects eligible for funding under the proposed WSSIP 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, given the demand responsive nature of the project, details of all the specific sub-projects are not available at this stage. Hence, site-specific Environmental Assessments (EA) cannot be conducted. What is possible at this stage is to carry out an identification of generic issues that are typically associated with the type of urban, rural and estate investments in water supply and sanitation that would potentially be funded by the project and apply the information to site specific environmental assessments, as and when details of specific investments are identified.

Therefore, the purpose of this document is to outline a framework for environmental management for the project, giving details of potential environmental issues and guidelines on assessing environmental sensitivity of sub-projects through appropriate environmental screening and follow on environmental analysis. The EAMF will serve as the basis in the preparation of recommended sub-project specific safeguard instruments such as Environmental Assessments and/or Environmental Management Plans (EMPs) etc. As stated earlier, it is being submitted in lieu of a project EA and has formed the basis for appraising the environmental aspects of the project.

It will be made available for public review and comment in Sri Lanka and in IDA's Public Information Center in accordance with requirements of disclosure. Detailed environmental

assessments (EAs and EMPs) for individual sub-projects will be carried out prior to implementing the sub-projects in accordance with the guidelines provided in this framework.

Therefore, the objectives of this Environmental Assessment & Management Framework can be summarized as;

- a. To establish clear procedures and methodologies for environmental planning, assessment, review, approval and monitoring of subprojects to be financed under the Project
- b. To specify appropriate roles and responsibilities, and outline the necessary reporting procedures, for managing and monitoring environmental concerns related to subprojects
- c. To determine training, capacity building and technical assistance needed to successfully implement the provisions of the EAMF
- d. To provide practical resources for implementing the EAMF

Scope of the EAMF

The World Bank has a long history of engagement in the water supply and sanitation sector in Sri Lanka, with the most recent ones being the CWSSP II and NEP WASH which were successfully concluded in 2010 and 2013 respectively. The proposed project has been designed and modeled after these successful past initiatives and the key lessons learnt through these experiences.

The CWSSP II prepared a Sectoral Environmental Assessment in 2003 as part of project appraisal requirements which included an EAMF to guide sub-project specific environmental assessments. This document provided an important basis to appraise the environmental concerns in NEP WASH and to develop its own EAMF giving due consideration to the post-conflict scenario of the targeted beneficiary communities.

Given the similarity of WSSIP to its predecessors, it was concurred that this framework should benefit from the existing documentation and the implementation experience, and updated as necessary to reflect the project's focus on all three major water supply and sanitation sectors in the country.

2 Institutional, Policy and Legal Framework for Water Resources and Environmental Management

As water is a limited natural resource which is essential for the existence of human and animal populations and plants, the State exercises full control over the determination of priorities of its use. The various development programs dealing with water are drawn by the individual Government Departments, Corporations or Authorities, and are submitted through their Ministries to the Ministry of Finance and Planning. These programs are subsequently presented to the Cabinet of Ministers and Parliament for final approval.

The determination of priorities is undertaken by the Government, both on a project-wise and area-wise basis. However, there is no regulation or law governing the priorities of supplies of water to different areas in Sri Lanka. Selection of priorities for implementation and the sequence of development are based on the evaluation of the projects in terms of the returns that accrue to the particular areas taking due cognizance of the need to develop certain totally neglected and underdeveloped areas.

2.1 Brief Overview of the Water Sector Legislation in Sri Lanka

In Sri Lanka, several laws have been enacted for the control and effective use of water. They have been amended from time to time to meet with situations caused by the institutional changes that are taking place in the country.

The sectoral uses of water can be identified mainly in the fields of agriculture and irrigation development, hydropower generation, industry, domestic usage and fishing. They are generally governed by different legal enactments which delegate the functions of control and administration of different waters to various government agencies that deal with them.

There are several legal enactments governing water use for agricultural and irrigation activities. The use of public water for such activities is fully under the control of the Government. Different Government and Corporate Agencies have been entrusted with the powers of enforcement of such enactments. A few important enactments are as follows:

- Irrigation Ordinance No. **32** of 1946 and its amendments,
- Paddy Lands Act No. 1 of 1958, replaced by Law No. 42 of 1973, No. 30 of 1958, 61 of 1961, 11 of 1964, 25 of 1966; Paddy Lands (Special Provisions) Act No. **2** of 1970.
- Water Resources Board Act of 1964,
- Mahaweli Development Board Act of 1970,
- Agricultural Productivity Law of 1972,
- Agricultural Development Authority Act of 1978,
- Mahaweli Authority Act No. 23 of 1979,
- Coast Conservation Act No. 57 of 1981 and 64 of 1988.
- Agrarian Services Act No. 58 of 1979 of 1990, 4 of 1991, 40 and 41 (Special Provisions) of 1993 and its subsequent amendments.

The provision of irrigation facilities for agricultural purposes is mainly under the charge of the Irrigation Department and the Mahaweli Authority of Sri Lanka. They generally make decisions in dealing with the overall policy as defined in the respective enactments.

The legal enactments dealing with hydropower are covered by the Electricity Act of 1950, its amended version in 1957, the Ceylon Electricity Board Act of 1959 and Act 17 of 1969. The generation of hydropower and its distribution through the national grid of Sri Lanka lie in the hands of the Government and is exercised through the Ceylon Electricity Board.

The legislation for the use of water for industries is given under the Factories Ordinance as amended in 1961, which provides the safety measures that are to be followed in the use of water for industrial purposes. The water after being used for industrial purposes, has to be often diverted back to the river or waterway, and it should be well below toxic levels for the downstream water users. The National Environmental Act and its subsequent amendment have strict stipulations against water pollution (see section below).

The major enactments pertaining to the domestic usage of water are as follows:

- Housing and Town Improvement Ordinance No. 19 of 1915 and its subsequent amendments,
- Village Communities Ordinance Chap. 198 of 1924, 1956, No. 35 of 1957 and 7 of 1959 and its subsequent amendments.
- Urban Council Ordinance No. 61 of 1939 and subsequent amendments,
- Town Council Ordinance No. 3 of 1946 and subsequent amendments,
- Municipal Council Ordinance No. 29 of 1947 and subsequent amendments,
- National Water Supply and Drainage Board Law No. 2 of 1974, and 13 of 1992.

The utilization, management and distribution of water supplies for municipal, urban and domestic purposes are generally being administered under the above legal enactments, under which the Local Government Bodies are empowered to make their by-laws in respect of any waters that may be vested in them. Most schemes of water supply for domestic purposes in the country are generally constructed and supervised by the National Water Supply and Drainage Board. In the areas defined and vested with the Mahaweli Authority of Sri Lanka, the right to control and regulate water lies with them.

2.2 Important Policies in the Water Supply Sector

National Drinking Water Policy

The National Drinking Water Policy on the urban sector focuses on the provision of pipe borne water supply to urban areas as defined by towns, cities, urban centres, industries and some sub-urban areas. The policy promotes all citizens to have access to safe drinking water and recommends a people centred, participatory and demand responsive approach towards project development.

It states that abstraction of water from rivers and streams will follow due recognition of downstream needs and that water for domestic purposes will receive priority over other uses, subject to implementation of any previous agreement for other uses.

It also promotes a decentralized system of management for water supply schemes and clearly mentions that safety of drinking water supplied to the people need to be measures at all times by all water service agencies through adoption of appropriate instruments. On water source management it states that 'A holistic approach for water source and watershed protection will be adopted to prevent depletion of the resource and to ensure adequate supply of water through environmental conservation'. Further, it elaborates on other key aspects in water supply such as disaster preparedness, regulation, quality assurance and capacity building, research and training, continued service improvement, financial sustainability of schemes etc and highlights the responsibilities of the NWSDB and other institutions with a mandate to provide public services.

Applicability to WSSIP – this policy is relevant to the project and guides project design and implementation mechanisms in the urban/rural water supply sub-sector.

The National Policy for Rural Water Supply

This policy was drawn in 2001. The policy is based on the principles IWRM and supports a demand driven, people centered and decentralized model of service delivery. The policy transferred the responsibility of provision of rural water supply and sanitation from the central government to the rural communities who are to be assisted by the Pradeshiya Sabha's and Provincial Councils. The central government is to play the roles of policy making, regulation, monitoring and evaluation. However, in practice some of the provisions of the policy, particularly on the provision of physical infrastructure has been difficult to implement effectively due to technical capacity constraints that existed particularly at the level of the Pradeshiya Sabha. Given this, the national body responsible for the provision of water, NWSDB had been providing Rural Water Supply infrastructure in collaboration with the Pradeshiya Sabha.

According to this policy, The NGOs, CBOs and private sector who either jointly or singly have the mandate to implement rural water supply and sanitation projects, including operation and maintenance responsibilities, have the responsibility of conserving the environment with emphasis on water sources and watershed areas,. The responsibility of implementing scheme specific environmental management plans rests with the body chosen to implement the rural water supply and sanitation projects.

Applicability to WSSIP – this policy is relevant to the project and guides project design and implementation mechanisms in the rural water supply sub-sector.

National Action Plan for Water Surveillance

A national plan of action for water surveillance of all drinking water supply schemes has been proposed by the NWSDB jointly with the MOH. It is based on the premise that water suppliers are responsible for the quality and safety of the water that they produce and that water supply agencies should develop the infrastructure necessary for quality control of drinking water.

The basic framework of the proposed water quality surveillance system recommends that:

- Each water provider must prepare a Water Safety Plan (WSP) for each pipe water scheme managed by the provider itself. Water quality testing and record of surveillance activities will be part of the WSP.

- The NWSDB in conjunction with its rural water supply division will prepare a set of standard WSPs to be utilized by the CBOs and LAs, and conduct training to the caretakers of those schemes.
- A Regional Water Quality Survey Committee and a Central Water Quality Survey Committee will be set up to oversee the implementation of the proposed framework, provide policy/technical directions and ensure inter-sectoral co-ordination.
- NWSDB will provide the necessary logistical and technical support for the implementation of the proposed framework.

Applicability to WSSIP – this policy is relevant to the project and the project should encourage the development of at least basic WSP in its water supply schemes.

At present, the NWSDB and a few other Municipal Councils carry out monitoring of the water distributed to the public. Monitoring of the quality of water produced and distributed by others is, if at all, episodic. Water quality testing in the rural schemes is carried out on an ad hoc basis by PHIs, normally in response to a problem. There is no proper mechanism to ensuring the safety of water in the communal and private wells, which is accountable to a large majority of the water supply at present. Under CWSSP II and NEP WASH, the importance of WQ testing at least twice a year has been emphasized using training and provision of equipment. However, the projects met with its own implementation challenges.

While the WQ surveillance plan of action has been proposed a few years back, implementation has been slow to begin with. However, the NWSDB has been encouraging the development of the WSPs since of late and piloting the initiative in selected water supply schemes. The project should try to take the initiative forward and strengthen the capacity of the relevant institutions to carry out at least basic water safety planning under the WSSIP.

2.3 Institutional framework for Water management

Water is managed as an input to major development sectors such as irrigation, hydropower, human and industrial water supply. Nationally, there are a number different government institutions dealing with water sustained by a number of legislative enactments concerning the water sector. These laws have been enacted over a considerable period of time to meet a specific need at a given point in time and therefore in some cases overlaps exist in their responsibilities and jurisdictions. However, collectively they cover the main issues related to water.

The most critical of institutions amongst many which deal with development, management and conservation of water are the Department of Irrigation (DI), Mahaweli Authority of Sri Lanka (MASL), Water Resources Board (WRB), National Water Supply and Drainage Board (NWSDB), Department of Meteorology (DM) and the Central Environmental Authority (CEA); each functioning under different Ministries of the central government with the following mandates;

- The Water Resources Board (WRB) was established in 1968. It coordinates governmental water resources functions and formulates national policies relating to the control and use of water resources. Though the board has wide-ranging power delegated by the act, functionally, at present it has restricted itself to groundwater development and monitoring.
- The National Water Supply and Drainage Board (NWSDB) is the main agency for domestic and industrial water supply and sewerage management.
- The Department of Irrigation (DI), established in 1900, is primarily responsible for water resources planning, project formulation, construction and maintenance of surface water

sources for irrigation purposes. It is also informally responsible for daily and seasonal allocations of water for irrigation.

- The Mahaweli Authority of Sri Lanka (MASL), established in 1979, is responsible for water resources development in the largest river basin in the country; the Water Management Secretariat of the MASL has the necessary technical resources to plan the distribution of water resources under the authority's jurisdiction.
- The Central Environmental Authority (CEA) was established in August 1981 under the provision of the National Environmental Act No:47 of 1980, with the objective of integrating environmental considerations in the development process of the country. The CEA was given wider regulatory powers under the National Environment (Amendment) Acts No:56 of 1988 and No:53 of 2000.
- The Department of Meteorology (DM) is responsible for gathering information needed for estimating available water supplies nationwide.
- The Department of National Community Water Supply is the newest addition to the water sector institutions, set up in 2014 in order to take the rural water supply sector mandate forward. With the formation of this new department, the rural water supply sector will most likely undergo an institutional re-organization.

In addition to the above, there are a number of national and local agencies that has delegated responsibilities and jurisdictions.

2.4 Relevant National Environmental Management Regulations

The National Environment Act No 47 of 1980 & its amendments

The National Environment Act (NEA) provides conservation and development guidelines for natural resources including water, soil, fisheries resources, forest, flora and fauna in Sri Lanka. It is the the basic national decree for protection and management of the environment. It paved the way for the creation of the Central Environmental Authority. The NEA has seen several amendments in the past in a bid to continually make improvements and to respond to the challenging needs of the time. There are two main regulatory provisions in the NEA implemented by the Central Environmental Authority (CEA) through which impacts on the environment from the process of development is assessed, mitigated and managed.

- The Environmental Impact Assessment (EIA) procedure for major development projects. Regulations pertaining to this process have been published in 1993 and are available with the CEA.
- The Environmental Protection License (EPL) procedure for the control of pollution. Regulations pertaining to this process have been published in 1990 and are available with the CEA.
- Scheduled Waste License procedure for the management and control of hazardous waste disposal

a. Environmental Impact Assessment

Sri Lankan Government recognizes EIA as an effective tool for the purpose of integrating environmental considerations with development planning. The application of this technique is considered as means of ensuring that likely effects of development projects on the environment are fully understood and taken into account before development is allowed to proceed. The importance of this management tool to foresee potential environmental impacts and problems caused by

proposed projects and its use as means to make projects more suitable to the environment are highly appreciated.

The legal provision for EIA in Sri Lanka was first included in the Coast Conservation Act No. 57 of 1981 (see below). These provisions were restricted to the Coastal Zone as defined by this Act. The broader legal framework for the EIA process in Sri Lanka was laid down by the amendments made to NEA in 1988 through National Environmental (Amendment) Act No. 56 of 1988. The provision relating to EIA is contained in Part IV C of the National Environmental Act. The procedure stipulated in the Act for the approval of projects provides for the submission of two types of reports Initial Environmental Examination (IEE) report and Environmental Impact Assessment (EIA) report. Such reports are required in respect of “prescribed projects” included in a Schedule in an Order published by the Minister of Environment in terms of section 23 Z of the act in the Gazette Extra Ordinary No. 772/22 dated 24th June 1993. This amendment makes EIA mandatory for whole of Sri Lanka and transformed Central Environment Authority (CEA) into enforcement and implementing agency.

b. Environmental Protection License

The Environmental Protection License (EPL) is a regulatory/legal tool that has been introduced to control and prevent pollution from waste discharges through the adoption of appropriate pollution abatement technology. The NEA specifies categories of ‘prescribed projects’ which would need to comply with these regulations and are supported by gazetted discharge and emission standards depending on the industry type as well as the receiving environment.

The EPL regulation classify industries into three categories, namely, A, B, and C corresponding to high, medium and low polluting potential of the relevant activity discharging/emitting waste into the environment. While EPL for A and B categories are directly administered by the CEA, issuing EPL for category C is delegated to the local authorities under the powers of the NEA.

Applicability of the NEA to WSSIP – As all investments under WSSIP and their scales are not known, it is not possible to say if the NEA will be triggered or not. At the time of sub-project screening applicability of the NEA will be determined.

The Coast Conservation Act No 57 of 1981 amended by Act No 64 of 1988

The Coast Conservation Act 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. 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) must undergo the approval process that is laid down in the Coast Conservation 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 CCD. According to the CCA, Director of the CCD 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 CCD reserves the right to request for an EIA/IEE and also to make a final decision.

Applicability of the CCA to WSSIP – Of the project districts, only Mullaitivu and Killinochchi has a coastal belt. It is unlikely that the CCD will request for an EIA/IEE for water supply

projects. However, at the time of sub-project screening applicability of the CCA will be determined.

The Fauna & Flora Protection Ordinance Act No 49 of 1993 & its amendments

This act provides for the protection, conservation and preservation of the fauna and flora of Sri Lanka. 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 of the Department of Wildlife Conservation.

Applicability of FFPO to WSSIP - If water intakes or transmission lines are located inside wildlife protected areas prior clearance from the Department of Wildlife Conservation should be sought.

The Soil Conservation Act of No. 25 of 1951

The harmful effects of water can be identified as flooding, soil erosion, siltation, salinization and water logging. The Soil Conservation Act No. 25 of 1951 provides for measures to prevent and mitigate soil erosion and for the protection of lands against damage caused by floods and droughts. It is the duty of the Director of Agriculture to investigate the nature and possible extent of soil erosion and the damage of lands and to enforce soil conservation measures to prevent them.

Applicability of FFPO to WSSIP - If water intakes or transmission lines are located inside wildlife protected areas prior clearance from the Department of Wildlife Conservation should be sought.

2.5 Compliance with World Bank Safeguard Policies

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 WB Operational policies that require consideration under this project are;

- OP/BP 4.01: Environmental Assessment
- OP/BP 4.01: Natural Habitats

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 type="checkbox"/>	<input checked="" 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 type="checkbox"/>	<input checked="" type="checkbox"/>
Safety of Dams (OP/BP4.37)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects in Disputed Areas (OP/BP/GP7.60)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects on International Waterways (OP/BP/GP 7.50)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Compliance with OP 4.01 on Environmental Assessment

This policy is triggered if a project is likely to have potential (adverse) environmental risks and impacts in the project's area of influence. The policy requires environmental analysis of projects proposed for World Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. When OP 4.01 is triggered, the World Bank classifies projects into 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.
- (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 subproject proposed for financing, and classifies it into 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 EAMF, including the screening process for categorization of subprojects, must be spelled out in the operational manual.

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

Given the nature and magnitude of anticipated environmental impacts, WSSIP has been placed under environment **category B**. This means that;

- (a) All investments under the project that has the potential to cause environmental impacts will be screened using appropriate methodology (as proposed in this EAMF), depending on the nature and scale of potential impacts, and mitigated. The borrower is responsible for carrying out the necessary environmental assessments.

- (b) Those investments that fall under the prescribed categories stipulated in the NEA and other local laws (as mentioned earlier), environmental assessments will be done according to local regulations as well as World Bank safeguard policies and cleared by both institutions.
- (c) Consultation with the public and key stakeholders will be carried out as part of EA and that all EAs will be publicly disclosed prior to project/sub-project implementation.

OP 4.04 on Natural Habitats

OP 4.04: Natural Habitats seeks 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 cause impacts to 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 a precautionary basis because it is anticipated that some of the water sources could be located inside natural areas and also because water source development in some sub-projects may involve building low weirs across rivers/streams in upper watershed areas that could potentially cause impacts to aquatic habitats. However, the scale of infrastructure development anticipated under WSSIP is small, hence no major impacts are expected to take place. Any impacts to natural habitats will be assessed and documented as part of the EA process, and if necessary supported with specialized studies.

3 Project Locations

The project will be implemented in 7 high priority districts. These districts have been selected based on (a) % of people with access to unimproved/unsafe water (ii) % households with access to non-piped water sources and (iii) location in the dry zone. Poverty, measured by the poverty head count, has a strong co-relation with access levels and is therefore implicitly captured in the district selection process. The districts are;

- ✓ Mullaithivu and Kilinochchi Districts in Northern Province
- ✓ NuwaraEliya District in Central Province
- ✓ Badulla and Monoregala Districts in Uva Province
- ✓ Kegalle and Ratnapura Districts in Sabaragamuwa Province

As location details of individual project investments are not available at this stage of the project, a short environmental profile for each district has been constructed, as below, in order to build a general understanding of the key physical and biological environmental features of the broader project area. During sub-project level assessments, specific environmental characteristics of each project site will be studied and recorded.

3.1 Environmental Profile- Nuwara Eliya District

Location

Nuwara Eliya district lies in the Central Province of Sri Lanka. It is land locked by 4 districts, Kandy to the North, Kegalle district to the North-West, Ratnapura district to the South-West and Badulla district to the East. The land elevation varies from 3,000 feet to about 8,000 feet and has variety of complex landform features like mountain ranges, mountain summits, denuded plateaus, plains, parallel ranges and slopes.

Geo-morphology

The terrain is generally mountainous, with deep valleys; it forms a complex of massifs, mountain ranges, plateaus and basins. The Southern border of this peneplain runs about 50 miles from Adam's Peak (7,360 feet) which is on the Western side to Namunukula (6,360 feet) of the Eastern side. From the middle of this Southern border and running towards North is the High Plains that extends between Kirigalpotta (7,875 feet) and Pidurutalagala (8292 feet). It is near this Pidurutalagala mountain that Nuwara Eliya town (6128 feet) is situated. The scenic grasslands of Horton Plains, Moon Plains, Kandepola-Sita Eliya Plains and Elk plains all are situated in this altitude range of 6000 to 7000 feet , few tens of kilometers away from Nuwara Eliya.



Ecologically Sensitive Areas



Horton Plains, its surroundings forests and the adjoining Peak wilderness, constitute Sri Lanka's most important catchments area of almost all major rivers. The plains are also of outstanding scenic beauty and conservation importance, containing most of the habitats and endemic plants and animals representatives of the country's wet and montane zones. The Western slopes support the most extensive area of montane cloud forest surviving in the country. This lies 32

km south of Nuwara Eliya in the Central Highlands of Central Province. Horton Plains comprises a gently undulating highland plateau at the Southern end of the Central mountain mass of Sri Lanka. It is well recognized for its rich biodiversity, its flora given to a high level of endemism. 5% of the species are found to be endemic to Sri Lanka. The town is a base for visits to Horton Plains National Park. Galway's Land Bird Sanctuary, close to Lake Gregory in the Nuwera Eliya town, is another wildlife site of 0.6 km²

The dense forest cover of the district includes the montane temperate forests and the sub-montane evergreen forests which reflect climatic, topographic and other variations. The montane temperate forest confined to hills above 1500m, has low canopy reaches, about 13m in better sites. In exposed areas the canopy height is low and the trees have a twisted, gnarled appearance. Stunted or "elfin woodlands" are found in the highest reaches. The effect of the wind on these montane ecosystems is pronounced in places where wind channels are developed. The main tree species are *Elaeocarpus glandulifer* (Thiththa weralu), *E-serratus* (Honda weralu), *Michelianilqirica* (Sapu), *Semecarpuscoreacea* (Badulla). The dense undergrowth has shrubs such as the small hill bamboos, *strobilanthus* spp. In the upper montane forest the flora abounds with lichens, mosses, liverworts and ferns besides the variety of angiosperms. The sub-montane evergreen forests are found on the Adam's Peak range around Hatton in hills between 900m to 1350m. The species which are frequent and characteristic of these forests are *Calophvlum calaba* (keena) *Doona qardneri* (Dun). *Diospyros sylvatica* (Sudu kadumberiya). *Terminaliaparviflora* (Hampalanda) and *Caralliacalyana* (ubberiya). There are 413 endemic plant species in the montane zone of which 62 species are considered very rare. The presence of 3 endemic genera alone highlights the importance of the natural flora in the montane zone.

Forests Cover

The Survey Department has estimated a total forest cover of 58,450 hectares. The present dense forest includes 30,410 hectares and this includes the natural montane forests. The other forest lands are Open forest - 10,570 ha. Scrubland - 9,880 , and forest plantation - 7,590 ha. The following are the three, forest reserves managed by the Forest-Department that come under Nuwara Eliya and Halgran oya ranges; Kandapola-Sita Eliya, Meepilimana, and Dambakelle Forest Reserves.

Climate and Rainfall

Annual average rainfall of the Nuwara Eliya district is above 1,500 mm. The climatological data indicates that Nuwara Eliya at an elevation of 1800 m receives low intensity rainfall while the intensity increases around lower elevations towards Nawalapitiya that lies on the windward slopes of the Central Mountains. Unlike the wet zone of the district that receives rainfall during the main four seasons, the intermediate zone receives rainfall only during the North-East monsoon and the

two inter-monsoonal months. Unreliable rainfall and frequent dry spells is a common feature in the intermediate zone. Relative humidity of Nuwara Eliya district varies 63 - 88 % in day time and 68 - 95 % at night.

Demographic Status

A total of 5 DS divisions located within the Nuwara Eliya district representing all ethnic and religious groups in the country. From the total population distributed in the district 40.2% Sinhalese, 6.5% Sri Lankan Tamil, 50.6% Indian Tamil, 2.4% Sri Lankan Moor, 0.1 % Burgher and 0.2% Malay. Mainly five religious groups are represented in the district as follows: 37.9% Buddhist, 51% Hindus, 2.7% Muslims, 5.0 % Catholics, and 1.5% other Christians and 0.1% other.

Agriculture and Livestock

Tea is the main plantation crop covering a land area of 50000 hectares, which includes both plantations and small holdings. Coconut and rubber are cultivated on a small scale in the wet and the intermediate zones. Coconut cultivation is carried out in Hanguranketha and Ambagamuwa. The rubber lands in the District are exclusively confined to Ambagamuwa DSD with an estimate of 300 hectares dedicated to this crop. Vegetable farming was introduced during the time of the British and still practiced today as small holdings by a large fraction of farmers. Potatoes, carrots, leek and cabbage are some of the most common crops cultivated.



Cattle farming is a well-established economic activity in the DSDs' due to the favorable climatic conditions and availability of large extents of grazing lands. The government sector animal farms in Nuwara Eliya associated with natural patana grasslands are maintained mainly for milk production. At present less than half the produce from GSD in Nuwara Eliya is supplied to milk powder production factory at Ambewela. Kotmale is the only division where poultry farming is done on a fairly large scale. The rearing of goats, sheep, pigs and rabbits are also done in this district though to a lesser extent for local consumption.

Land Degradation

The mountainous terrain of the District is highly susceptible to soil erosion due to several factors such as its slopy nature, high rainfall and improper land use. The introduction of tea plantation to the up country had caused irreversible damage by way of soil erosion. It has been estimated that during the past 150 years, a 30cm thick layer of topsoil had eroded in Nuwara Eliya, Kandy and Badulla Districts. Subsequently so has potato farming, which is an economically attractive crop, but it causes soil erosion to a great extent. The Nuwara Eliya District contributes about 27% of the national potato production and about 58% of the potato-cultivated land is prone to severe soil erosion. In spite of the seriousness of the soil erosion and the need for effective soil conservation practices, there is an absence of research on soil conservation practices and the level of adoption by both tea and potato cultivators in the region.

Natural Disasters

The major types of disasters in Nuwara Eliya are landslides and forest fires. The occurrence of landslides and earth slips are frequent in the Nuwara Eliya district as the areas subject to monsoonal changes. However in the recent past there has been unprecedented increase in the occurrence of landslides mainly due to unplanned land use. This is due to people having had to exploit hazardous areas which are only partially or not at all suitable for uses to which they have been put.

Water Resources

The Kotmale Oya, one of the seven major tributaries of Mahaweli formed by its several head streams arise in the core of the central highlands in the Nuwara Eliya District. The Dambasatalawa Oya originating in Ambewela hills flows into Agar Oya and joins Nanu Oya to meet Kotmale Oya. Pundalu Oya has its source in Great Western and Ramboda Mountain and Punna Oya in Kikilliyamana Mountain. The many other tributaries of the Kotmale Oya are Ganthera Oya, Devathuru Oya, Hyimal Oya, Nidahaskotuwa Oya and Niyangandara Oya. The district is basically suited for the development of water power, the only source of indigenous energy in Sri Lanka. The tributary of Maskeliya Oya with catchments of 129.5 km² was dammed at Mousakelle to detain 123 million m³ to generate hydro-power at Polpitiya. The tributary of Kehelgama has been fully tapped with a 48 m³ million reservoir at Castlereagh and a small reservoir at Norton and the second to another plant at Laxapana.

The district has hard fractured rock with local and limited ground water resources. Most of these areas consists of crystalline rocks traversed by discontinuities such as plains of bedding joints and foliations along which water circulates, a feature leading to many springs. There is no continuous body of ground water with a single water-table in crystalline rocks but rather separate pockets of ground water each having a distinct water table. The utilisation of such water pockets depends on their exact location and this is often indicated by heavy fissuring and jointing. Thus haphazard well sinking in areas of crystalline rocks often lead to failure. There is heavy concentration of springs in Hanguranketha where the ground water yield is fairly reliable as well.

Water Quality

Some studies have shown that the cultivation of tea and exotic vegetables in the Nuwara Eliya District over the years has led to the deterioration of the quality of water available for other purposes. Production of vegetables such as beet, leeks, and potato require the use of fertilizers and agro-chemicals in levels above those that are recommended and this has been a common agricultural practice within the district. Being in the headwater areas for important rivers in the country, excess accumulation of these contaminants in the soil, transport of pollutants with sediments and subsequent release to the water sources are some serious concerns that have been flagged. Agricultural runoff, which comes from non-point sources, consists of pesticides, nutrients, suspended solids and organic materials. Soil erosion and sedimentation of water bodies is another adverse effect due to the improper agricultural activities in the region.

According to Rajakaruna et al. (2005)⁷ there were high levels of nitrate and basic cations in well-water in crop fields compared to the same in forest areas in Nuwara Eliya. As reported by

⁷ Rajakaruna, R.M.P., Nandasena K.A. and Jayakody A.N. (2005). Quality of Shallow Groundwater in an Intensively Cultivated Hilly Catena in Up Country Intermediate Zone of Sri Lanka, In: Water Resources research in Sri Lanka, Galagedara L.W. (Ed), Symposium Proceedings of the Water Professionals' Day, Postgraduate Institute of Agriculture, Sri Lanka, pp 163-178.

Premarathna et al. (2005)⁸ there was high cadmium (Cd) concentration (1.96 mg/kg) in the tested soil samples of Kandapola. Removal of productive fertile top soil and eutrophication in areas such as Nanu Oya, Lake Gregory, and Barrack plain are some other problems related to soil erosion and sedimentation identified in Nuwara Eliya district (UDA, 2004)⁹. Water quality data of Lake Gregory collected by the Urban Development Authority in 1996 show the presence of nitrogenous and phosphorus compounds, iron etc. Further analysis has shown that the upcountry estate sector commonly has outbreaks of communicable diseases like hepatitis, typhus, and diarrhea, skin diseases, mainly resulted from consumption of polluted water.

It must be noted that Nuwera Eliya district does not have a long-term water quality monitoring network from which trends & patterns across the district could be reliably inferred on. The above inferences have been made from isolated research studies.

3.2 Environmental Profile- Kegalle District

Location

Kegalle district is situated between the central highlands and western southern planes. The altitude of the western region is less than 175 m from the sea level while eastern region exceeds 300 m. The extent of the district is 1,692.8km². Kegalle is the capital city of the district which is one of the two districts belonging to Sabaragamuwa province. Boundaries of the Kegalle district are; Kurunegala district by North, Kandy and NuwaraEliya districts by East, Ratnapura district by South, and Colombo and Gampaha districts by West. The Kegalle District has a land area of 1,663 Km.



Geo-morphology

The elevation of the district of Kegalle varies from 30-170m from the MSL. The highest elevation is towards the South-East of the district. The landform features vary from plateaus to steep escarpments with medium to high elevations: and from broad valleys to steep gullies. The district of Kegalle exhibits complex topographical features consist of hills and ridges, broad valleys, gorges and plateaus. Highest peak along the line route was observed in Puwakdeniya area while Kandegedara, Dewalegama and Hunuwala areas have isolated peaks. Kegalle district nourishes many rivers including Kelani River, MahaOya and Attanagalu Oya.

Ecologically Sensitive Areas

Thulhiriya Forest Reserve/Koskanda Forest Reserve is located in the Kegalle District in Thulhiriya. This is about 200 acres in extent and comprise of predominantly Mahogany which are about 25 yrs old. The origin of this forest reserve had been a Mahogany mono-cultural plantation established by the Forest Department about 25 years ago. However, with time due to dearth of management this area had become naturalized. The predominant vegetation is Mahogany (*Swieteniamacrophylla*) trees and their seedlings while others like Halmilla (*Berryacordifolia*), Puwak (*Areca catechu*), Kitul (*Caryotaurens*) *AlstoniaLunimidella* (*Meliadubia*),Kaduru (*Cerberamanghas*), Gadumba

⁸ Premarathna, H.M.P.L., Hettiarachchi, G.M. and Indraratne, S.P. (2005). Accumulation of Cadmium in Intensive Vegetable Growing Soils in the Up Country. Tropical Agricultural Research, 17: pp 93-103.

⁹ Urban Development Authority (UDA) (2004). Development Plan for Nuwara Eliya Urban Development Area (Nuwara Eliya Municipal Council area) 2004-2016, Volume 1, Situational Plan and Development Report.

(*Tremaorientalis*), Bowitiya (*Melastomamalabathricum*), Hik (*Lanneacoramandelica*), Ginisapu (*Micheliachampaca*) also prevail

Forests Cover

The forest cover in Kegalle were classified in to three groups namely dense forests (4226.0 ha), open forests (3432.0 ha) and planted forests (3201.0 ha) owing to a total forest cover of more than 15000 hectares. Studies conducted in the early 1990s by the Central Environmental Authority account that the Deraniyagala Division has the highest forest cover as it receives ample rainfall. It is recorded that 6000hectares or so of the total forest cover of the District is located in Deraniyagala.

Climate and Rainfall

The mean annual daily temperature in the district is estimated to be between 22.50C to 32.50C and diurnal range is around 60C. November, December and January are considered as the coldest months while April to June as the hottest months. Humidity of the district increases with the altitude and also varies from the wet zone to dry zone. The average humidity varies between 70-80% during the day time and between 88-94% during the night. Highest monthly rainfall receives in October as 302.7mm and lowest rainfall recorded in January as 33.6mm. About 60%-75% of the district receives rainfall over 3,000 mm per year.

Demographic Status

A total population of 818000 is distributed within the 11 Divisional Secretariat (DS) divisions of the district representing all ethnic and religious groups in the country. Warakapola DS recorded maximum population (110422) and lowest population can be seen in Bulathkohupitiya DS. Considering the population density, Mawnalle DS had the highest value than other 10 DS in Kegalle district. 18,372 peoples live in urban area while 741,310 and 53,318 peoples live in rural and estates respectively according to the Department of Census and Statistics in 2010.

Livestock and Agriculture

According to the land used pattern in district - 2010, home gardens (5, 9271 ha) is the major land use pattern in Kegalle district. Also, commercial crops, rubber (51,976.0 ha), tea (11551.0 ha) and Coconut plantation (12,507.0 ha) can be seen. In addition to rubber, tea and coconut, cinnamon is cultivated on a plantation scale (61.0 ha). Out of total area of district (2952.0 ha) 2.0% and (6188.0) 4.0% are categorized as irrigated paddy land and paddy land by using rainwater respectively.



Natural Disasters

Excessive rainfall, typical landform and geology, deforestation and unplanned land use practices combine to create landslide hazard especially during the last two decades in the mountain slopes of the Central and South Western regions of the Island. Landslides like any other natural disaster are a concern as they threaten the life and property of the people in the hill slopes. The Kegalle District is the most high risk area prone to landslide as per the National Building Research Organization and landslides are very common during the rainy season. Due to the sharp slopes that make up its geomorphology disaster risk assessments have classified Kegalle as the most high risk district with significant flood and landslide risk and moderate risk from drought.

Water Resources

More than 60% of the area of the district of Kegalle is drained by the Kelani Ganga system. Its headwater tributaries rise at an elevation exceeding 5500ft above sea level on the hill sloped forming the western rim of the Central Highlands. The Attangalu Oya and the Maha Oya also flow across the Kegalle district. Ground water resources are utilized for domestic and water supply, however no extensive groundwater aquifers have been identified in the District. The water table varies from around 10m to 30m. During the dry season most of the wells run dry causing water shortages for drinking and domestic use purposes in DS divisions such as Kegalle, Warakapola and Galigamuwa.

Water Quality

Studies conducted on the District's water distribution system and diarrheal diseases by the University of Peradeniya have point to certain issues of water quality in the district. In one study over 113 water samples were collected from locations throughout the District, from both urban and rural areas (from dug well, rap and spring water sources) over a period of six months from August 2009. The bacterial quality of 61.8% of dug well samples, 48.1% of tap water samples, and 94.1% of spring water samples exceeded the standard local guidelines for drinking water with respect to *Eschericia coli* and coliform which are indicator organisms for contamination of water sources with fecal matter. The study suggested that tap water may be of safer and better quality in comparison to the samples taken from dug wells or springs.

Water quality studies have also been conducted by the NWSDB for the Maha Oya which is one of the main major sources of surface water to which District taps in to for everyday purposes. Analysis of long-term water quality data has revealed high variations of Chemical Oxygen Demand (COD). Major pollutants of the water way are deemed to be of industrial origin. There have also been cases where there have been increases in the color of the water and levels of albuminoidal nitrogen, oil and grease have also been observed in water samples. The decreasing water quality has also impacted drinking water supply as per the NWSDB as many people complain of bad test, smell and color. In areas where the Maha Oya passes through urban areas, such as the Kegalle Town, effluent are discharged in to the river and there are also recorded events of contamination due discharges of polluted sewer and drainage water from the urban areas.

No detailed studies have been done to deduce the quality of ground water in detail within the district.

3.3 Environmental Profile- Ratnapura District

Location

Ratnapura district is one of the two districts in the Sabaragamuwa province of Sri Lanka. The district is famous as a gem mining area, and situated between the southern plains and the hill country. The name 'Ratnapura' translated to English means – the city of gems.

Geo-morphology

The general elevation of the district ranges from 30 m to 2,135 m. Mountain ranges, high peaks, dissected plateaus, escarpments etc. cover a greater part of the district. From its height and slope characteristics the district can be divided into three main morphological regions. The lowlands which include mainly the basins of the Kalu Ganga and the Walawe Ganga. The uplands



with an elevation of 270 m to 1,060 m consist of a ridge and valley topography. Furthermore, the uplands are also characterized by highly dissected plateaus of the Sabaragamuwa ridges, the Rakwana massif (hills) and the Southern Platform of the Central Highlands. The highlands which lie at the elevation of over 1,060 m consist of plains and plateaus, mountain peaks and ridges, rock-knob plains, erosional remnants, steeprocklands and lithosols. These features characterize the highest elevations of the southern rim of the Central Highlands, Rakwana massif and the Southern platform.

Ecologically Sensitive Areas

Two main vegetation types occur in the Ratnapura district viz: the tropical rain forest and the mountain forest. The tropical rain forest occurs in the "Afw" climatic region. The Sinharaja forest too belongs to this type. There is also the smaller reservations at Waratelogoda, Delgoda, Delwala, Kuduminiya,



Damalakandd and Welankanda which show characteristics somewhat similar to Sinharaja. In the region where the "Aflni" climatic type occurs the natural vegetation is again tropical rain forest but towards the south there are stands of deciduous trees among the evergreens. The Sinharaja Forest Reserve is located towards the southern parts of the district. Sinharaja Forest Reserve is a national park and a biodiversity hotspot in Sri Lanka. It is of international significance and has been designated a Biosphere Reserve and World Heritage Site by UNESCO.

The hilly Sinharaja virgin rainforest, part of the Sri Lanka lowland rain forests eco region, was saved from the worst of commercial logging by its inaccessibility, and was designated a World Biosphere Reserve in 1978 and a World Heritage Site in 1988. The reserve is only 21 km (13 mi) from east to west, and a maximum of 7 km (4.3 mi) from north to south, but it is a treasure trove of endemic species, including trees, insects, amphibians, reptiles, birds and mammals. Second to Sinharaja, the Kitulgala forest reserve would be the ideal rainforest habitat to spot most of the lowland endemic species of birds.

Kitulgala forest reserve is a primeval rain forest with lush tropical flora including several species of trees and Lianas that are endemic to this area. Many of the lowland endemics who also inhabit Sinharaja can be seen in Kitulgala It is also excellent for many rare species of butterflies, most of them endemic, and amphibians. The streams hold a vast number of fresh water fish that are mostly endemic and endangered. Parts of the Udawalawe National Park also border the Ratnapura District.

The meandering streams that flow across the district and feed to the Kalu River also give way to some of the Islands most picturesque water falls. Bopath Ella Situated at Kuruvita, few miles away from Colombo Ratnapura high level road, Katugas Ella, situated at Mahawalawatta, 3 km away from Ratnapura town. Kirindi Ella, The seventh highest waterfall in Sri Lanka. Situated 4 km away from Ratnapura - Pelmadulla Main road from Pelmadulla town and Rajanawa are some of the most popular waterfalls.

Forests Cover

Surveys conducted by the Central Environmental Authority in the late 1980s have indicated that the forest cover in the district accounted to 20% of its total land use, constituting 15% dense forest and 4.3% open forest this rate is very low when compared to the national average of 24.9 percent.

Owing to chena cultivation and heavy logging operations the natural dense forest Cover in the district had been reduced by as much as 9 percent by the early 1990s,

Climate and Rainfall

Ratnapura is Sri Lanka's wettest district. Even in February (considered as the driest month of the year) Ratnapura normally has nearly 100 mm of rain. In May (considered as the wettest month of the year) the district receives nearly 500 mm of rain. The average annual precipitation is about 4,000 to 5,000 mm. The average temperature varies from 24 to 35 °C, and there are high humidity levels. The city is above 21m from sea level.

Demographic Status

The district covers a land area of approximately 3,275 sq.km, with a population of 1,099,000(estimated for 2008). Of them, 8.8 percent reside in the urban sector, 81.2 percent in the rural sector and 10.0 percent in the estate sector

Agriculture and Livestock

Agricultural crops in the Ratnapura district consist of perennial and semi-perennial crops which mostly include cash crops, paddy and other food crops. The distribution of these crops have close relationship with relief, soil and climatic conditions. Tea, rubber, coco, cardamom and pepper are the main perennial and semi perennial crops in the Ratnapura district. Of the total land area (327,740 ha) in the Ratnapura district about 23,200 ha (7percent) are paddy lands. Ratnapura district accounts for 0.02 percent of the cattle and 0.02 percent of the buffalo population of the Island.

Natural Disasters

The occurrence of floods (which may range from moderate to severe) is most frequent in the Kalu Ganga basin. In terms of periodicity they occur during the southwest monsoon (especially in the months of May to June) and in the inter-monsoonal months of September to October. The Ratnapura town and its environs which lie on the right bank of the Kalu Ganga is especially flood prone. It is reported that, approximately one-half of the population lives on the flood plain, and the majority of flood plain residents are concentrated in the most hazardous areas. Overall the divisions most susceptible to floods are Ratnapura, Ayagama, Elapata, Kuruwita, Pelmadulla, Kalawana and Eheliyagoda. Major landslide areas in the Ratnapura district are found in AGA divisions of Ratnapura, Kuruwita, Elapata, Ayagama, Balangoda, Kahawatta, Godakawela and Pelmadulla. The occurrence of landslides is most frequent during the period of the southwest monsoon.

Water Resources

The Kalu River which measures 129 km (80 mi) in length is the main river in the district. The river originates from Adam's Peak and reach the sea at Kalutara. The Black River flows through the Ratnapura and the Kalutara District and passes the city Ratnapura. The mountainous forests in the Central Province and the Sinharaja Forest Reserve are the main sources of water for the river.

Water Quality

Over the last decade there have not been comprehensive studies on water quality within the Ratnapura District. Water Quality studies conducted by the Department of Forestry and Environment Science, University of Sri Jayewardenepura in 2012 provide insight on the water quality of the Kalu Ganga, which flows across the Ratnapura District.

Based on the results obtained the river was not considered to be polluted much and the presence of heavy metals were not observed. The total coliform count was well below the standard level, while the fecal coliform count was above the standard level especially during the high flow period mainly in sampling points near tributaries.

In 2012 a study was also done on the Iodine concentration in common potable water sources in the estates of Ratnapura district and thyroid status of children on main potable water sources available to the population which in the Ratnapura District was spring water (84%). The findings of this study were published in the Sri Lanka Journal of Child Health. The mean iodine concentration of spring water was significantly lower as compared to other water sources. Further, agro-chemicals have also considerably contributed to the deterioration of water quality in the region. Carbofuran and diazinon are heavily used for controlling insects in the agricultural areas of the district. Carbofuran is used by 65% of farmers as an insecticide in Embilipitiya area and creates a high potential to contaminate groundwater (Watawala et al, 2005)¹⁰.

3.4 Environmental Profile- Badulla District

Location

The Badulla District belongs to the Uva Province, Sri Lanka. The entire land area of the Badulla district is 2,861 km² and the district is bounded by the districts of Monaragala and Rathnapura on the East & South, by Ampara and Kandy districts on the North and by Nuwara Eliya and Matale on the West. The main economic drivers of the district are agriculture and livestock, with plantations and farms dotting the terrain.



Geo-morphology

The Badulla district is located towards the East of the Central highlands. Physiographically, it is a complex region with mountain ranges, dissected plateaus and narrow valleys covering a greater proportion of the district. The Eastern arm of the Central highlands extends towards Dewatagala in the East, through the Southern part of the district. This Eastern range has an elevation ranging from 1200-1800 m to the East. And North-South aligned Namunukula range beyond which are located a section of Lunugala ridges that rise to over 1200m. The terrain of these ridges is rugged. At the extreme South of the district separated from the Eastern range by a steep escarpment is a section of the Koslanda plateau, with an elevation ranging from 300-1000 m. On the whole the general gradient of a large part of the district is northwards to the valley of the Mahaweli Ganga.

Ecologically Sensitive Areas

Among Sri Lanka's nine provinces Uva holds an undisputed first place in natural beauty. Its varied topography ranges from elevations of 2100m on the western borders, to the spreading lowlands on its Southern, Eastern and Northern limits. High mountain chains, steep peaks, precipitous

¹⁰ Watawala, R.C., Liyanage, J.A., and Mallawatantri A.P. (2009). Assessment of Risks to water bodies due to residues of agricultural fungicide in intensive farming areas in the Upcountry of Sri Lanka using an indicator model, In: Food Security and Climate Change in Sri Lanka, Evans A and Jinapala K (Ed), Proceedings of the National Conference on Water, Food security and Climate Change, Volume 2, International Water Management Institute, Colombo, pp 69-75.



escarpments and majestic waterfalls are few of them. The Uva province has within it many of Sri Lanka's outstanding natural sights and wonders. The vast diversity of Badulla area are Montane, Sub Montane, Moist Monsoon and Dry Monsoon forests. These forests cover an area of 93, 3888, 1577, 17517 and 3353 hectares respectively.

Ravana Ella Sanctuary, Badulu-Oya River Basin and Gallanda Oya enhance the ecological value of the Badulla district. About 1932 hectares of Ravana Ella Sanctuary is located around the Ravana Ella falls. Large number of mammals, birds and reptiles distributed within the sanctuary of Rawana Ella. Hakgala Mipilimana Forest Reserve and Thangamale Sanctuary also provide greater diversity to this area. It lays in Haputale and Sorabora Wewa near Mahiyanganaya.

Haputale Forest Reserve provides greater diversity of avifauna in this area. Ravana and Dunhinda provide intimate aesthetic value for Badulla district. Part of the Maduruoya National Park also lies towards the Eastern border of district Maduruoya National Parks is also important Elephant habitats distributed in the area.

Forests Cover

Natural vegetation of the district consists of wet zone forests, intermediate zone forests, scrublands and grasslands. The dense and open forestlands mentioned above comprise only 19.6 % and the total forest cover has been estimated as 54271 hectares within the district. Forest plantations cover 4.6 % from the total land area of the district. There are 10,230 under dry pathana grasslands especially in the crests and upper slopes of hills in Passara, Ella, Haldummulla and Migahakivula where soils are shallow. The 14,240 hectares of scrubland are concentrated predominantly in Mahiyangana and Ridimahaliyadda. These scrublands are the result of the abandoning of chena lands after constant cultivation.

Climate and Rainfall

A large section of the Badulla district belongs to the intermediate zone of Sri Lanka. The average annual rainfall in the district is around 2000 mm. but it varies from 900 mm in the Northern and Southern extremities of the district to over 2500mm in the Eastern flanks the Central highlands, Namunukula and Lunugala ridges. The average annual rainfall of the Uva Basin, which is protected on all sides by highlands, is approximately 1700 mm. The rainfall in the district is subjected to inter annual, seasonal and monthly variations. Drought is an important climatic characteristic in Badulla district. Partial drought occurs very often during the months of February to July. The average annual temperature of the district varies between 20-25°C depending on the altitudes. The period of greatest diurnal temperature range occurs during the Southwest monsoon due to the influence of wind.

Demographic Status

A total of 779,983 populations are distributed within the 15 DS divisions of the district while 465251 (59.4%) of the population is distributed within 9 DS divisions representing all ethnic and the religious group in the country. From the total population distributed in the district 72.4% is Sinhalese, 3.8% Sri Lankan Tamil, 18.4% Indian Tamil, 5% Sri Lankan Moor, 0.1 % Burgher, 0.2 % Malay and 0.1% others. Mainly four religious groups represented in the district as follows: 72%Buddhist, 20.3 % Hindus, 5.3 % Muslims and 2.4 % Catholics. From the total population 51,500 (6.6%) people is distributed in urban areas while 728500 (93.4 %) distributed in rural areas of the district.

Agriculture and Livestock

The Badulla District is an agricultural district where tea, vegetable and paddy are cultivated. Mainly the district is divided into two portions as Upper region and Lower region according to climatic and geographical characteristics. Upper division of the district is famous for tea plantation and vegetable cultivation while lower division is famous for paddy cultivation. Badulla is the third largest tea growing area in the island and both tea estates and small holdings are concentrated over 13 875 hectares in the district.

Paddy is the second most important crop in the district although it is grown only in 7.1 % of the area. During the Maha season over 95% of paddy lands in the district are cultivated but during the Yala the cropped area is reduced to less than 45%. Only 4% of all the minor export crops grow in Sri Lanka is found in the district. Coffee, Cocoa, Cardamoms etc are grown in only 0.5% of the total land area either in pure stands or in mixed gardens. Animal husbandry is also practiced in the region but on homesteads, for local consumption.

Land Degradation

In the Badulla District widespread deforestation gives rise to a series of interrelated environmental problems. Among these the more easily identifiable are those of soil erosion, earth slips, drying of springs, wells and water courses, and the silting of tanks, rivers and tributaries. It also adversely affects soil-moisture and ground-water conditions. The reasons which contribute to soil erosion are deforestation, chena and tobacco cultivation. In the case of both chena and tobacco cultivation, the utilization of steep slopes has further contributed to soil erosion. Prolonged use of pesticides have also lead to the contamination of the soil and water in the region but specific studies have not been carried out to look at the impacts.

Natural Disasters

The Badulladistrict is classified as a district where there are multiple disaster risks, including landslides, drought, flashfloods and forest fires. Deforestations coupled with the absence of soil conservation at the requisite management levels in tea plantations and farms have led to soil instability which results in sever landslides in the area. Land Sides in the Badulla district at least nine AGA divisions (Badulla, Bandarawela, Haputale, Kandaketiya, Migahakivula, Passara, Soranatota, UvaParanagama and Welimada) have seen the occurrence of landslides. Their occurrence is particularly evident during heavy rains and is the result of both the natural and man-made causes.

As per drought hazard mapping done in the early 2000s it was indicated that the Badulla District is the second district among the main districts susceptible to droughts as well, during the dry periods.

Water Resources

Several head streams of the Mahaweli, Walawe, Menik, Krindi, Kumbukkan and Gal Oya rise in the mountain ranges within the district and then flow North, South and Eastwards across the district. The rim of the Basin and the Uva highlands located in its center are highly dissected by the Northward flowing Uma, Badullu and Loggal Oyas and their tributaries. Valley bottoms of the Uma, Badullu and Loggal Oyas have undulating floors while the flanking hills rise sometimes to a height of 900 m. The headwaters of these major rivers which tumble through the province's rugged terrain create numerous enchanting waterfalls. The Bambarakanda Falls which plunge down 790 ft. is Sri Lanka's highest seasonal waterfall, beautifully sited in secluded surroundings. The majestic 560 ft. Diyaluma Falls at Koslanda is Sri Lanka's highest perennial waterfall and sixth highest in the world. Dunhinda (Smoky Water), Sri Lanka's loveliest, most dramatic waterfall is located 5.5 km. from Baddulla.

Water Quality

The use of fertilizers and agro-chemicals in levels above those that are recommended is also a common practice in the Badulla District due to its main agricultural practices yet detailed studies on the quality of water for the District as a whole have not been undertaken to deduce the condition of the water sources available.

As per studies one particular study conducted by the Center for Science and Environment, New Delhi in Sri Lanka on water quality in relation to the presence of heavy metals the water samples of the Badulla district were shown not to contain levels that were not acceptable. The study detected hardness at a mean level of 154 which is within the maximum desirable level of 250 ppm. All samples for calcium were within the maximum desirable level. The levels of fluoride were detected at a mean level of 0.9 ppm, in the range of 0.6 to 1.2 ppm which is normal.

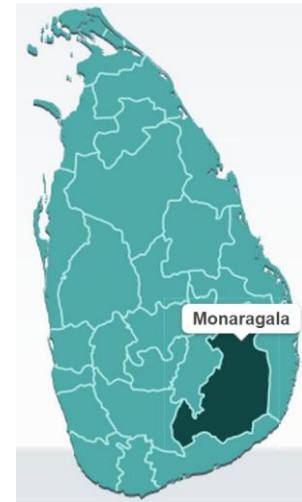
A baseline technical study of water service delivery within the plantations estates in the Nuwara Eliya and Badulla District was also conducted in 2010. The study deduced that estate-managed water supplies are not subjected to any treatment, including disinfection. In general, most of the chemical parameters analyzed are in line with the required quality standards. It was revealed that there is a deterioration of biological quality of water during the supply & distribution in both districts. The water sources in the Badulla District, in particular, showed poor conformity with bacterial quality when compared with the drinking water quality requirements. The mineral and anion content in the raw water is well below the desirable levels for all six schemes this water can be highly corrosive under certain conditions which may damage the network assets also.

It must be noted that Badulla district does not have a long-term water quality monitoring network from which trends & patterns across the district could be reliably inferred upon. The above inferences have been made from isolated research studies.

3.5 Environmental Profile- Monaragala

Location

Moneragala district located in the middle of the southeast quadrant of Sri Lanka occupies a total land area of 5587 square kilometers (566,000ha) and is the second largest district of the island. Located in the Uva province, Moneragala is bordered by four districts on each side, namely Ampara district on eastern and northern side. Badulla district on western and northern side, Hambantota district on southern side and Ratnapura District on the southwestern side.



Geo-morphology

Topographically Moneragala district is in a transitional zone from central highlands to flat lowland. According to the landscape three terrain types could be identified within the district. Highly Mountainous terrain, which covers the Western boundary towards Badulla and Ratnapura districts, the elevation is between 550 to 1400 meters. Undulating and flat terrain, which cover the broad Eastern and Southern plain, occupying about three fourths of the district.

Ecologically Sensitive Areas

A considerable extent of land in the district is under natural reserves and forest. Natural forests under National Parks and or Sanctuaries, which are not available for human settlements, cover approximately a third of total land area in the district and another 25 % of land is under different types of grasslands. The total natural forest area in 1982 was reported to be 16,000 hectares, which is about 28% of the land area. During the past decades forestlands has been cleared at an alarming rate, for chena cultivation, logging and development activities.

The forest cover, which is described as tropical, dry, evergreen, mixed forest and is mainly a secondary climax developed after a long period of earlier civilization based on irrigated agriculture. Weera (*Drypetessepiaria*), Kanumella (*Diospyrosovalifolia*) Palu (*Manilkarahexandra*) Halmilla (*Berryacordifoila*), Kuma (*Glenieaumjuga*), Burutha (*Chloroxyloswietenia*), Kaya (*Memecylonspp*) Kaluwara (*Dispyrousebenum*) are the prominent species found in the high forests in Moneragala district. A considerable extent of vegetation cover in the district is found in the forms of savanna and grassland (pathana) both of which are ecologically categorized as fire climax or Anthro- climax as human activities are causes for existence.

The savanna in West and Northwestern area of the district (Bibile, Medegama and Madulla areas) is well known for their medicinal trees in upper strata. The common species found are Aralu(*Terminalia belerica*), Bulu (*Terminalia chebula*), Nelli (*Embilicaofficinalis*). The ground strata of savanna are dominated by grass varieties like Mana (*Cymbopogonconfertiflorus*). The grasslands are found in Southern dry areas (Buttala and Thanamalwila divisions), bordering forest areas, and they are locally known as "Dry Pathana". They are dominated by guinea grass (*Panicum maximum*) Illuk (*imperatacylindrica*) and Mana. The most important and divers Wild life area within the province can consider as a Moneragala district. Four National Parks (Yala, Galoya, UdaWalawe and Lunugamvehera), few Sanctuaries and number of Wildlife Corridors and Forest Reserves (Lunugamvehera-Udawalawe, SellakaOya Sanctuary, Yala-Lahugala, Bakinigahawela FR, Daragoda FR, NF, and Bibilehela FR) are located within the district. Gal Oya National Park located South-East

of the country in the Eastern and Uva provinces. This park was established to protect the catchments area of the Senanayake Samudraya (lake).

In addition to the National Park, three Sanctuaries (Senanayake Samudra Sanctuary, Gal Oya Valley Northeast Sanctuary, Galoya Valley Southwest Sanctuary) were declared to protect the catchment area of this tank. Together these reserves and the national park cover approximately 63,000 ha of land. Due to the richness of this wetland, the park is a natural habitat for a wide range of fauna and flora consisting of dry mixed vegetation.



Forests Cover

A considerable extent of land in the district is under natural reserves and forest. Approximately a third of total land area in the district is covered by natural forests under natural parks and/or sanctuaries which are not available for human use and another 25 per cent of land is under different types of grassland. The total natural forest area in 1982, was reported to be 160,000 hectares which is about 28 per cent of the land area. The total extent of land under protection in the district exceeds 158,070 ha with proposed area covering an additional 11,900.ha).

Climate and Rainfall

Moneragala district belong to the dry zone of Sri Lanka and total rainfall in the district ranges 1300-1800 mm per year. Over 84% of rain is received during the seven months of October to January and March to May inclusive. There are also minor but significant regional differences in the amount and distribution of annual rainfall within the district. Mean daily temperatures of the district vary little over the year, as the altitude within the vast low country of the district does not exceed 91m. The temperature varies from 21.6oC - 29oC. However, there is a high average annual diurnal temperature range of 8.9 oC. The mean annual relative humidity in the district varies from 75 % at diurnal and 86 % during the night.

Demographic Status

A total population of 397,375 is distributed within the 11 DS divisions of the district. From the total population distributed in the district 94.5% is Sinhalese, 1.4% Sri Lankan Tamil, 1.9% Indian Tamil, 2 %Sri Lankan Moor and 0.1% others. Mainly four religious groups represented in the district as follows: 94.4% Buddhist, 2.9 % Hindus, 2.1% Muslims and 0.6 %Catholics.

Agriculture and Livestock

Present agricultural land use in the district is a combination of traditional irrigated and rain fed agriculture plus the plantation crops. Intermediate and dry zone plantation of sugar cane was introduced by the government, which transformed most of the traditional chena areas and scrub jungles into sugar cane estates and out-growers plots. Paddy is the most important crop in the district, which contributes to 22028 hectares of which over 70%, is cultivated during Maha season and in a normal year while only 20% is cultivated during Yala season. Total extent under the permanent crops is 14000, which include tea (899 hectares), rubber (1830 hectares), and coconut (10,701 hectares). Minor crops of coffee, cocoa and cashew are grown in the district smallholdings. The subsidiary food crop extent, which varies year by year, and season by season contribute to about 13,000 hectares and together with home gardens and permanent highland cultivation.

Livestock Farming is relatively a significant economic activity in the district although it has not been very well developed when its vast potential is considered. The district's livestock is dominated by cattle and buffaloes. There is a limited number of pigs and goats and a considerable population of poultry.

Land Degradation

Soil erosion was identified as a very widespread and acute problem in the district. It is a combined effect of the other environment problems of chena cultivation, encroachment of reserves, deforestation, and mono-cropping which are caused by human activities. In the mountainous region of the North Western part of the district, mass movement, gully, and rill erosion have occurred but most widespread type of soil erosion caused by clearing of land and burning the vegetation before the onset of the monsoonal rains annually. Clearing the land within a short period of time and burning the slashed jungle destroys the soil structure and makes it very susceptible to movement of the topsoil as thin sheet with run-off water.

Natural Disasters

The moragala district is susceptible to sever periods of drought due to the prevailing climatic conditions and geographic location. A look at the seasonal distribution shows that droughts occur largely in the month of August in Moneragala.

Water Resources

There are seven river basins, which drain the Moneragala District. These Rivers originate in the West central highlands and flow towards East, Southeast and South. Most of these rivers originate outside the district boundary and strengthen the volume by several tributaries within the district and then flow outside the district to meet the Indian Ocean. Heda Oya, Kubukkan Oya, Wila Oya, Menik Ganga, Kirindi Oya, Malala Oya and Walawe Ganga are the main rivers drainage through Moneragala district. Menik Ganga has the largest river basin in the district with 117,480 hectares representing 20.8% of the district's land area. This river basin has excess water and good soil for lowland cultivations. Kubukkan Oya is the second largest river in the district, which has a river basin of 112,930 hectares while Walawe Ganga is the third largest river in the district. Malala Oya represents the smallest river basin with only 11,400 hectares representing 2% of the district's land area. There are also a number of manmade tanks in the district that hold water during the dry season, these include the Senanyake Smaudraya

Water Quality

No detailed studies have been done on water quality for the Monaragala District except for very few independent studies that have connected water quality to other environmental and social issues. Water quality data obtained from the NWSDB and from database of on groundwater study in Hambantota and Moneragala District completed by JICA in 2003 presents the basic ground water chemistry. The results of the study showed highly uneven spatial distribution of the fluoride can be observed over the catchment. The fluoride concentration is fairly low in the western and northwestern part of the basin while it exceeds the maximum permissible level (1.5 mg/l) in the Moneragala District (Hambegamuwa) and some areas in Hambantota District. High fluoride concentration has resulted in dental fluorosis among the school children. A study done on the water quality of deep ground water, by the University of Peradeniya in 2012, also reported excessive levels of fluoride and iron which was attributed to the geological conditional and climate of the region. Further, 20% of the deep bore hole wells that were studied were deemed unsuitable for drinking and water quality was reported as below the national permissible levels.

3.6 Environmental Profile- Kilinochchi District

Location

Kilinochchi District is situated in the Northern part of Sri Lanka and belongs to the Jaffna Peninsula, forming its bottom half. It covers an extent of land area approximately 1237.11 square Km and inland water way of 44.30 sq. km. The average density of population is being 96 persons per sq.km. The boundaries of the district encircled are the Jaffna District to the North, the Mullativu District to the East and South and the Mannar Districts to the West and South as well.



Geo-morphology

The typical topography of the Kilinochchi District consists of undulating to rolling, mantled plain stretching down to the coast with large masses of lagoon forming the Jaffna Peninsula. The highest ground level is 11 m above mean sea level (AMSL). The land forms include floodplains, coastal plains, sand dunes, and beaches.

Ecologically Sensitive Areas

The north-eastern part of the mainland including parts of the Kilinochchi District, have large areas of forests and contains a large percentage of the forest cover of the country. Forests in the seasonally dry northern and eastern plains (transition between the wet and dry zones) consist of tropical semi-evergreen forests with their own characteristic species as well as some common to the adjacent zones. The major part of the dry zone has tropical dry mixed evergreen forests, where the dominant species seldom exceed 20m in height and do not form a closed canopy. There are two forests reserves in Kilinochchi District: the recently declared Thirumurukkandiya Forest Reserve and the 1,417 ha Panikkankulam Forest Reserve. These are along the western side of the A9 road in the Paranthan area.

However for more than three decades the conflict has prevented any detailed ecological assessments in the project area, and the only recent data collected on rare and endangered species is from some individual studies carried out by the local universities.



Forests Cover

In the Northern Province as a whole, including the Kilinochchi District, management of the forest reserves faced major difficulties during the conflict period. Forests, forest reserves and Palmyra

plantations suffered heavy damage due to their use by combatants and the resulting effects of land mines and shelling, and from unregulated felling for timber. A skeleton staff of the Department of Forests Conservation continued to operate at Vavuniya but enforcement of the legal forestry regulations was prohibited in areas not controlled by the Government. As a result, some parts of the forest reserves were deforested and used for settlements or for other activities by combatants. About 27.5% of the land in the Kilinochchi District is under forest cover. There are two forests reserves in Kilinochchi District: the recently declared Thirumurukkandiya Forest Reserve and the 1,417 ha Panikkankulam Forest Reserve. These are along the western side of the A9 road in the Paranthan area.

Climate and Rainfall

Kilinochchi District is also in the dry zone. The average annual rainfall here is 1,017mm and again nearly 75% falls during the Northeast monsoon from October to January. The remaining period of the year is dry with the driest period being June to August. According to the regions meteorological data, the average monthly temperature is 28.4 °C while maximum and minimum averages are 35.0 and 21.3 °C. The average monthly temperature ranges from 25.6 to 30.0 °C. Monthly average wind speed varies from 5.9 to 1.7 km/h and the highest level is recorded in June, and lowest in November. Figure 7 shows the rainfall pattern in the project area

Demographic Status

During the conflict period the country lost many lives, many people were displaced and were forced to flee from their homes in Northern and Eastern Provinces. Due to extensive fighting, severe damage was caused to lives, properties, houses, and public amenities. As a result the entire population in Kilinochchi District was forced to evacuate during the latter stage of the civil war in 2008-2009 and transferred to IDP camps in Jaffna and Vavuniya Districts. With the end of the conflict in May 2009, under the Governments' resettlement schedule, a total population of 26,785 (2,416 families) were resettled in Karachchi (3,218 families), Poonakary (4,937 families) and Pachchilipalai (261 families) divisions as of February 2010. As per the Population census conducted post the resettlements, the total population was recorded as 112,875 individuals at a density of 88/km² (230/sq mi). The breakdown of the population of ethnicity is, Sri Lankan Tamil-109,528 (97.03%), Indian Tamil-1,682 (1.49%), Sinhalese-962 (0.85%), Sri Lankan Moors-678 (0.60%) and other ethnicities-25 (0.02%)

Agriculture and Livestock

While the cultivatable land extent in the Kilinochchi District is in the region of 50% nearly 45% of the cultivatable land is paddy land and 27% of the land is cultivable with subsidiary and other food crops. The balance 17% of the land is planted with perennial crops such as Coconut, Mangoes, Bananas, Palmyrah, and Limes, etc. In Kilinochchi District, agricultural production was the major livelihood of the population. Among the annual crops paddy is the major crop cultivated in larger extent. It is cultivated in 14,650 ha in Maha season and 4,413 ha in Yala season producing a total of 41,057 MT in 2008. Both minor irrigation and rain-fed methods of cultivation are used throughout the district. Field crops were cultivated under lift irrigation from the dug wells and deep wells. The common field crops cultivated in the district are chilli, onion, cowpea, green gram, black gram, groundnut, gingili, potato, and vegetables where the major cash crop is chilli. Perennial crops cultivated in the district include fruit crops like mango, lime, banana, orange, jackfruit and coconut. Fruit crops were cultivated in 1,042 ha. Total extent of coconut in Kilinochchi district was 11,541 ha. Most of this is under small holding and estates and a small amount in homestead. Animal husbandry is mostly managed at the homestead level for minimal local consumption.

Land Degradation

There are no recent studies done on the land degradation patterns in the Kilinochchi via which proper conclusions can be drawn. Due to the conflict period there were high level of mines in the Kilinochchi District and demining activities have been completed, apart from this as intensive farming and anthropogenic activities were less it is expected that the land degradation would be less in comparison to other inhabited areas of the country.

Natural Disasters

The tsunami that hit Sri Lanka on December 26, 2004 caused the worst devastation from a natural disaster in the country's history and affected Kilinochchi as well. The division affected in Kilinochchi District were Pachchilapillai, Kandawali, and Poonakary. Thus these areas still remain susceptible to Tsunami Risk.

During the months of October to January with the North East Monsoon period, cyclonic activities and depressions in the Bay of Bengal bring heavy torrential rains to the project area in some years. The most recent cyclone which caused severe flooding was the Cyclone Nisha which swept through the Jaffna Peninsula in November 2008 bringing with it very high rain fall.

Water Resources

There are 7 perennial rivers available in the district with the total catchment area of 1,823 km². Further nine major irrigation tanks are available in the district with a total capacity of 1,575,55 acre feet of water. The total irrigable extent under major irrigation is 13,172 ha. A total of 283 minor tanks are also available in the district. Each of these tanks has the capacity of irrigating less than 80 ha. Among them, 106 minor tanks are abandoned. Among the major irrigation tanks Irranaimadukkulam, Kalmadukkulam and Akkarayankulam are the largest tanks in the district.

Water Quality

Detailed studies on the quality of the available water resources are still underway in these districts post the end of the conflict in 2009, thus detailed data on the current status of water quality are not available.

3.7 Environmental Profile- Mullaitivu District

Location

Mullaitivu District is a district in Sri Lanka which was created in 1979. This District occupies the Eastern part of the main land of Northern Province. Mullaitivu District has the Kilinochchi district on its Northern border, the Trincomalee district and the Vavuniya district and part of the Mannar district in the south, Mannar district in the West and the sea in the East. It covers a land area approximately 2516.9 sq. Km (including forest areas and excluding large inland waters). This District accounts for 3.8% of the country's total area.



Geo-morphology

The physical feature of Mullaitivu District is flat land, generally sloping to the East and North, in the Western part, towards West and South. This district has 70km of coastal belt and four lagoons viz Kokkulai, Nayar, Nanthikadal and Mathalan with high potentials for prawn culture. The evaluation varies from sea level to 36.5 meters.

Ecologically Sensitive Areas

With respect to floral and faunal distribution four different types of habitats namely natural forest and forest plantations, paddy fields, and water bodies are observed. However all most all of these habitats had been modified for about 30 years mainly due to the civil conflict prevailed in the areas. Natural forest and scrub areas are mainly dry mixed evergreen forests characterized by floral species such as palu (*Manilkara hexandra*), burutha (*Chloroxylon swietenia*), weera (*Drypetes sepiaria*), divul (*Feronialimonia*), milla (*Vitex altissima*), *Syzygium* spp. and ehela (*Cassia fistula*). As per 2007 red list of threatened fauna and flora of Sri Lanka and Asian elephant (*Elephas maximus maximus*), a vulnerable mammalian species is inhabiting the Mullativu area. Mullaitivu district has a wonderful coastal stretch which is almost 70 kilometres long from Chundikulam to Kokilai and the beaches are well preserved due to limited human activity in the areas.



Forests Cover

It is estimated that the forest cover in the Mullaitivu district is as follows, Natural Forests 270 hectares, dense forest 133,490 hectares and open forest 31,620 hectares. Forest plantations are estimated to count for 2740 hectares. Unfortunately post the conflict no detailed studies have been conducted to take stock of the forest cover in the region as yet.

Climate and Rainfall

Mullaitivu has comparatively low annual rainfall and it is constricted to period from around November to February. Main rainfall governing season for the project area is north east monsoon with the effect of north – east winds which exists from November to February. Other than this, the area receives a considerable amount of rainfall during months of September and October with the effect of Second Inter Monsoon. During this period there is a possibility of experiencing minor cyclones to this area of the country. The period from May to September is generally dry and there is a dry wind flows over the district. However localized sporadic rainfall events are possible during this period due to the effect of local convections. Annual temperature varies from 26.50C to 300C while high monthly temperature is observed during May to September.

Demographic Status

Mullaitivu District's population was 91,947 in 2012. The population of the district is mostly Sri Lankan Tamil. Like the rest of the north and east of Sri Lanka, has been heavily affected by the civil war. As per the population senses of 2012 the ethnicities of the population are as follows Sri Lankan Tamil-79,081 (86.01%), Sinhalese- 8,851 (9.63%), Indian Tamim-2,182 (2.37%), Sri Lankan Moors-1,7 (1.91%) and Other-73 (0.08%).

Agriculture and Livestock

The Agriculture sector is the main income generating source in this district. Totally 80% of people depend on this sector. 3 major tanks & 16 medium tanks feed paddy land of 7109 ha and 220 minor tanks feed paddy lands of 11749 ha in this district as per the Districts 2012 annual Performance Report & Accounts. Post conflict assessments have indicated that District has 16737 ha of suitable land to undertake paddy cultivation. Due to the many lagoons and coastal area, Fishing is also major source of income for locals. This district has a coastal belt of 70 km and four lagoons namely Mathalan, Nanthikadal, Nayaru & Kokulai which are very suitable for fishing development. These lagoons are famous for crab and prawn cultivation. There are possibilities for inland fishing

development in major tanks. Fishing sector takes important place in generating employment opportunities and income facilities to considerable number of families in this district. Still deep-sea fishing is not attuned by concerned authorities.

Land Degradation

There are no recent studies done on the land degradation patterns in the Mullativu via which proper conclusions can be drawn. Due to the conflict period there were high level of mines in the Mullativu District and demining activities have been completed, apart from this as intensive farming and anthropogenic activities were less it is expected that the land degradation would be less in comparison to other inhabited areas of the country.

Natural Disasters

Assessments have shown that the Northern Province as a whole including Mullativu is vulnerable to natural disasters, particularly cyclones, floods, lightning strikes and strong wind events, especially its coastal areas. The tsunami that hit Sri Lanka on December 26, 2004 affected conflict affected Mullativu furthermore, causing major devastation to coastal towns and villages. Thus the Tsunami risk remains in the area.

Water Resources

Kanakarayan Aru (3km) and Kuruweli Aru (26 ~ 26.5km) are the major streams while there are few minor streams found in the Mullativu District. Kanakarayan Aru is fed with a catchment area of 896km² while the catchment of the Kuruweli Aru is 374km². In addition to streams inland tanks hold fresh water for the area and Olumadu tank (4km), Kruppaddamurippu tank (9.7km) and Kulamurippu tank (31km) are such major tanks found within the district. The inland tanks have been badly damaged or abandoned during the past 30 years due to lack of maintenance. Most of these water sources are seasonal which get dried during the dry season. Dug wells and tube wells located in home gardens are a common sight and residents mostly depend on ground water for drinking and other domestic requirements.

Water Quality

Detailed studies on the quality of the available water resources are still underway in these districts post the end of the conflict in 2009, thus detailed data on the current status of water quality are not available.

4 Assessment of Potential Environmental Impacts & Impact Management Measures

Preliminary assessment of environmental issues relevant to the project

The project is classified as safeguards category B. From an environmental point of view, the overall project outcome is expected to be overwhelmingly beneficial. And, as has been witnessed through the previous two projects, constructional impacts of water supply and sanitation projects of the proposed scale are not very serious.

However, there are potentially critical environmental risks that need to be taken into consideration when sub-projects are planned and designed in order to ensure these risks are adequately understood and addressed, so that communities could enjoy the anticipated multiple benefits of clean water and improved hygiene in the long-term. Therefore, the project needs to pay due consideration to these risk factors, which are discussed below, to ensure that adequate precaution is built in to enhance environmental sustainability of water supply schemes.

As mentioned earlier, this EAMF reflects experience gained under IDA financed CWSSP II and AUSAID financed/WB managed NEP WASH, and tried to build on the key lessons learnt. The EAMF will be a living document and will be reviewed and updated periodically as needed.

4.1 Possible Positive Environmental Impacts

The multiple benefits of rural water supply and sanitation projects have been amply demonstrated in past similar experiences in the country. Consumption of unclean water and improper disposal of human waste are known to be the primary causes of many water borne diseases that undermine community and environmental health. As such, the project which aims to provide nearly 125,000 households with access to safe drinking water and improved sanitation will have many positive health and environmental impacts to the communities in the selected localities. In addition to improved community health, the following positive impacts of improved water supply and sanitation has been documented and is anticipated to occur under the proposed program as well.

- Poverty Reduction and social equity;
- Reduction of activities contributing to pollution of water sources;
- Source protection and catchment area protection;
- Construction of hygienic latrines and reduction of environmental pollution;
- Improved rural environment which leads to appreciation of land values;
- Reduction of forest clearing for fuel wood for boiling water;
- Reforestation in the catchment areas by the communities to protect the water sources;
- Improved nutrients and moisture condition in soil due to discharge of domestic waste - water into house gardens and vegetable plots, thereby promoting the good practice of home gardening; and
- Enhancement of the self esteem and social acceptability of the individual beneficiaries by the use of proper latrines.
- Saving of time by women through improved water facilities and opportunity for community engagement
- Social integration and social capital building through water user associations

4.2 Possible Negative Environmental Impacts and Mitigation Measures for water supply design

Depletion of water resources

The project will develop both surface and groundwater sources depending on the availability. Although each individual rural and small town water supply scheme of the proposed scale is unlikely to cause significant depletion of water resources, the water source identified could already be stressed due to over abstractions. Hence, it is necessary to identify these challenges in water source development and consider cumulative impacts of all abstractions in the sub-catchment as part of feasibility studies, so that sub-projects designed are sustainable to serve the communities for its design lifetime.

The proposed project area is vast and shows wide variability in terms of quality and quantity of available water resources. In the North, Mullaitivu and Killinochchi districts, groundwater is the main source of water for domestic, agricultural and other needs.

- Water scarcity and competition for available water between different water use sectors has seen the intensified utilization of water resources resulting in negative impacts such as over-extraction, drying up and salinity intrusion.
- This is especially so in the dry zone, including areas such as Jaffna in the Northern Province.
- However, since Mullaitivu and Killinochchi have been largely undeveloped due to the long drawn out civil conflict, these issues could be less pronounced than in the Jaffna district.

In the case of other districts both surface and groundwater sources will be used. In the central hill country, where there is ample surface water perennial rivers and streams will become the main water sources.

- During the feasibility and design stage, it is important to study the **available flow in both wet and dry seasons** and the proposed % of extraction as well as the method of extraction in order to assess both downstream social and environmental impacts.
- Possible adverse social impacts could include depletion of available water quantity for other downstream functions such as irrigation diversions, other drinking water supplies, industrial abstractions, mini-hydro power generation, fishing and tourism etc and subsequent user conflicts
- Possible adverse environmental impacts could include impacts to aquatic habitats, reduction in fish stocks, destruction of riparian habitats and reduction in natural moisture content of the soil in the immediate neighbourhood downstream.
- In addition, if the method of abstraction involves constructing river barriers and weirs, impacts to fish and other wildlife migration, aquatic habitat fragmentation, inundation of riparian wildlife areas could occur and need to be considered.

Given the experience so far with CWSSP II, the likelihood of extreme downstream social and environmental impacts occurring from the type and scale of schemes proposed is low, as other the natural springs in the sub-catchment would contribute to the downstream flow of the water course, maintaining its natural water balance. However, site specific assessments for each site should be conducted.

Mitigation measures for source sustainability

- During the feasibility stage of sub projects, the minimum yield of a source should be assessed by monitoring the flow/levels regularly over a period of observation (at least for

six months). Then, a safe yield should be determined using standard methods, based on an assessment of current requirements and the predicted increase in the current demand (for a given future) for water in the sub-basin.

- This would provide the basis of determining the yield from the particular source for the sub-project without compromising other current water users.
- Thus, at the planning stage, utilisation of the entire source for the proposed scheme must not be intended, and a good proportion of the flow (at least the environmental flow), especially during dry seasons, must be ensured downstream.
- Based on the water needs assessment of all current and potential users agreements should be reached for user-sharing at a catchment/sub-catchment level, if necessary.
- During the scheme operational stage, there is a possibility that the beneficiaries, in an attempt to increase and expand their water supply, would try to capture the entire yield of the source. In order to mitigate this risk, an assessment of the long-term requirements of the community should be made at the planning stage if possible, and this value used as a design parameters.
- In addition, O&M agreements should specify that communities will need to get clearance from the local authorities for increased rates of abstraction and that it should not exceed the design specifications of the water scheme.
- Augmentation of existing water supply schemes through rehabilitation/upgrading should be on priority wherever feasible.
- Efficient use of water should be promoted through education, regulation, incentives and disincentives.
- To minimize negative impacts to downstream aquatic and riparian habitats from river/stream damming (weirs), a study of the aquatic habitats and organisms should be conducted and depending on the need fish pass structures should be included in the weir design to ensure continuity of the river for animals that migrate for various needs.

Water source degradation

Source selection

The process of choosing the most suitable water source for public water supply largely depends on local conditions. Among the several factors considered in source selection is the quality of the source. In Sri Lanka both groundwater (springs, shallow wells, bore holes) and surface water (streams, rivers, lakes, tanks, irrigation canals) are used as water sources for public supply.

While good quality groundwater aquifers, rivers and streams that require minimal treatment can be found all over the country, water resources have come under increasing quality issues due to anthropogenic activities. In general, problems of water quality can arise from two main causes (i) naturally high levels of some chemical constituents due to certain climatic and hydro-geological setting of the area and (2) anthropogenic pollution and excessive abstraction.

Generally, in Sri Lanka, issues with chemical water quality for drinking purposes are mostly studied for groundwater on which most people in the dry zone areas depend on for their water requirements. While comprehensive water quality monitoring on a continuous long-term basis has not taken place in the country, some patterns endemic to certain areas have been reported through various research work. Some of these issues could pose potential risks in the project area, adequate diligence should be paid for source water quality investigations.

- High levels of fluorides have been reported for groundwater (for both dug wells and deep wells) in some hard rock areas of the dry zone. It is caused by a combination of climatic and geological conditions in these areas. Fluoride, though considered an essential element that promotes dental health, becomes toxic when ingested in excessive doses¹¹. The optimum recommended range for fluorides that generates health benefits is rather narrow: 0.5 – 1.5 mg/L by WHO; 1.5 mg/L maximum limit by Sri Lanka Standards Institute (SLSI)).

The known worst affected high fluorides areas, such as the North Central and North Western Provinces, are outside the WSSIP area. Within the project areas, some parts of the Uva province have reported high fluoride levels. The Northern Province could potentially experience high fluoride areas but no published data exists given that these areas were under the conflict for 30 years.

- High iron and manganese concentration has been reported in ground water in some parts of the country. While exact information on the spatial distribution of iron and manganese enriched groundwater aquifers is unavailable, certain studies have pointed to high iron content in water in some parts of the Southern Province. While this province is not part of the WSSIP project area, there could be localized problems in other parts of the country with similar hydro-geographic settings.
- Water hardness is another common problem encountered in the dry zone, especially in the Northern and the North Central Provinces, caused by the leaching of calcium and magnesium salts from the underlying geology. Water hardness is easy to detect in the field and the people in the area would have a good awareness about it as it imparts an objectionable taste to the water.
- In the coastal areas, the potential of groundwater aquifers for drinking purposes is constrained by the presence of high salinity levels as a result of salt water intrusion.
- Inorganic pollution due to high nitrates has been reported in shallow sand and limestone aquifers in intensely cultivated areas. This problem has been extensively studied in coastal aquifers of Jaffna and Puttalam which are not within the project area, however, nitrate pollution has occurred in inland areas as well.
- Although little documented data exists, water in surface streams and shallow groundwater wells have increasingly come under threat from bacterial pollution owing to bad sanitary facilities and practices. In the hill country, where headwaters of many of the rivers/streams are located, run off from tea and vegetable fields (which are intensely cultivated using inorganic chemicals) and watershed forest clearance for further development are contributing to water quality deterioration.

Long-term exposure to excessive chemicals gives rise to various public health concerns. Since of late, the Chronic Kidney Disease of unknown etiology (CKDu), which has affected a large number of people in some areas, has taken centre-stage in the country's public health sector. Given its importance, this issue has been given some prominence in the following section.

¹¹ Dissanayake C.B., 2005, Journal of National Science Foundation of Sri Lanka 33(3); 161 - 168

Over the last two decades or so a significant increase in CKDu patients has been observed in some parts of the dry zone in Sri Lanka. The worst CKDu affected areas include the North Central Province, North Western Province and some areas of the Eastern and Uva provinces. Out of this, only Uva province is within the project area. Despite numerous research efforts including those funded by the WHO over the last decade, none of the hypothesis regarding what is causing CKDu has been conclusively proven. Hence, the causative factors and etiology of this disease is therefore still considered uncertain or unknown.

However, drinking water is at the base of all theories and all studies point to a strong linkage between the disease and drinking water quality in the affected areas. The following have been widely discussed as possible risk factors against which preventive measure are recommended.

- **Fluoride in drinking water**

Some of the worst fluoride contaminated areas, such as North Central and North Western Provinces and pockets of the Uva province are also the endemic CKDu areas. Out of these areas only Uva province is within the project area and the CKDu areas are located closer to its border with the North Central Province. This hypothesis is not conclusive given that high fluoride levels are encountered in non-CKDu endemic areas as well. Another research study points to the possibility of cooking in aluminum pots with fluoride enriched water as the main causal factor.

- **Water hardness and arsenic**

Some research studies have reported an overlap between the distribution pattern of high ground water hardness with that of CKDu patients, while a link has been proposed of a combination of high levels of arsenic and hard water as what is causing the disease. The CKDu affected area is largely farmlands and the chemical fertilizer/pesticides used intensively in the fields are the key source of arsenic in water, hence it is considered a strong risk factor. It has been also suggested that fluorides and hardness in combination could be the main risk factor.

Research on the CKDu continues, however, the common consensus seem to believe that the cause of the disease has a strong link with drinking water quality (mainly groundwater on which majority of the CKDu affected areas depend on) and hence provision of pipe bourne treated drinking water has been recommended as a key mitigation against the problem.

As mentioned, a majority of the CKDu areas lie outside WSSIP project area. Within the project area, Giradurukotte in the Uva Province has been identified as a CKDu affected area.

Mitigation measures for source selection

Water quality can vary greatly, temporally and spatially even within the same area. As such, identification of the most appropriate water sources both in terms of quality and quantity within a reasonable distance to the service area is a critical step in developing water supply schemes.

- The project proponent should perform a full raw water quality test of the selected source, repeated under different climatic conditions, and design the treatment process to treat raw water to comply with SLSI standard for drinking water in Sri Lanka (see **Annex 1**). This process is mandatorily followed by the NWSDB who has published several technical guidelines on source selection and design of urban/rural water schemes.
<http://www.nwsdbrws.org/guidelines/GL12.pdf>

http://nwsdbwss.org/training_manuals/TM04.pdf

The NWSDB is the authority in Sri Lanka on public water supply and has well established procedures, technical expertise and resources (including a network of regional laboratories) to ensure that drinking water distributed meet SLSI standards.

- Additionally, the site environmental screening that will be undertaken for each scheme will particularly collect, evaluate and report information on water quality aspects.
- If the selected sources have quality limitations, suitable treatment methods (low cost & low maintenance) should be incorporated into the design so that water at the end of the pipe fully complies with SLSI standards. If not, alternative sources should be explored. This is also the NWSDB policy.
 - ✓ Water with high levels of fluorides can be treated with various defluoridation methods. In Sri Lanka, granular insoluble media is commonly used which adsorbs fluoride as water percolates through them. Since these processes are difficult and expensive, the best solution, where alternatives exist, would be to abandon the source and seek a new one.
 - ✓ If nitrates in the source are proved to be exceeding Sri Lanka standards it would be necessary to seek alternative sources as nitrate removal is expensive and requires technical expertise that may go beyond the capacity of the CBOs where the rural and estate schemes are concerned.
 - ✓ Iron and Manganese imparts an objectionable taste and odour to water when it exceeds about 0.3 mg/L and 0.1 mg/L respectively. Iron and manganese can be removed from water with a combination of aeration, sedimentation, sand filtration and lime treatment depending on the chemical concentration.
 - ✓ Hard water also has an objectionable taste can be removed with lime softening, ion exchange and filtration.
- Water that meets SLSI standards will ensure that mitigation against CKDu risk factors are taken.

Source protection

A source that is plentiful, uncontaminated and requires no treatment or disinfection at the time of project planning can later become vulnerable to contamination and depletion due to subsequent development in its catchment. Therefore, developing basic **Water Safety Plans** (WSP) targeting the immediate catchment for each scheme should be a priority requirement.

Developing WSPs is a comprehensive process and requires the combined efforts of many stakeholders. In 2005, the NWSDB jointly with the MOH developed a policy for a water surveillance system targeting each water supply scheme, irrespective of operator. Since of late, after a slow initial period, the NWSDB has begun the implementation of this policy in various parts of the country.

Under WSSIP, WSP should be integrated into the design and implementation of water supply schemes. The project should mobilize the required technical assistance for developing the WSPs.

WSP can be very comprehensive and time consuming to prepare. Briefly, it should include;

- Delineation of inner/outer catchment boundaries.
- An assessment of upstream/catchment conditions as well as potential for activities in the future that could lead to source degradation during the planning stage. This will involve engagement of concerned parties such as the Local Authorities, District/Divisional Secretaries and Grama Niladhari etc in discussion to identify and evaluate such risks.
- Design of proper protective measures in the intake and its surroundings, with properly covered chambers and erection of protective fences erected where necessary.
- Micro-watershed protection and tree planting in buffer zones
- Regulation/relocation of land use activities within specified distance from the source
- Other pollution control measures such as maintaining chemical fertilizer/pesticides free zones

During sub-project planning, the NWSDB, CBO and consultants will assess the need for and type of short/long-term source protection activities that would be required under each sub-project and include them as part of implementation and/or O&M plans. The project would explore possibilities of engaging and training beneficiary communities and local authorities in such initiatives.

4.3 Construction Phase Environmental Issues for Water Supply and Sanitation Schemes

Encroachment into ecologically sensitive areas

There are many wildlife and forest protected areas and sensitive wetlands in the proposed project areas. It is possible that the water sources identified could sometimes be located in such sensitive areas, away from human settlements. In such situations;

- The NWDSB should consult the relevant authority (DS, Forest Department, Central Environmental Authority, Department of Wildlife Conservation etc) and follow the procedure for obtaining permission to utilize the water source/s for purposes such as drinking water supply.
- Construction activities at the point of tapping of the water source are generally confined to a limited area, and hence would not be destructive to the environment. The method used for abstraction of water from ground aquifers and streams should be such that it will not disturb the natural condition of these sources, which is a fact should be strictly observed during construction.
- No heavy machinery should be used for construction, nor should heavy transport be involved requiring road construction or clearing of jungle. Transport of construction materials should be made manually to the site in such cases.
- No rock blasting should be permitted, as it could disturb the stream/aquifer and the surrounding forest

Felling of trees

Ground preparatory activities will require clearing of vegetation and trees on the water transmission/supply network and access roads as well as where all the other facilities will be constructed. This is not expected to cause significant impacts, however;

- Felling of trees shall be limited to the absolute minimum and replaced on 1:2 ratio.

Dust, soil erosion and damage to other utilities

Trenching along the route of the water transmission/supply lines, site clearance and excavations for water treatment plants, septage treatment plants and other associated infrastructure can cause;

- Dust generation and impairment of air quality in the locality. This is will be a rather localized impact which will last only during construction period.
- In the hilly terrain soil erosion will be an already existing issue. Hence, trenching will need to be planned on a roll out basis to minimize length of excavations at a given time.
- In the North soil erosion will not be a major issue given the flat terrain and dry weather that prevails most part of the year.
- It is possible that roads and drains may get damaged during trenching. In estates and rural areas other types of utilities such as underground telephone and electricity cables are usually not present and hence damage to these utilities will be at minimum. However, in small town water supply scheme utility relocation might become a necessity and the sub-project planning will need to identify such issues early.
- Any road damage that will occur will need to be reinstated by the project through the regular maintenance agency.

Increase generation of waste water

With the introduction of piped borne water, there will increased generation of domestic wastewater than before.

- It is not expected to be a significant issue in rural communities as water from the pipe would be used mainly for drinking and cooking purposes. In fact, increased discharge of domestic wastewater would have an indirect beneficial effect by improving soil moisture levels in the homesteads and thereby promoting the good practice of home gardening.
- Most rural communities are in the habit of depending on home garden produce for various family needs, mostly nutrition, and lack of water in the dry zone is the restricting factor. Where houses are supplied with running water, domestic wastewater discharges (from the kitchen tap) are frequently used in a productive manner by diverting to vegetable/banana plots.
- As use of detergents etc is rare in rural communities, kitchen water is deemed to carry little or no risk in its application to food crops. However, the project should ensure to provide guidance to communities on the possible limitations of applying all types of waste water to vegetable/fruit plants through its hygiene program.
- Therefore, the project does not anticipate this as an issue in rural/estate areas and would encourage communities to develop their own solutions for wastewater management with technical assistance from the project if needed.
- Where the community would opt for common water pipes, such as stand posts, dug wells and tube wells, there may be a slightly increased risk of wastewater stagnation and mosquito breeding. However, it is unlikely that communities would choose common water point as the preferred service level. Past experience show that the preferred service level is the household connection.
- In small town areas increased WW generation can be an issue. Most of these towns do not have WW collection and treatment options and the water will usually drain out to the nearest stream/waterway or infiltrate into the ground.

- Small town water supply schemes will need to look into this issue and assess current practices and potential for pollution to occur. NWSDB will be required to provide case-specific solutions which are technically feasible, low cost and low maintenance.

Improper siting of latrines near water sources

If the latrines are sited too close to the water sources, there is a possibility of the source getting polluted. This is especially so in areas where there is a high ground water table. In order to ensure proper siting and construction quality, the project will ensure that the;

- CBO, supported by the project, will inspect the site and approve the application that has been made by a beneficiary for the partial grant. The CBO will approve the application subject to proper siting and recommended design considerations.
- The necessary training in latrine design and siting will be provided to the CBO members assigned to implement the sanitation program in each village.
- Latrine construction will be monitored by CBO and technical officers in subsequent inspections made at the time of part payments.

Bad Odours and Mosquito Breeding in Damaged Latrine Pits

If the latrine pits are damaged during usage, there is a possibility of mosquito breeding and emanating bad odours. Proper construction of sub structure will minimise such possibilities. To ensure this, inspection of the construction will be made prior to the payment of installments, thus allowing time for corrective action during construction.

Material transport and on-site stockpiling

Construction material transport and on-site stockpiling can cause various issues such as reduction of road parking, obstruction to vehicular movement and increased traffic, disturbance to pedestrian movement and safety issues, localized flooding due to blocked drainage paths, contamination of surface runoff and even interruption of livelihoods of pavement vendors, hawkers, middlemen etc. The severity of impacts will depend on the location characteristics.

The project will be implemented in rural and semi urban areas where finding land area for stockpiling will not be a major issue and traffic on the roads will not be as dense as in urban areas. However, these impacts need to be assessed during screening and managed during implementation.

Traffic and Access Management

Construction activities have the potential to cause obstruction to vehicular/pedestrian movements and cause inconvenience to residents due to traffic diversions and restricted entry to by-roads. During construction especially near residential areas, contractor should plan their works in such a way that vehicular and human movements are not disturbed by on-going pipe laying and construction. In particular, the contractor should pay attention to;

- Special safety measures in case of public places for access;
- Special safety measures for access for children to schools;
- Special safety measures for access of patients to hospitals.

While traffic is not anticipated to be a huge issue in rural areas, temporary closure of access can be very inconvenient to people.

Health and safety

Health and safety of worker and public are critical aspects, and often overlooked, in construction. While the project may not involve perilous construction activities, minimum standards to ensure worker safety and public safety must be ensured. Please refer Annex 2 for a list of these minimum standards.

Construction in landslide hazard zone

Landslides constitute a major natural disaster threat in the Central and Sabaragamuwa Provinces. While not all areas are equally vulnerable, various parts within these two districts have been subjected to landslides from time to time causing much damage to people and property.

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. The LHZ maps assign risk levels to areas depending on susceptibility for landsliding. It is important for WSSIP to use the LHZ maps for project areas concerned in these two provinces as a basis for initial risk screening. The NBRO should be consulted for site specific remedial measures especially where overhead/ground water reservoirs, treatment plants etc are to be located in vulnerable 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.

Impacts on physical cultural resources

The project area is vast and although it's outside the cultural triangle and other well known sites of cultural significance, negative impacts on unknown PCRs can take place either directly or indirectly during project implementation. The impact from the project on PCRs, if at all, is considered low given the nature of construction activities under water supply schemes. However, the following procedure is recommended for the contractor to follow in dealing with chance find of a PCR.

Recognition of unknown PCRs

- This is the most difficult aspect to cover, especially when the contractor is not full-time accompanied by a specialist.
- For WSSIP contracts, the initial environmental screening will try to capture any presence of PCRs in the vicinity of project sites.
- As part of screening, the PMU will be required to consult with the Department of Archaeology before work commencement to identify the likelihood of such material being uncovered, especially where trenching work is expected for pipe laying etc.
- The Department of Archaeology has inventoried PCRs for most areas of the country.

During execution of work, **if a discovery of such material is made or suspected**, the contractor should carry out the following;

- Immediately stop construction activities.
- With the approval of the resident engineer delineate the discovered site area.
- Secure the site to prevent any damage or loss of removable objects. In case of removable antiquities or sensitive remains, a night guard should be present until the responsible authority takes over.
- Through the Resident Engineer, notify the responsible authorities, the Department of Archaeology and local authorities within 24 hours.
- Submit a brief chance find report, within a specified time period, with date and time of discovery, location of discovery, description of finding, estimated weight and dimension of PCR and temporary protection implemented.
- Responsible authorities would be in charge of protecting and preserving the site before deciding on the proper procedures to be carried out.
- An evaluation of the finding will be performed by the Department of Archaeology who may decide to either remove the PCR deemed to be of significance, further excavate within a specified distance of the discovery point and conserve on-site, and/or extend/reduce the areas demarcated by the contractor etc. This should ideally take place within about 7 days.
- Construction work could resume only when permission is given from the Department of Archaeology after the decision concerning the safety of the heritage is fully executed.

4.4 Operational Phase Environmental Issues for Water Supply

Water safety plan implementation

As mentioned earlier, water safety is a critically important factor in the continued and regular supply of safe water to the community during the operational phase. While the preparation and implementation of water safety plans will be encouraged under the project (at least for a pilot number of schemes), as a minimum;

- The NWSDB and CBOs who will be operating and maintaining the scheme will need to ensure that a full drinking water quality test is performed on the source at least twice a year in the closest NWSDB laboratory, so that any changes in quality can be detected early and remedied before the risk becomes too high.
- As such, water quality monitoring should be mainstreamed as part of O & M activities to be mandatorily carried out, especially by the CBOs in the rural sector.
- In order to ensure this, training of the CBO members on basic water quality training and testing should be planned and carried out.

Leakage and unsafe water in pipelines

Water is often wasted through leaking pipes, joints, valves and fittings of water supply system either due to bad quality of material used, poor workmanship, corrosion, age of installations, or through vandalism as well. This leads to a reduction in supply and loss of pressure. The leakages could either be visible or invisible. In the case of invisible leaks, sections of pipeline must be isolated and searched for location of leaks.

Also, the lack of maintenance of pipeline may cause leakages in the long run which have various other negative impacts such as water stagnation in the village roads/streets/low lying areas. Contamination of water could occur due to improper maintenance of structures, or breakage of pipe lines. The risk would be higher in CBO supervised schemes.

- Proper construction of facilities with adequate quality supervision will be required to minimise this problem. Correct plumbing practices and strict quality control on pipe material used for house connection and pipe network during the constructional phase must be ensured.
- Therefore, the rural sub-projects will need to assure quality of construction and also try to engage the Public Health Inspector (PHI) of the area in a supervision role. Further, regular checking by the project staff will further strengthen the supervision aspects.
- Caretaker CBOs will need to be trained on preventive maintenance aspects. Preparation of good O&M manuals detailing daily, monthly and annual maintenance requirements (cleaning, replacement and inspection) is important.
- To retain trained caretakers and also to ensure regular preventive maintenance, a payment system for care takers will be encouraged.
- As an additional preventive measure, chlorination will be mandatorily made a part of the water treatment process.
- Maintaining the water disinfection system is critical, hence the staff should be specifically trained on its routine maintenance.

4.5 Construction Phase Environmental Issues for Septage treatment plants

Land clearing and development

Construction of the STP will involve land clearing, excavation, filling, compaction and concreting. Hence, physical changes with the site will occur. Site specific impacts caused by these activities can only be assessed once the land for the proposed STP is identified.

Excavation of the tank beds and ponds will create spoil material which can either be used as fill material in the site or disposed to another location. Although this might not be a significant quantity, the waste must be managed. Rain during excavation work can cause temporary blockages of drainage paths and erosion which can result in impacts downstream.

Sometimes, topography of the site will be such that earth will be necessary as fill material to obtain the required levels of the tanks. This will require the operation of burrow pits and exacerbate dust, noise and vibration as a result of burrowing, loading, transporting and unloading of the earth. During the rainy season this will involve additional issues such as erosion, sedimentation and even slope failures.

Dust, Noise and Vibration due to Construction Activities

Noise, dust and vibration are unavoidable issues of construction typical to projects of this nature. Involvement of heavy equipment, machinery, movement of heavy vehicles and presence of workers are the main sources of noise generation. According to CEA regulations, permissible noise levels at the boundary of the land in which the noise is located for construction activity is 75 dB in the day time and 50 dB in the night time.

The sites proposed for the STPs are not known. It is anticipated that given the semi urban and rural nature of the selected provinces, this will not be a significant impact. Vegetation cover of the site would help attenuate the noise/dust levels to some extent, hence retaining vegetation within the site as much as possible should be given priority.

Destruction of Habitats

This impact will be very site specific, and generally contained within the direct impact zone which will be a relatively small area. Site selection should avoid sites with high ecological value or in close proximity to protected areas.

Traffic and access management, Health and Safety Issues, Construction in Landslide Hazard Zones and Impacts to PCRs

Refer sections above and Annex 2 for mitigation of general construction impacts

4.6 Operational Phase Environmental Issues for Septage Treatment Plants

Operational Efficiency and Maintenance Problems

The STPs will be designed by the NWSDB and operated by the Local Authority. Although the STPs planned under the project are small in scale, its operation will require minimum amount of technical expertise and budgetary resources for continued running.

Lack of capacity and resources within the Local Authority could severely affect the maintenance of the system. Further to this, technology options and unavailability of skilled workers causes maintenance problem especially in the villages where electro-mechanical systems are to be provided. Inadequate maintenance arrangements of the electro-mechanical treatment systems can further deteriorate surrounding environment leading to the odour nuisance and mosquitoes and houseflies breeding grounds. These are some of the risks that could occur resulting from poor plant operation and maintenance.

Hence, the project should identify capacity constraints within the relevant LA as part of planning and address the challenges with necessary technical capacity building, maintenance arrangements and ensuring necessary budgetary allocations. An O&M manual will need to be prepared for the LA and training on plant maintenance requirements should be provided.

Effluent Disposal and utilization and WQ of receiving waterbodies

General understanding is that the treated effluent will flow into a nearby stream/river. Sri Lanka has gazetted standards for discharge of treated effluents for inland surface waterbodies, which has

been applied in similar projects in the past. Similarly, the project has reviewed the IFC's suggested guidelines for sanitary wastewater (See annex 3).

While meeting the country regulatory standard will be a mandatory requirement to obtain CEA approval, going beyond to reach more stringent IFC standards for nutrients will be sought through design considerations, where it is technical, financially and practically feasible.

As part of site specific environmental assessments, the receiving waterbody will be studied to document baselines conditions and specify monitoring requirements.

Impacts due to release of obnoxious gases

Obnoxious gases can arise under anaerobic conditions in ponds. This problem should be addressed by adjusting loading rates such that the top few centimetres remains under aerobic conditions.

Release of obnoxious gases also takes place in STPs during unloading operations. The design can take several steps to address this issue, such as shielding of the unloading bay to prevent gases from being windblown and hydraulic arrangements to minimize agitation of sewage during release to the treatment system among a few.

The severity of these issues depends much on the characteristics of the site selected. So if a site that is far from habitation is selected, management of these issues become easy. However, the driving forces of site selection will be minimizing land acquisition, ease of access and low travel time etc, hence a balance may be required.

5 Environmental Management Framework

Environmental safeguards procedures

5.1 Project Planning Phase – Preliminary Environmental Screening

To ensure that potential risks described in the previous section are identified in the early planning/identification stage of each sub-project, an **environmental screening** will be initiated.

Environmental screening will be the first step of integrating environmental concerns into the planned water supply/sanitation schemes and will be carried on completion of the technical feasibility study. The screening will enable early determination of potential environmental issues and possible mitigation or minimization of such impacts through appropriate design considerations. The suggested environmental screening will be carried out using a structured environmental checklist as given in annex 4 of the EAMF.

The environmental checklist will be filled by the (i) DSUs with close guidance and assistance from the PMU and (ii) in close co-ordination with the technical specialists who prepared the feasibility report.

The objectives of the environmental screening process are mainly twofold;

- Identify early in the sub-project cycle as to what the key environmental issues and risks are.
- Define the sub-project safeguards category and accordingly describe the scope for follow up environmental assessments.

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 4.

Data collection and stakeholder consultations

Data for environmental screening 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 the environmental screening:

- Project details/ Reports/ Location Maps/ documents including design details available with the implementing agencies
- Literature on flora/ fauna/ biodiversity/land use/soil/geology/ hydrology/ climate /socio economic profiles/public health and environmental planning data collected from GOSL agencies past EIA studies etc
- Maps on land use, water resources, archaeological interests and environmental sensitive areas within the project boundary from various GOSL agencies

- Hydrological/ rainfall/ drainage datasets

Field Visits:

Each sub-project site will be visited by the EO 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 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 EO will represent the project proponent and sub-project related technical discussions are expected to take place internally) and local authorities to discuss pertinent issues. In addition, the public consisting of both beneficiary and affected groups will be consulted (at least 5 such consultations in each site) to record their views and concerns about the proposed investment.

Data Analysis and Interpretation

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

Impact identification

This will be carried out by the EO in discussion with the PMU.

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.
- **Chapter 8** provides guidelines for EMP preparation.
- 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.
- Chapter 8 provides a sample TOR for likely EAs under the project – (i) Water Supply projects that require barrier building across flowing streams and (ii) Septage Treatment Plants.

5.2 Project Design Phase - Environmental Assessment

Once the feasibility study and the environmental screening is over, the PMU/DSU with close guidance and assistance from the technical staff of the relevant agency, will proceed to prepare an Environmental Management Plan (EMP) and a budget for implementing the EMP.

If the screening determines OR if national regulations require that detail environmental analysis is needed to study particular aspects in depth, the PMU/DSU will initiate the necessary the Environmental Assessment (EA). The EA shall have a detail EMP. Water Safety Plans will be part of the EMP and carried out in parallel to sub-project implementation, together with the scheme operator and community.

As the outputs of the EMP and the Detail Design report are inter-dependent, the EMP will be prepared in co-ordination with the design team. For this, a focal person in the design team will be appointed to liaise with the ES/EOs who will ensure that the EMPs supplement the design work. Any major potential environmental concerns will be communicated to the design team and suitable alternatives, if available, discussed (for ex: transmission routes through protected area which can be avoided).

It is anticipated that most of the sub-projects will require only the screening report with a site specific EMP. Those on urban sanitation and water schemes that require barriers built across rivers to abstract water will need at least IEE level of environmental analysis.

Any environmental clearances from the CEA or any other national regulatory agencies should be pursued and obtained during this stage.

Most importantly, the EMP should be budgeted and finalized prior to tendering. The EMP should be part of the tender document and the cost of implementing the EMP should be included in the BOQs.

5.3 Construction Phase - Environmental Monitoring and Progress Reporting

The WSSIP will focus strongly on effective environmental monitoring.

- Monitoring will be largely carried out in the form of compliance monitoring through regular site supervision by the responsible officers.
- Monitoring of environmental parameters (such as air, water, salinity, sediment quality, etc.) will be conducted based on the requirements specified in the individual EMPs, either by the contractor or by the PMU/DSU.

Annex 5 carries suggested report formats that can be used by the PMU/DSU to record monitoring observations.

The WSSIP is essentially environmentally beneficial and 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 targeted areas/communities. As such, no additional environmental indicators are proposed.

Most importantly, the project will support periodic environmental audits (at least 3) throughout project implementation. The TOR for the proposed annual independent Environmental Audit is included in Chapter 8 of the EAMF.

Progress Reporting

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

1. Contractor's environmental compliance reports to the DSU office on a monthly basis
2. DSU'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 MWSD on a quarterly basis (this will be part of the quarterly project progress report produced by the PMU)

5.4 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	DSU	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	Carrying out of environmental screening		X		
4	Review and endorsement of screening report and decision Category B and C type Category B Sensitive	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 Category B Sensitive	X In prescribed projects the PMU will submit documents to CEA and obtain approval			X
7	Obtain clearances from local environmental/other regulatory authorities	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 Project Implementing Agencies on EMP compliance			X	
11	Reports to PMU on EMP compliance		X		
12	Quarterly reports from PMU to WB	X			
13	Maintaining records of safeguards documents for all sub-projects		X		

5.5 Timeframe for planning and carrying out safeguard screening and 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, where applicable, 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 as mentioned 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 an investments under the project that requires;

- (a) EMP only
- (b) An Environmental Assessment
- (c) A detailed Environmental Impact Assessment

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
Scenario 1: Sub-project that need to meet WB safeguard requirements only				
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	1	1	

	month	month	month	
Report Finalization	2 weeks	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			
Tentative time for EA cycle (min - max)	8 months	5.25 months	3-4 months	

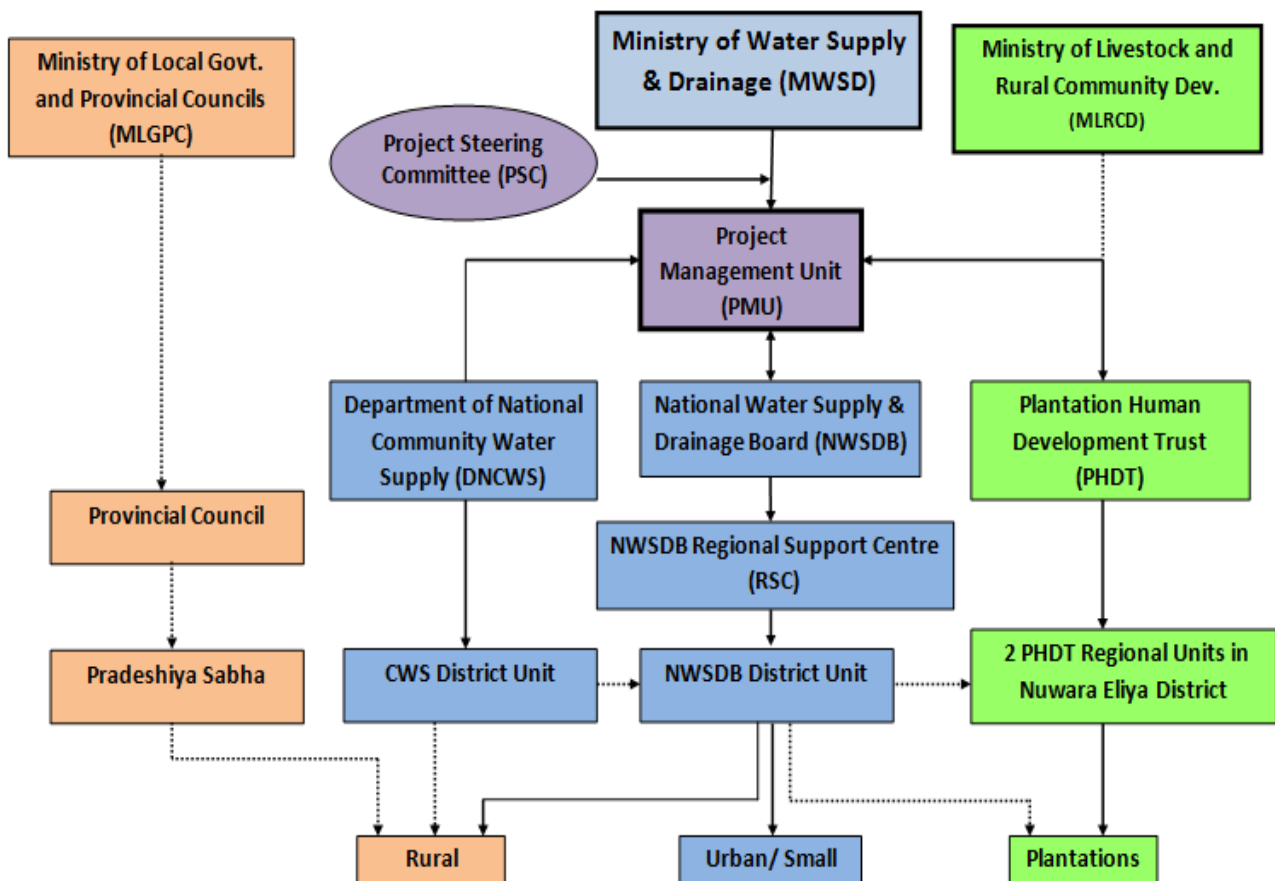
Note: The above does not take not of time taken for local clearances. Certain projects that require CEA clearance will need extra time.

6 Institutional Arrangement for Implementing the EMAF

6.1 Institutional Arrangement for the Implementation of WSSIP

The Ministry of Water Supply & Drainage (MWSD) will be the executing agency for the project. A Project Steering Committee (PSC) will be set up at the national level to provide guidance on both components, in particular where cross-Ministry support and coordination will be essential.

Figure 1: Project Institutional and Implementation Arrangements



PSC Members are as follows

- Ministry Water Supply and Drainage – Secretary, is the Chair of the PSC
- Ministry of Local Governance and Provincial Councils –Secretary or Addl. Secretary
- Ministry of Irrigation and Water Management –Secretary or Addl. Secretary
- Ministry Live Stock and RCD –Secretary or Addl. Secretary
- Ministry of Health – Director General of Health Service or Addl. General
- Ministry of Finance (NPD and ERD) –DG or Addl. Director General
- Ministry Water Supply and Drainage, Addl. Secretary, Planning

- National Water Supply & Drainage Board (NWSDB) – General Manager
- Department of National Community Water Supply (DNCWS)– Director General
- Plantation Human Development Trust (PHDT) – Director General or his representative
- Central Environmental Authority – DG or Addl. Director General
- NWSDB - Addl. GM / Project Director as the Secretary to the PSC
- NWSDB – Addl. GM responsible for the regions/districts
- NWSDB - Addl. GM responsible for sewerage
- World Bank as Observer

The Project Management Unit (PMU) will be established under the MWSD with key staff from the NWSDB, DNCWS & PHDT.

The PMU will be headed by a Project Director (PD) from the MWSD at the level of Additional Secretary to provide overall project management for all three sub-sectors. The Deputy Project Directors will be at level of Additional or Deputy General Managers from NWSDB and similar level from PHDT and DNCWS. Key staff of PMU is as follows:

Position	No	From
Project Director	01	MWSD
Deputy Project Director (Technical)	01	NWSDB
Deputy Project Director (Community Dev)	01	DNCWS
Deputy Project Director (Technical)	01	PHDT
Finance Manager (Assistant General Manager, Finance)	01	NWSDB(Part Time)
Senior Officer	01	PHDT
Chief Engineers	02	NWSDB (01)
Chief Sociologist	01	NWSDB
Senior Community Development Officer	01	DNCWS
Senior Accountant	01	
Procurement Specialist	01	
Environmental Specialist	01	
MIS Specialist	01	
Institutional and Communication Specialist	01	
Sanitation and Hygiene Specialist	01	
Supportive Staff(Account Assistants ,Procurement Assist, Management Assists, Office Assists, Drivers	10	

Component 1

Water Supply and Sanitation Infrastructure will be implemented by the NWSDB with the support from DNCWS and PHDT and the close coordination with Provincial councils, district and divisional

Health Authorities, Pradeshiya Sabhas (Local Authorities) and Divisional offices of the Divi Neguma Department¹².

- **Urban/Small Towns Sub Projects** - Feasibility studies of urban/ small towns will be carried out by the Planning & Design Section of the RSC of NWSDB. Appraisals of those will be done by the Main Project Appraisal Committee of the NWSDB. Planning, designs and documentation of those will be carried out by the P&D Section of the RSC/NWSDB with the support of P&D Section and Sewerage section of the NWSDB and PMU. Implementation of urban/small town's subprojects will be carried out by DSUs with the support from PMU and approval from relevant Procurement Committee.
- **Rural and Plantation Sub Projects** - Overall implementation responsibility of Rural/Plantation sub projects will be with the DSUs which will work in close coordination with DNCWS District Unit, Regional Unit of PHDT and the Plantation Companies. Planning, Design, Documentation and contracting of rural sub projects will be carried out by the DSUs with the support from PMU and approval from the relevant Procurement Committee.

Component 2

Technical Assistance for Sector Capacity Building and Sustainability will be carried out by PMU with support from NWSDB, DNCWS and PHDT as required.

District Support Units (DSU) of the NWSDB at each project district will be strengthened to handle small town water supply, septage treatment and Rural Water Supply and Sanitation (RWS&S) sub-projects. NWSDB will assign a District Manager and Accountant to the DSU along with other staff as needed. Key staff of the District Support Units of the NWSDB will be as follows.

Position	No.	From
District Manager/ Chief Engineer	01	NWSDB
Engineers	02	NWSDB (01)
Sociologists	01	NWSDB
Community Development Officer	01	DNCWS
Environmental Officer	01	
Accountant	01	NWSDB
System Operator	01	
Procurement Officer	01	
Engineering Assistant	09	NWSDB (03)
Community Development Assistant	05	DNCWS (01)
Supportive Staff	05	

¹²The main objective of the Divi Neguma Department of Ministry of Economic Development is to make the island a poverty-free country by ensuring food security and providing microfinance, physical and social Infrastructure facilities for the poor to strengthen livelihoods and development at community level.

6.2 Implementation arrangements for environmental safeguards

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

- **Project Management Unit** - 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 environmental specialist, who is suitably qualified and experienced in planning/managing environmental issues in the water and sanitation sector development, 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 sub-project specific 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.

- **District Support Units** - The responsibility of day to day planning, implementation and supervision of environmental safeguards specific to sub-projects will be borne by the DSUs, supported by the implementing agencies such as NSWDB, PHDT, DNCWS.

For this, the DSUs will be supported by an environmental officer (EO) who will ensure timely and sound application of the EAMF to the planned investments. The implementing agencies 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.

Initially, one EO to support a Province will be adequate and as the work load increases the PMU can increase its environmental cadre, depending on the requirement.

- **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 an environmental officer who will be directly responsible for ensuring compliance with the EMP during construction.

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

Senior Environmental Specialist

Project Management Unit / Ministry of Water Supply and Drainage

- Provide overall policy and technical direction for environmental safeguards management under the WSSIP (as defined by this framework).
- Ensure suitably qualified and experienced personnel are in place to support the DSUs.
- Co-ordinate closely with the Environmental Officers in the DSUs 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
- 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 B sensitive type of sub-projects
- Ensure that applicable measures in the EMP are included in the design, and condition on compliance with EMP is included in the bidding documents and condition on compliance with EMP is included in the contractor's agreement.
- Develop, organize and deliver environmental training programs and workshops for the staff of sectoral implementing agencies, contractors, Partner Organizations, CBOs, field supervision staff and other implementing agency officials (responsible for the supervision of Maintenance works), as needed, on safeguard requirements and their management
- Prepare additional technical guidelines, if necessary, to support the EAMF in order to strengthen implementation of environmental safeguards under the project
- Obtain clearances from local environmental/other regulatory authorities, where applicable.
- Report to WB and MWSD on the overall environmental performance of the project as part of PMU's periodic progress reporting.
- Maintain close cooperation with project implementing agencies to monitor O&M during the operation of the project;
- Hold regular review meetings with the environmental officers of the DSUs and visit selected project sites to assess environmental planning requirements and to monitor implementation of the EMP by Contractors
- 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 DSUs

The person should have a Post graduate qualification in Environmental Management or related field and at least 5 years of experience working in a similar position in development work.

Environmental Officers – District Support Units

- 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
- Ensure consistency of safeguard documents with national environmental regulations; work with the PMU to obtain necessary clearances from local environmental/other regulatory authorities for sub-projects, where applicable.
- Ensure relevant EMP provisions are reflected in the design; and EMPs are included in the bid documents; and condition on compliance with EMP is included in the contractor's agreement.
- 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.
- 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
- Prepare and submit regular environmental monitoring and implementation progress reports to the PMU
- Ensure adequate public consultation during environmental screening and EA/EMP preparation; encourage community participation in sub-project planning, management and monitoring
- Ensure public complaints relating to nuisance and inconvenience caused by sub-project implementation are addressed with corrective action and adequately documented

The person should have a BSc in Environmental Management or related field and at least

5 years of experience working in a similar position in development work.

Environmental Focal Point - Contractor

- Ensure implementation of relevant provisions of the EMP during sub-project implementation;
- Prepare contractor's action plan for implementing the EMP
- Ensure close co-ordination with the Environmental Officer from the DSUs and report progress on compliance on a regular basis

The person should have at least 5 years of experience in safety, environment and health issues working in a similar position in development work.

World Bank

- Provide close supervision and necessary implementation support in the initial stages of the project in conducting screening, preparation of EAs and EMPs
- Undertake prior review of screening reports, EA/EMPs for all Category B sensitive 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 B sensitive type projects (those involving constructions across rivers to abstract water and septage treatment work)
- Conducting annual independent environmental audits

The relevant expertise is included in the TORs provided in Chapter 8

6.4 Capacity Development Requirements

For effective environmental safeguards management, the PMU/DSU/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)

Short-term training and awareness programs

In order to ensure safeguard procedures, instruments and monitoring needs of the WSSIP 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 WSSIP as specified in the EAMF.

Technical assistance

Where stand alone Environmental Assessments and Environmental Impact Assessments are required as screening outcomes, the PMU will hire independent consultants.

Long-term capacity building

The project will also explore the possibility of building long-term capacity, within the sector agencies and local authorities in environmental planning essentials in urban/rural water supply and sanitation through a well structured and modular training program.

Sri Lanka was one of the first countries in the region to have instituted EIA/IEE for development projects. In the early days much capacity building on environmental management across sectors were planned and held to build awareness on the importance of ensuring environmental sustainability in sectoral development plans. However, since of late such training opportunities have become scarce resulting in a generally low depth of knowledge on important environmental planning applications such as EIA and SEA.

Hence, a long-term capacity building program for the water supply sector with a view to upgrading and updating current knowledge and skills in environmental management in water supply and sanitation schemes of varying scales is deemed appropriate. Some suggested training topics;

- Basic principles in EIA
- Applications of SEA and benefits
- Planning drinking water catchment protection
- Water quality assessment and mapping

6.5 Estimation of Environmental Management Framework implementation cost

Activity	Quantity	Unit Rate in US\$	Total in US\$
Environmental Staff			
- PMU Environmental Specialist	1	1,000	60,000
- DSU Environmental Officers	3	700	126,000
Sub-total			186,000
Training and awareness programs (short-term and long-term)			
- Training on sector env management issues	1	50,000	50,000
- 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			100,000
Consultancy for annual environmental audit	3	15,000	45,000
Environmental monitoring that includes sampling and laboratory testing			50,000
-Water quality samples			
- Unspecified			
Environmental screening and monitoring by project staff (will be part of transport and O/H budget of the WSSIP)			
Costs associated with mitigation measures	Included in individual contracts		
Contingencies			20,000
Sub-total			463,000

7 Stakeholder consultation and disclosure requirement

As this is a category B project, the EAMF will be disclosed to the public prior to appraisal. A soft copy of the framework will be posted on the websites of the MWSD who will be vested with the implementation responsibility for WSSIP. Hard copies will be made available at all regional offices of the NWSDB, PHDT and DNCWS, which are the main implementing agencies, for review by interested sections of the public. The framework will also be made available at IDA's public information centre in accordance with requirements of disclosure. The implementing agencies, should organize special workshops, if needed, to evince feedback, and these should be incorporated into the project designing. All EMPs that will be prepared by the project once it is effective shall also adhere to this disclosure policy.

Public consultation will be an integral part of the sub project design and implementation, for both water supply and sanitation components.

- Rural and estate water supply projects will have a strong community focus, where the community will be closely involved in taking decisions about the project, especially in selecting and finalising options for water supply. The community is free to make observations, request for clarifications or forward their requests at these consultations, which will be paid due attention and consideration. Finally, the community, represented though a legally appointed CBO will administer and manage the entire scheme.
- Urban water supply and sanitation too will require strong community mobilization and consultation of public opinion. This will take place through formal social surveys and community meetings.

For all types of environmental analyses conducted under the WSSIP (including screening), communities in the project sites should be consulted within a structured and culturally appropriate manner. This should cover both beneficiary and affected community groups. 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, CCD 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 WSSIP. 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 DSUs supported by the implementation agencies.

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 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 WSSIP, as determined by the requirement.

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 mainly for Component 2

Focus groups discussions

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.

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.

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.

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.

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 Implementing Agencies.
(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

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 minimize 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.

8.2 Terms of Reference for the Periodic Environmental Audit

1. Introduction to the project

To be filled

2. The Need for Environmental Assessment

All sub-projects financed under WSSIP 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 in the DSUs and reviewed and cleared by the PMU. For sub-projects with Category B sensitive type impacts a prior review of the screening is carried out by the World Bank. When stand alone 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 WSSIP. The consultant will review the application of the EAMF to the WSSIP. In particular, the consultant will review a sample of (i) the screening forms prepared by each DSU (ii) stand alone 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 DSUs and the main PMU, on the sub-project under implementation as well as under preparation of the WSSIP. This may include, but not be limited to, relevant plans, drawings, screening reports, social analysis, stand alone 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].

6. Qualifications of the team

Serial No.	Staff Position	Desired Requirements	Man Months
1	Lead Auditor	<p>Post graduate degree in Environmental Engineering or equivalent with at least 10 years of experience in the field.</p> <p>Experience in conducting environmental assessments (EIA/IEE) and audits, especially for infrastructure development projects</p> <p>Expertise in institutional development and to mainstream environmental safeguards implementation, monitoring and evaluation systems.</p> <p>Proven ability to ensure targets and deadlines are met and to ensure quality of outputs meet Client expectation</p> <p>Demonstrated proficiency in writing and speaking in English</p> <p>The lead auditor will be responsible for planning the audit, preparing questionnaires/checklists etc, manage the time schedule in consultation with the PMU, complete the audit within the given scope and time frame and prepare a comprehensive environmental audit report for the MCUDP.</p>	2
2	Assistant Auditor	<p>A minimum academic qualification of a Bachelor's degree in an Environmental Science/Management discipline.</p> <p>At least 6 years experience in monitoring and reviewing Environmental Safeguard / Environmental protection / EMPs/EIAs/IEEs implementation in projects</p>	1
Total Input of Professional Time (Man Months)			3

8.3 Terms of Reference for an Initial Environmental Examination for water supply projects that involve construction of low weirs across free flowing rivers/streams

1. Introduction

2. Project Description

Provide a brief description of the project including

- a. Weir design, location, height, weir top level, LS section, intakes and related structures as well as capacity of reservoir, water spread area, new access roads and temporary structures (if any)
- b. Methodology of construction
- c. Methodology of operation
- d. Project implementation plan

3. Description of the Environment

Provide a brief description of the key environmental characteristics of the area likely to be affected by the proposed development.

- a. Topography, geology and soil type, rainfall patterns in the project area
- b. Existing hydrological regime of the **XX Oya** (Immediate catchment area, flow volumes, duration, seasonal patterns, overbank inundations, groundwater level variations etc)
- c. Current baseline water quality in the stream reach proposed for development including seasonal variations
- d. Present ecological status of in-stream and off-stream habitats falling within the likely impact zone with faunal/floral biodiversity of the different habitats including presence of species of conservation significance
- e. Presence of or proximity to areas of conservation significance
- f. Presence of any pollution sources along the relevant stream reach
- g. Presence of archaeologically significant areas
- h. Water uses in the downstream reaches where impacts as a result of the project could occur

4. Assessment of potential impacts

Describe and assess any impacts on and resulting from the below;

- a. Changes to surface water flow regime and quality, groundwater levels, occurrence of localized water logging and inundation,
- b. Changes to aquatic biodiversity and habitats including
 - i. Loss, fragmentation and alteration of in-stream and off-stream habitats due to changes in the flow regime of the **XX Oya** resulting from construction and subsequent water operations, above and below proposed weir/impoundment.
 - ii. Potential entrainment and entrapment of fish at water intake works/impoundment
 - iii. Barriers to movement of fish and other wildlife due to the presence of the weir and its operations throughout the year

- iv. Potential effects on aquatic biodiversity due to changes in water quality from construction and ongoing operations of the weir
- v. Potential for introduction and establishment of weeds and aquatic invasive species
- c. Impacts to other downstream water uses (environmental and social) resulting from changes to stream flows and water quality
- d. Impacts on any archaeological/cultural heritage resources
- e. Any aspect of the weir construction and operation that may have any implications for public safety

5. Management of impacts

Develop an Environmental Management Plan (EMP) with mitigation measures planned to avoid, minimize or eliminate the identified impacts for all stages of the project. In particular, provide clear guidelines on the following, if deemed necessary.

- a. Catchment conservation
- b. Provision for minimum flow release
- c. Measures to facilitate fish/ wildlife movement and improve habitat conditions
- d. Rehabilitation of areas disturbed by construction activity

6. Environmental Monitoring

Develop a suitable monitoring program to monitor the changes of the environment and implementation of mitigatory measures.

7. Recommendations and Conclusions

Determine the environmental acceptability of the proposed project and provide key recommendations based on the findings of the assessment.

Team requirements

Serial No.	Staff Position	Desired Requirements	Man Months
1	Team Leader Ecologist	Post graduate level qualifications and at least 10 years of experience in conducting field ecological surveys and assessments; ability for taxonomic identification of flora and fauna	2
2	Hydrologist	Post graduate level qualifications and at least 10 years of experience in conducting hydrological assessments, catchment water balance studies and water resource development	2
3	Sociologist	Post graduate level qualifications and at least 10 years of experience in conducting social surveys, assessments and	2

		stakeholder consultations.	
Total Input of Professional Time (Man Months)			6

8.4 Terms of Reference for an Initial Environmental Examination for the construction of a Septage Treatment Plant

1. Introduction

- Background of the project
- Need for the project
- Project objectives and main beneficiaries
- Scope of the IEE, methods employed and members in the team
- Applicable laws, regulations and standards applicable to the project
- Approvals that are needed for the proposed development

2. Project Description

- Description of the project and its location
- Design details of septage treatment plant and method of sludge disposal
- *(Attach relevant drawings to support project description, project location map and layout covering the entire site including all major components etc)*
- Construction and operation methodology
- Raw materials to be used for the construction
- Supporting infrastructure to be constructed
- Time schedule for construction
- Evaluation of alternatives
- *(alternative sites, alternative design, technology and construction technique)*

3. Description of the Study Area

(This should include area of the treatment work, main road haulage routes, effluent discharge area and at least a 500m impact area from the boundary of the site)

- Topography, geology and soil type, rainfall patterns in the project area
- Existing hydrological regime and drainage patterns in the area (surface waterbodies, groundwater levels and seasonal variations etc any irrigation/flood protection schemes)
- Current baseline water quality in the adjacent surface waterbodies and groundwater wells & seasonal variations
- Ecological resources within the impact zone with faunal/floral biodiversity of the different habitats including presence of species of conservation significance
- Presence of or proximity to areas of conservation significance
- Presence of any pollution sources within the project impact area

- Presence of archaeologically significant areas
- Economic/social infrastructure and activities within the project impact area

4. Description of anticipated environmental impacts

Constructional Impacts

- Impacts of land clearing, (soil erosion, increased run off, cutting, leveling)
- Noise, vibration and dust due to construction (blasting operations should be mentioned)
- Air quality impacts from traffic during transportation of material and equipment
- Impacts on natural drainage patterns in the area
- Impacts on ecological resources (forests, wetlands, protected areas, flora/fauna with conservation significance)

Operational Impacts

- Impacts on water quality in adjacent ground water
- Impact on flooding
- Impact on lagoon/sea/stream/river/land due to disposal of effluent water
- Impact on any economic activities in the adjacent areas
- Impacts from noise and odours
- Impacts on ecological resources & animal migration from operation

5. Proposed mitigatory measures

- Recommend mitigatory measures to minimize all the impacts identified above. Mitigatory measures should be clearly defined and its effectiveness should be evaluated.

6. Institutional requirements and environmental monitoring plan

- Describe institutional arrangements for implementation of the mitigatory measures.
- Present a fully developed environmental monitoring plan describing what should be monitored when and where
- Prepare a budget for the implementation of the mitigatory measures and monitoring plan

7. Public consultation and Information Disclosure

- Present a summary of the public consultations carried out under the project
- Provide a summary of key comments received
- Provide a summary of methods used to disclose information to the public

8. Findings and Recommendations

Serial No.	Staff Position	Desired Requirements	Man Months
1	Team Leader	Post graduate level qualifications and at least 10 years of experience in conducting environmental assessment;	4

	Environmental Engineer	experience in pollution control technologies, specifically on wastewater treatment and treatment quality requirements	
2	Ecologist	Post graduate level qualifications and at least 5 years of experience in conducting field biodiversity surveys and assessments; ability for taxonomic identification of flora and fauna	1
3	Sociologist	Post graduate level qualifications and at least 5 years of experience in conducting social surveys, assessments and stakeholder consultations.	1
4	Geologist	BSc/Post graduate level qualifications and at least 5 years experience in geological and hydrogeological assessments, water table and water movement assessments	1.5
Total Input of Professional Time (Man Months)			7.5

ANNEXES

Annex 1 – Sri Lanka Drinking Water Quality Standards (SLSI)

Parameter	Highest Desirable Value	Maximum Permissible Value
Electrical Conductivity at 25°C $\mu\text{s}/\text{cm}$	750	3500
Total Solids (mg/l)	500	2000
Colour (Hazen Units)	5	30
Taste	Unobjectionable	
Odour	Unobjectionable	
Turbidity (NTU)	2	8
Chloride (Cl^-) (mg/l)	200	1200
Fluoride (F^-) (mg/l)	-	1.5
Iron (Fe) (mg/l)	0.3	1
Manganese (Mn) (mg/l)	0.05	0.5
Copper (Cu) (mg/l)	0.05	1.5
Zinc (Zn) (mg/l)	5	15
Calcium (Ca) (mg/l)	100	240
Magnesium (Mg) (mg/l)	30	150
Total Phosphates (PO_4^{3-}) (mg/l)	-	2
Sulphates (SO_4^{2-}) (mg/l)	200	400
Total Alkalinity (as CaCO_3) (mg/l)	200	400
Total Hardness (as CaCO_3) (mg/l)	250	600
Free Ammonia (as NH_3) (mg/l)	-	0.06
Nitrate (NO_3^-) (mg/l)	-	45
Nitrite (NO_2^-) (mg/l)	-	0.01
pH	7.0-8.5	6.5-9.0
Arsenic (As) (mg/l)	-	0.05
Cadmium (Cd) (mg/l)	-	0.005
Chromium (Cr) (mg/l)	-	0.05
Cyanide (CN^-) (mg/l)	-	0.05
Lead (Pb) (mg/l)	-	0.05
Mercury (Hg) (mg/l)	-	0.001
Selenium (Se) (mg/l)	-	0.01
Free Residual Chlorine (as Chlorine) (mg/l)	-	0.2
Polynuclear aromatic hydrocarbons (mg/l)	-	0.0002
Grease and oil (mg/l)	-	1.0
Chemical Oxygen Demand (mg/l)	-	10
Gross Alpha Radioactivity (pCi/l)	-	3
Gross Beta Radioactivity (pCi/l)	-	30
Total Coliforms/100 ml	Absent in (i) 95% of the samples in a year and (ii)	

	in two consecutive samples	
E.Coli/100 ml	Absent	Absent

Annex 2

Example environmental best practices to manage constructional impacts

Type of Impact	Mitigation measures	Standards applied
Dust	<ul style="list-style-type: none"> Regular watering of sites for dust suppression in urban, residential areas and in areas with sensitive receptors Covering of excavated soil temporary stored on site Daily cleaning of tires of vehicles covering up any vehicle transporting materials and spoil to and from construction sites Daily cleaning of streets and pathways in vicinity of construction site that are affected by soil and dust Imposing speed controls for construction vehicles 	ICTAD Publications: SCA/5; SCA/3/1
Air pollution	<ul style="list-style-type: none"> Employ construction machines with low emissions to reduce pollution, arranging sources of emission far from people's houses and public places All construction machines and vehicles should meet the standard on emissions and have passed the emission test No burning of wastes on site Limit traffic congestion through proper planning and operating of traffic diversions Do not let machines idle when not necessary 	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"> 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 Use vehicles and equipment that meet standards for noise and vibration in Sri Lanka. Publishing and registering working time of construction machines with local authorities and strictly compliance therewith. Restricting use of noisy machines near sensitive receptors such as schools and hospitals, use noise-reducing means for construction machines, if required. 	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3; CEA noise & vibration standards
Solid waste (demolition, construction and excavation)	<ul style="list-style-type: none"> Work sites should be cleared of residual solid waste and wastewater before work commences Temporary storage of solid wastes shall be done with appropriate containment to avoid spreading of waste, odor and avoid dust Temporary storage of solid waste should be done to avoid interfering with traffic obstacles and aesthetics Sites for collecting solid waste in each sub-project area should be determined prior to commencement of 	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3;CEA guidelines on Solid Wastes

Type of Impact	Mitigation measures	Standards applied
	<p>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</p> <ul style="list-style-type: none"> • Construction wastes should be removed as much as possible within 24 hours from the site to ensure public safety in urban areas • All waste should be collected and disposed in compliance with the local and national laws, in sites identified by the respective LA • Excavated soil, if suitable, should be used for leveling and backfilling • No solid waste can be burned at the site • Clean the construction site of solid wastes, wastewater etc. before its closing 	
Domestic waste	<ul style="list-style-type: none"> • Construction camps should be sited appropriately with consent from the necessary public authority or the implementing agency, • Labour camps shall be provided with adequate and appropriate facilities for disposal of sewage and solid waste • Domestic solid waste shall be collected and disposed of daily at the LA designated site or given for collection by the LA • Discharge and disposal domestic waste from worker camps into water sources should be strictly avoided • Burying and burning domestic waste in the project site should also be strictly avoided • Avoid construction workers staying overnight in the construction sites 	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3; CEA guidelines on Solid Wastes, Code of practices by SLSI
Oil and lubricant waste	<ul style="list-style-type: none"> • 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. 	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3
Soil erosion	<ul style="list-style-type: none"> • 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 • Stockpiling of earth should be done a safe distance away from waterways • 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. • If necessary, silt/sedimentation traps should be used to 	ICTAD Publications: SCA/5; SCA/3/1; SCA/7

Type of Impact	Mitigation measures	Standards applied
	prevent soil particles from getting into drains and canals	
Extraction of earth and quarry	<ul style="list-style-type: none"> • All quarry/burrow sites operated by the contractor should be licensed with the LA/CEA/GSMB, as appropriate. • 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 • Establishment of burrow pits/areas and its operational activities should not endanger properties and cause a health hazard to the people. • At contract closing, all burrow/quarry sites should be fully rehabilitated • If contractor would procure earth/quarry material, he should do so from sources that are operating with the required licenses 	ICTAD Publications: SCA/5; SCA/3/1;; SCA/3/3, GSMB guidelines
Traffic Congestion	<ul style="list-style-type: none"> • All sub-project should have a traffic management plan • Temporary home and business accesses should be provided where necessary and transport along main roads during rush hours should be avoided where possible. • Temporary access roads should be identified before construction begins and upgraded if necessary. • All roads and access sites must be restored to their original state as soon as possible • Speed limits and operating times for the construction vehicles should be imposed • Travel route for construction vehicles should be designed to avoid areas of congestion. • If project works occur after dark, a lighting system should be maintained such that vehicles and pedestrians can clearly see the construction area. • One-way flow of traffic should be promoted whenever practical • Contractor should supply traffic co-coordinators to manage traffic flow in areas that are subject to congestion. • 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 • Awareness programs can be conducted on safety and proper traffic behavior in densely populated areas near the construction sites. 	ICTAD Publications: SCA/5
Access roads	<ul style="list-style-type: none"> • Before construction, the pre-project state of site access roads should be recorded by the project/contractor • During construction, site access roads should be inspected regularly and repairs made as required • After construction, site access roads used by the Project 	ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2;

Type of Impact	Mitigation measures	Standards applied
	<p>should be inspected and compared to records taken during Pre-construction.</p> <ul style="list-style-type: none"> If notable road quality differences exist, the road should be repaired to its original condition 	SCA/3/3
Health and Safety	SEE SEPARATE SECTION ON HEALTH AND SAFETY BELOW	<p>ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3, Guidelines of Department of Labour</p> <p>IFC General Environmental, Health and Safety Guidelines</p>
Impacts on flora and fauna	<ul style="list-style-type: none"> A compensatory tree planting program should be developed to replant native species wherever available space beside the proposed project. Workers should be instructed to protect flora and fauna including aquatic life as well as their habitats. Hunting and poaching should be strictly prohibited. Washing, maintenance and service of vehicles and machinery should not be done closer to the freshwater habitats. 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</p>
Impact on water resources	<ul style="list-style-type: none"> Identification of the reliable water resources and obtain necessary approvals from the relevant authorities to extract water prior to commencement of construction work. Contractor should not obstruct or prevent water flow when working closer to water bodies. 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. Construction material and stock piles should be covered to avoid wash off to water bodies. 	<p>ICTAD Publications: SCA/5; SCA/3/1; SCA/3/2; SCA/3/3, Mahaweli, Irrigation Department guidelines</p>
Worker	<ul style="list-style-type: none"> Mobilizing maximum capacity of skilled and unskilled labour force from the surrounding project area 	<p>ICTAD Publications:</p>

Type of Impact	Mitigation measures	Standards applied
camps	<ul style="list-style-type: none"> • Identify location of camps with consultation of LA. • Camps should not be located near water ways, human settlements or near drinking water intakes. 	SCA/5; SCA/3/1; SCA/3/2; SCA/3/3 Code of practices by SLSI

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 WSSIP 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.

Tolerance Limits for the Discharge of Industrial Waste into Inland Surface waters

Reference : Central Environmental Authority

No	Parameter	Unit type of limit	Tolerance limit values
1	Total suspended solids	mg/l , max	50
2	Particle size of TSS	Mm, less than	850
3	pH at ambient temperature	-	6.0 – 8.5
4	BOD BOD5 in five days at 20C or BOD3 in three days at 27C	mg/L	30
5	Temperature of discharge	C, max	Shall not exceed 40 in any section of the stream within 15 m downstream of the effluent outlet.
6	Oils and greases	Mg/L, max	10
7	Phenolic compounds	mg/L	1
8	COD	mg/l, Max	250
9	Dissolved phosphates (as P)	mg/l, Max	5
10	Total Kjeldahl N (as N)	mg/l, Max	150
11	Ammonical N (as N)	mg/l, Max	50
12	Cyanide (as CN)	mg/l, Max	0.2
13	Total residue chlorine	mg/l, Max	1.0
14	Fluorides (as F)	mg/l, Max	2.0
15	Sulphide (as S)	mg/l, Max	2.0
16	Arsenic (as As)	mg/l, Max	0.2
17	Cd	mg/l, Max	0.1
18	Total Cr	mg/l, Max	0.5

19	Cu	mg/l, Max	3.0
20	Fe	mg/l, Max	3.0
21	Pb	mg/l, Max	0.1
22	Hg	mg/l, Max	0.0005
23	Ni	mg/l, Max	3.0
24	Se	mg/l, Max	0.05
25	Zn	mg/l, Max	2.0
26	Pesticides	mg/l, Max	0.005
27	Detergents/Surfactants	mg/l, Max	5
28	Faecal coliforms	MPN/100ml, Max	10^{-8}
29	Radio Active Material		
	Alpha emitters	Micro Curie/ml, max	10^{-8}
	Beta emitters	Micro Curie/ml, max	10^{-7}

Indicative values for treated sanitary sewage discharge**Reference : IFC, General EHS Guidelines, Wastewater and Ambient Water Quality**

Pollutants	Units	Guideline Value
pH	pH	6 – 9
BOD	mg/l	30
COD	mg/l	125
Total Nitrogen	mg/l	10
Total Phosphorus	mg/l	2
Oil and grease	mg/l	10
Total Suspended Solids	mg/l	50
Total Coliform bacteria	MPN/100 ml	400

Environmental Checklist for the Preliminary Assessment of Environmental Impacts from the Proposed Water Supply and Sanitation Schemes

Water Supply Improvement and Sanitation Project

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 & 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</i>	

<i>project purpose)</i>	
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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	

5. Description of the existing environment

5.1 Physical features – Ecosystem components	
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>	
Air quality <i>(any pollution issues)</i>	

5.2 Ecological features – Eco-system components	
Vegetation (trees, ground cover, aquatic vegetation)	
Presence of wetlands	
Fish and wildlife habitats	
Birds (waterfowl, migratory birds, others)	
Presence of special habitat areas (special designations and identified sensitive zones)	
Other features	
Residential/Sensitive Areas (Eg, Hospitals, Schools)	
Traditional economic and cultural activities	
Archeological resources (recorded or potential to exist)	

6. Public Consultation

Public consulted	Consultation method	Date	Details/Issues raised

7. Screening for Potential Environmental Impacts

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
Project Design					
a. Development of the water source					
1	Has the project adequately assessed the quantity of available surface/ground water, taking into consideration typical seasonal and annual variations?				
2	Has the project adequately assessed the quality of available surface/ground water, taking into consideration typical seasonal and annual variations?				
3	Can pumping of water lead to seasonal/permanent alteration of groundwater flows, reduce groundwater levels? Can it eventually lead to salt water intrusion in the aquifer?				
4	Can extraction of water lead to seasonal/permanent reduction in surface water flows and cause loss of habitat and aquatic life				

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
	downstream				
5	Can extraction lead to diminishing of other downstream uses and curtail recreational possibilities?				
6	Will there be a change in hydrology downstream of the intake of the surface waterbody, such that aquatic life and ecological functions will be impacted?				
b. Laying of transmission/distribution network					
7	Will water transmission lines cross any environmental, ecological, historical or archaeological areas of importance?				
8	Will the alignment interfere with natural drainage paths of natural or man-made rivers, streams or channels?				
9	Will the alignment interfere with other sensitive infrastructure such as roads, pedestrian paths, schools and temples?				

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
c. Treatment of water					
10	Does siting of the treatment plan require land acquisition?				
11	Will it involve the use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment?				
12	Does storage of any of these chemicals require special consideration when designing storage space?				
Project Construction					
14	Will construction and operation of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in waterbodies, etc)				
15	Will construction of the project cause soil erosion within the site due to steep grade or soil content?				

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
16	Will the Project produce solid wastes during construction?				
17	Will the Project release pollutants or any hazardous, toxic or noxious substances to air?				
18	Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?				
19	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?				
20	Will the project cause localized flooding and poor drainage during construction Is the project area located in a flooding location?				
21	Will there be any risks and vulnerabilities to public safety due to physical hazards during construction of the Project?				

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
22	Are there any transport routes on or around the location which are susceptible to congestion or which cause environmental problems, which could be affected due to construction work?				
23	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?				
24	Are there any areas or features of high landscape or scenic value on or around the location which could be affected by the project?				
25	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 waterbodies, the coastal zone, mountains, forests which could be affected by the project?				
26	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,				

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
	nesting, foraging, resting, migration, which could be affected by the project?				
27	Is the project located in a previously undeveloped area where there will be loss of greenfield land				
28	Will the project cause the removal of trees in the locality?				
29	Are there any areas or features of historic or cultural importance on or around the location which could be affected by the project?				
30	Are there existing land uses on or around the location e.g. homes, gardens, other private property, industry, commerce, community facilities, agriculture, forestry, tourism, mining or quarrying which could be affected by the project?				
31	Are there any areas on or around the location which are densely populated or built-up, which could be affected by the project?				
32	Are there any areas on or around the location which are occupied by sensitive land uses e.g. hospitals, schools, places of worship, community				

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
	facilities, which could be affected by the project				
33	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?				
34	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?				
	Operational Impacts				
35	Will the project lead to increased wastewater generation and discharge at the end-user level?				
36	Will the project lead to more stagnant water and drainage problems causing increased vector bourn diseases?				
37	Is there a risk for potential degradation of the quality of the water source in future?				

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
38	Will the project introduce mechanisms for regulating the withdrawal and use of water and to monitor possible depletion of water source?				(sufficient monitoring and maintenance of leaks) This could happen but daily record of pumping records, leakage surveys, semi-annual inspection of pumps can be done
39	Will there be waste generated from the treatment process, if so types and quantities?				
	Sanitation				
40	Is there a risk of contamination of ground water due to poor siting, construction and maintenance of pits				What is the depth to the water table from the bottom of the latrine (both seasons) Distance to nearest water sources?

8. Permits and clearances needed for project to proceed

	Permit/Clearance	Yes	No	TBD	Remarks
1	National Environmental Act				
2	Soil Conservation Act				
3	Coast Conservation Act				
4	Fauna and flora protection ordinance				
5	Local Authority Act				
6	Irrigation Ordinance				
7	Any other				
8					
9					
10					

9. Conclusions

Conclusions
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):

Project Category	Safeguard	
		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. Therefore, stand alone Environmental Assessment not required, an Environmental Management Plan would be suffice
		Potential adverse impact are significant, hence, stand alone Environmental Assessment and Management Plan needed before the project can proceed
		Potential adverse impact are significant, hence project cannot be justified

9. Details of Persons Responsible for the Environmental Screening

Screening report completed by <i>Name/Designation/Contact information</i>	Date <i>Signature</i>
Screening report reviewed and approved by <i>Name/Designation/Contact information</i>	Date <i>Signature</i>

For Septage Treatment Plants Section 7 of the screening form given shall be replaced with the following.

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
Project Design					
a. Site Selection					
1	Is the selected site a government owned property?				<i>Provide ownership/acquisition details</i>
2	Does the site have adequate space for the construction of the treatment plant as well as to create a buffer zone around it?				<i>Provide details of land area available within the site and land required for the STP.</i>
3	Are there houses around the site? What is the distance to the nearest dwelling from the boundary of the site?				
4	Are there any other areas on or around the location which are important or sensitive for reasons of their ecology e.g. national park, sanctuary, forest reserve or environmental special areas				<i>If yes give distances</i>
5	Are there any wetlands and watercourses (ponds, reservoirs) on or around the location which are sensitive?				<i>If yes give distances</i>
6	Are there any areas on or around the location which are used by protected, important or				<i>If yes give distances</i>

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
	sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, migration, which could be affected by the project?				
7	Are there any areas or features of high landscape or scenic value on or around the location which are used by people for recreation, which could be aesthetically affected by the project?				<i>If yes give distances</i>
8	Are there any areas or features of historic or cultural importance on or around the location?				<i>If yes give distances</i>
9	Are there any paddy lands or cultivated areas on or around the location?				<i>If yes give distances</i>
10	Are there any areas on or around the location which are densely populated or built-up, which could be affected by the project? Any sensitive receptors like schools, hospitals and public places?				<i>If yes give distances</i>
11	Is there proper access to the site with good road conditions				
12	Is the site subjected to seasonal flooding/ waterlogging or falls within a HFL of any reservoir?				
Project Construction					

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
13	Will construction and operation of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in waterbodies, etc)				
14	Will construction of the project cause soil erosion within the site due to steep grade or soil content?				
15	Will the Project produce solid wastes during construction?				
16	Will the Project release pollutants or any hazardous, toxic or noxious substances to air?				
17	Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?				
18	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?				
19	Will the project cause localized flooding and poor drainage during construction Is the project area located in a flooding location?				

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
20	Will there be any risks and vulnerabilities to public safety due to physical hazards during construction of the Project?				
21	Are there any transport routes on or around the location which are susceptible to congestion or cause environmental problems, which could be affected due to construction work?				
22	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?				
23	Is the project located in a previously undeveloped area where there will be loss of greenfield land				
24	Will the project cause the removal of trees in the locality?				<i>How many, identify them</i>
25	Will the existing land uses on or around the location e.g. homes, gardens, other private property, industry, community facilities, agriculture, tourism etc which could be affected by project construction?				

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
26	Will any sensitive land uses around the site e.g. hospitals, schools, places of worship, community facilities, be affected by project construction?				
27	Will the project cause further pollution or environmental damage to sites where existing legal environmental standards are already exceeded? Eg; Waterways, wetlands, soil, air				
	Operational Impacts				
28	Will the project cause impacts on ground and surface water quality on or around the location?				<i>(including the receiving waterbody)</i>
29	Will the project cause any impacts on irrigation water quality?				
30	Will there be problems of noise, odour and traffic during operations of the project?				
31	Will there be waste generated from the treatment process, if so types and quantities? How frequently will these waste be generated?				
32	Will the disposal of waste originating from the treatment process cause any environmental				

	Screening question	Yes	No	Significance of the effect (Low, moderate, high)	Remarks
	pollution on-site or off-site?				

ENVIRONMENTAL FIELD MONITORING DATA SHEET

Water Supply and Sanitation Improvement Project

Project Management Unit

Date of Visit:

Name of Sub-Project:

Location:

Equivalent EMP Compliance

		Progress Level (Activity Implementation Status)		Level of Execution (Environmental Rank)		Remarks - During this Field Visit	
		%	Color	Rank	Color	Photo Taken*	Observations
	Monitoring Activities from the EMP						
1							
2							
3							
4							
5							
6							
7							
8							

9							
10							
Overall EMP Compliance							

Color Code	Level of Execution	Envy/Adopted Practices. Rank
	Good-1	High
	Moderate-2	Moderate
	Poor-3	Low