



Environmental Impact Assessment

Restoration/Rehabilitation of Baburail Canal
with Landscaping, Beautification and Lighting

Narayanganj City Corporation

FINAL

Submitted by

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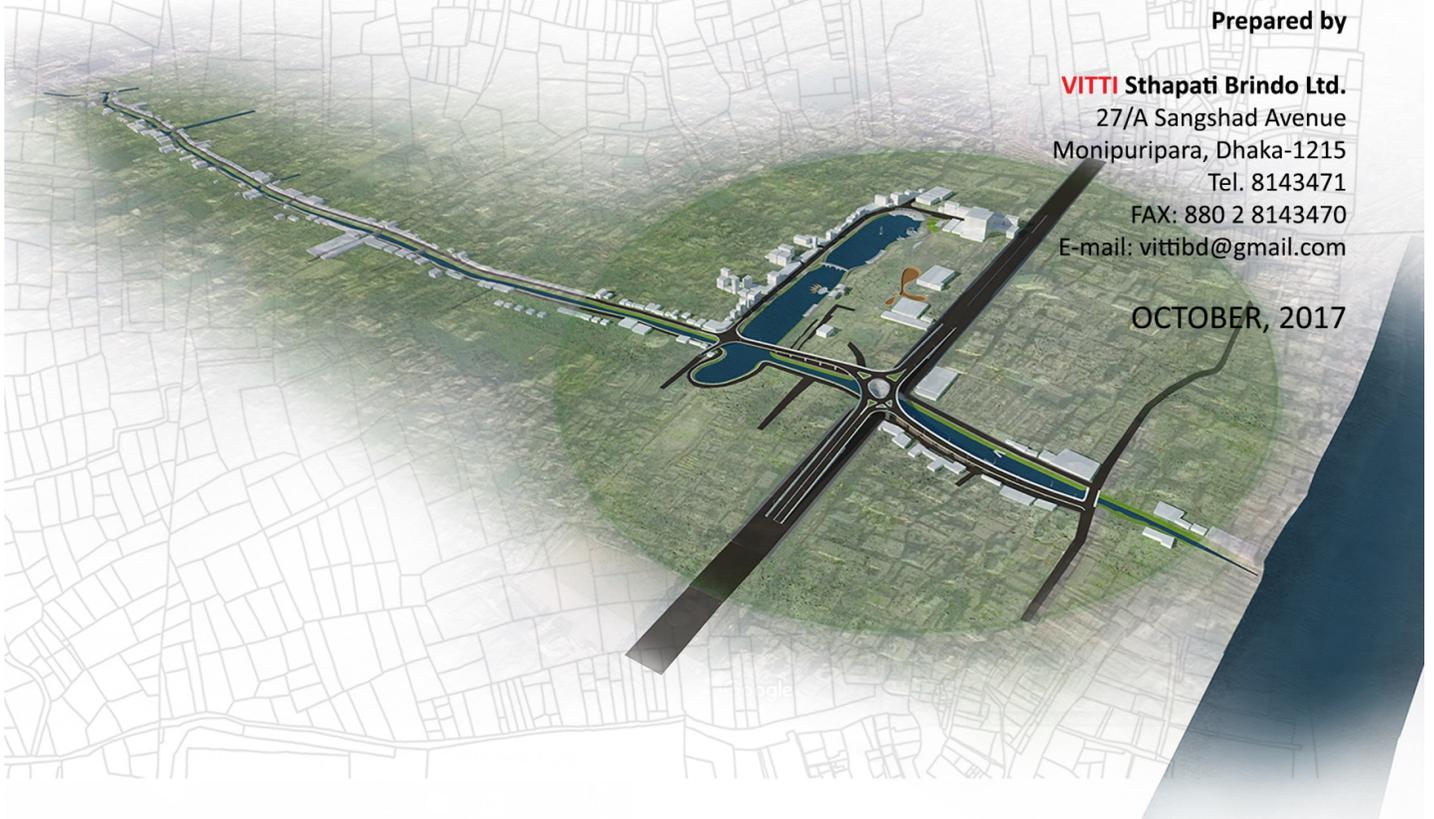


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ABBREVIATIONS AND ACRONYMS

CSC	Construction Supervision Consultant
DoE	Department of Environment
EA	Environmental Assessment
EIA	Environmental Impact Assessment
ECA	Environmental Conservation Act; Ecologically Critical Areas
ECC	Environmental Clearance Certificate
ECoP	Environmental Code of Practice
ECR	Environment Conservation Rules
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EA	Environmental Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
E&S	Environmental and Social
FGD	Focus Group Discussions
GoB	Government of Bangladesh
GRM	Grievances Redress Mechanism
GRC	Grievances Redress Committee
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature
MOEF	Ministry of Environment and Forest
NOC	No Objection Certificate
NGO	Nongovernmental Organization
OP	Operational Policy
O&M	Operation and Maintenance
PD	Project Director
PIU	Project Implementation Unit
PM	Particulate Matter
RPF	Resettlement Policy Framework
SRDI	Soil Resources Development Institute
t	Metric ton or tonne

ToR Terms of Reference
USD US Dollars
VOC Volatile Organic Compounds
WB World Bank
WBG World Bank Group
WHO World Health Organization

GLOSSARY

Adverse impact: An impact that is considered undesirable.

Ambient air: Surrounding air.

Aquatic: Growing or living in or near water.

Baseline (or existing) conditions : The “baseline” essentially comprises the factual understanding and interpretation of existing environmental, social and health conditions of where the business activity is proposed. Understanding the baseline shall also include those trends present within it, and especially how changes could occur regardless of the presence of the project, i.e. the “No-development Option”.

Beneficial impacts: Impacts, which are considered to be desirable and useful.

Biological diversity: The variety of life forms, the different plants, animals and microorganisms, genes they contain and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecological diversity.

Ecosystem: A dynamic complex of plant, animal, fungal and microorganism communities and associated non-living environment interacting as an ecological unit.

Emission: The total amount of solid, liquid or gaseous pollutant emitted into the atmosphere from a given source within a given time, as indicated, for e.g., in milligrams per cubic meter of gas or by a relative measure, upon discharge from the source.

Endangered species: Species in danger of extinction and whose survival is unlikely if the existing conditions continue to operate. Included among those are species whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to suffer from immediate danger of extinction.

Environmental effects: The measurable changes, in the natural system of productivity and environmental quality, resulting from a development activity.

Environmental Impact: An estimate or judgment of the significance and value of environmental effects for natural, socio-economic and human receptors.

Environment Management Plan (EMP): A Plan to undertake an array of follow-up activities which provide for the sound environmental management of a project/ intervention so that adverse environmental impacts are minimized and mitigated; beneficial environmental effects are maximized; and sustainable development is ensured.

Environmental Management: Managing the productive use of natural resources without reducing their productivity and quality.

Fauna: A collective term denoting the animals occurring in a particular region or period.

Field Reconnaissance: A field activity that confirms the information gathered through secondary sources. This field study is essentially a rapid appraisal.

Flora: All of the plants found in a given area.

Habitat: The natural home or environment for a plant or animal.

Household: A household is identified as a dwelling unit where one or more persons live and eat together with common cooking arrangement. Persons living in the same dwelling unit having separate cooking arrangements constitute separate household.

Important Environmental Component (IEC): These are environmental components of biophysical or socio-economic importance to one or more interested parties. The use of important environmental components helps to focus the Environmental Impact Assessment .

Khal: Small Channel, Canal

River:A large natural stream of water flowing in a channel to the sea, a lake, or another such stream.

Land use: Types include agriculture, horticulture, settlement, pisciculture and industries.

Mouza: A Bangla word for the smallest government administrative area corresponding to village revenue unit.

Mitigation: An action, which may prevent or minimize adverse impacts and enhance beneficial impacts.

Public involvement / Focus Group Discussion/ Public Consultation: A range of techniques that can be used to inform, consult or interact with stakeholders" affected / to be affected by a proposal.

Stakeholders: Those who may be potentially affected by a proposal, e.g. Local people, the proponent, government agencies, NGOs, donors and others, all parties who may be affected by the project or to take an interest in it.

Terrestrial: Living on land.

Union: Smallest unit of local self-government comprising several villages.

City Corporation: A city corporation is the legal term for a local governing body, including (but not necessarily limited to) cities, counties, towns, townships, charter townships, villages, and boroughs.

Executive Summary

A. Introduction

The proposed development of Restoration of Baburail canal reshaping, Landscaping, Beautification, along with Lighting of Shitalakhya-Dhaleswari River via Baburail in NCC Connecting Canal will be a visionary of unique urban and waterways project. Narayanganj, acquiring the status of City Corporation in 2011, is facing the demand to address various issues for city dwellers, such as recreation, leisure and urban breathing facilities. The project is carrying a very important intention to restore the existing canals of the city with the appropriate restoration of the environment as well as ensuring the recreation and amusement for all age group of city dwellers. Identifying an appropriate design concept and pragmatic visualization will, no doubt is the pre-requisites for the development intervention for undertaking of such a sizeable project.

This Environmental Impact Assessment Report (EIA) presents the environmental Impact assessment of the proposed Baburail Canal. A Social Impact Assessment (SIA) and Resettlement Action Plan (RAP) will be prepared for the Restoration of Baburail Canal and are presented in separate covers.

The above-mentioned project activities will impact environment. The project authority intended to develop and implement the project with sustainable manner as per DoE and WB guideline.

B. Policy, Legal Administrative and Regulatory Framework

The Environmental Conservation Act (ECA, 1995) is the main legislative framework related to environmental protection in Bangladesh. This umbrella Act includes laws for conservation of the environment, improvement of environmental standards, and control and mitigation of environmental pollution. In accordance with this Act, the proposed Project will need to be cleared by DoE before commencing the project following procedures given in the Environment Conservation Rules (ECR) 1997 amended on 2010. ECR classify the projects in to various categories (Green, Orange A, Orange B and Red) for the purpose of environmental clearances. Restoration of canal is not included in the classification of different industrial units or projects list in ECR. However, based on the component of the project activities mainly on landscaping, beautification and lighting, it falls under Orange B category.

Among the World Bank Safeguards, from an environmental perspective, the Environmental Impact Assessment (OP/BP 4.01) is triggered. Since most of these impacts are site specific and can be mitigated with standard mitigation measures, hence the proposed project falls under category B. This Environmental Impact Assessment (EIA) report prepared for Baburail Canal in compliance with the WB policy. Stakeholder and Public consultation and disclosure of requirements have been performed on 11th April 17.

C. Project Description

The proposed canal is locally termed as 'Baburail & Jhelepara Bangla Bazaar Canal', which is 2.8 km long and 15-30m wide in different sections connecting Shitalakhya River at the East and Dhaleshwari River at the West. At present, the canal is disconnected with earth fill and unauthorized inhabitant occupying the canal area. The canal is situated under ward no 15 and 16 of NCC. While connected with the rivers, the canal would flow East to West at monsoon and West to East at the lean period. Jimkhana Lake is also connected perpendicularly to the canal and approximately 405 m long and 75 m wide surrounded by Deobogh Pucca Road and Bangabandhu Road. The canal is adjacent to RK Mitra Road at South and Mubarak Shah Road at North; crossed the Bangabandhu Road at Mondal Para Intersection, the SM Maleh Road at

Hangsha Cinema Hall Bridge, Deobogh Pucca Road at Zallerpar Bridge and Dhaka-Munshiganj Highway at Jhelepara Bridge (Kashipur).

D. Category of the Project

According to the Environmental Conservation Rule (ECR, 1997) the proposed restoration of Baburail canal is fall under Orange B Category. According to World Bank Safeguard policy the project falls under Category B, since most of these impacts are site specific and can be mitigated with standard mitigation measures.

E. Initial Screening and Scoping of Environmental Impacts

The Baburail Canal is to be restored as in previous navigation way. A summary of the screening of potential impacts has been associated with the proposed restoration of the canal development is provided along with the potential mitigation measures.

F. Environmental Impact Assessment

Environmental Impact Assessment (EIA) of the Project has been carried out using Environmental Management Framework (EMF) provided by World Bank. The studies ensured all relevant environmental issues are mainstreamed into the design and implementation of the proposed project, ensure compliance of the Project with national and World Bank requirements, and conducting EIA for the Restoration of Baburail Canal project.

The following environmental issues were considered baseline survey of during EIA study.

- i. Silted soil disposal
- ii. Hydrology of the project area
- iii. Biological species study (Flora and fauna, endangered species)
- iv. Climatic condition (Temperature, rainfall, humidity)
- v. Environmental quality (Air, water, noise)
- vi. Socio economic condition (Population, demography, archeology, economy and culture, indigenous people, water supply and sanitation and affected person)

Mitigation measure developed as per impact identified.

G. Alternative Analysis

The alternate analysis found that the restoration of Baburail canal is the only better option since it exists with unacceptable condition. The cost of restoration, time, will be less than any other option.

H. Stakeholder and Public Consultation

The stakeholder and public consultation program is an essential part of the Environmental Impact Assessment process and has been undertaken both formally and informally throughout the study to ensure that the knowledge, experience and views of stakeholders and the general public are taken into account during the study. The information shared and recorded where relevant, has been applied to justify design, construction methodology and timing changes, in order to reduce predicted negative effects. This approach satisfies statutory consultation requirements of the DoE.

The primary methods followed in the consultation process are:

- Individual level consultation/discussion;
- Key Informant Interview
- Focus group discussion;

A public consultation meeting on draft environmental and social assessment study held on 11th April 17 at NCC Seminar Room at Narayanganj. Photographs of this consultation meeting have been provided at the end of report. During these consultations, leaflets on key environmental and social issues were distributed to the participants (these were prepared in local language, Bangla) and posters were also displayed focal places and also at the venue. Power point presentations were made by environmental expert and participants were encouraged to ask questions on the environmental issues.

Before the commencement of the EMP meetings the following materials were disseminated and invite all stakeholder and affected person, postering in important place one day before the consultation meeting, with the aim of developing positive and constructive relationships with stakeholders and improving their knowledge about the project and therefore enhance their ability to ask informed questions and to provide useful input and advice.

These materials were:

- Summary of the mitigations proposed during Project Disclosure meetings
- Written and visual information, including leaflet/brochure in Bangla, maps, drawings and diagrams, detailing the Project activities; and
- Identification of environmental impact of reshaping of Canal in order to make beautification of the canal
- The draft EMP
- Grievance Redress Mechanism (GRM)

General findings of the public consultation: Some issues, as described by those who attended in the consultation are summarized below:

The silted earth material will be used for filling up NCC own lowland. Affected structures, shops, income loss, compensation for structure and loss of income, Socio-Economic Benefit, Job facility and Communication, drainage, solid waste management, water supply and toilet at the Canal shops, Accident, Noise pollution, Air pollution, Traffic congestion, Contribution of improvement of traffic communication system also discussed.

I. Environmental Management and Monitoring Plan

The basic objective of the EMP is to manage adverse impacts of proposed project interventions in a way that minimizes the adverse impact on the environment and people at the subproject sties. The specific objectives of the EMP are to:

- Facilitate the implementation of the mitigation measures discussed earlier in the document.
- Maximize potential project benefits and control negative impacts;
- Draw responsibilities for NCC, contractors, consultants, and other members of the project team for the environmental and social management of the Project;

- Define a monitoring mechanism and identify monitoring parameters in order to:
- Ensure the complete implementation of all mitigation measures,
- Ensure the effectiveness of the mitigation measures;
- Maintain essential ecological process, preserving biodiversity and where possible restoring degraded natural resources; and
- Assess environmental training requirements for different stakeholders at various levels.
- Ensure Contractor Code of conduct.

The EMP will be managed through a number of tasks and activities and site specific management plans. One purpose of the EMP is to record the procedure and methodology for management of mitigation identified for each negative impacts of the subproject. The management will clearly delineate the responsibility of various participants and stakeholders involved in planning, implementation and operation of the subproject.

J. Institutional Arrangements

The Project implementation will be led by the Project Implementation Unit (PIU) that will be established within NCC. The PIU will be responsible for procurement of consultants for carrying out the EIA and engineering designs for the proposed sub components. The PIU will be headed by the Project Director (PD). The E&S Cell will also provide trainings to the NCC field personnel responsible for monitoring of environmental compliance including waste management call during both construction and O&M phases of the project. In addition, NCC will recruit a permanent Environmental, Health and Safety Specialist in the entire proposed project, who will be responsible for overseeing the environmental mitigation measures during operation and maintenance period.

The overall responsibility of environmental performance including EMP implementation of the Project will rest with the project management of MGSP.

CHAPTER -1: INTRODUCTION

1. Introduction

1.1 Background

The proposed development as Restoration and Shitalakhya-Dhaleshwari River Connecting Canal will be a visionary and unique urban and waterways project in the context of Bangladesh. Narayanganj, acquiring the status of City Corporation in 2011, is facing the demand to address various issues for city dwellers, such as recreation, leisure and urban breathing facilities. The project is carrying an important intention to restore the existing canal of the city with the appropriate restoration of the environment as well as ensuring the recreation and amusement for all age group of city dwellers. Identifying an appropriate design concept and pragmatic visualization will, no doubt is the pre-requisites for the development intervention for undertaking of such a sizeable project.

Due to neglect for long time of sewage openings in the canal it had become a dumping garbage ditch & an eyesore to the people of city because of emitting foul odors. Several sewerage canals regularly drop huge amount of polluted water. The canal is now disconnected from the river Shitalakhya at east by filling it with earth. Once upon a time it was a navigated canal. Various types of country boats with jute, jute products and essential goods come from different places to Narayanganj through this canal for different trade & commerce as it is the commercial & industrial old town & famous for business center. So, the authority of Narayanganj City Corporation intends to take up the task to restore & beautify the canal and provide the public with recreational space by constructing Landscape around the belt of it in order to relieve the people. This project will include the cleaning of the canal by removing the dumped garbage & excavating the slushy earth.

The overall vision for the Baburail Canal Restoration Project as expressed by the Mayor of NCC aims in 2011 is to restore the Canals to full navigation in the interests of conservation, biodiversity and local quality of life, and to use the restoration as a catalyst for wider social, economic and environmental regeneration in areas neighboring the canal. A fundamental aim of the Restoration Project is to balance the need for restoration with the need to conserve the historic environment and protect biodiversity. The NCC is determined to carry out the restoration of the canals in an exemplary manner, according to recognized principles of sustainability. The project will thus demonstrate good practice in waterway regeneration, protecting and enhancing both the built heritage and the natural environment, and this conservation-led approach will underpin all aspects of the work.

In addition to the conservation of the waterway heritage and ecology, the restoration of the canals is intended to deliver significant social and economic regeneration. The intention is that it will make a substantial contribution to local community development and quality of life by increasing opportunities for recreational and amenity use of the canal and their immediate environs. A vitally important aspect of this will be improved access for all, including people with disabilities. The project authority is intend to conserve and improve the quality of Environment and implements the project with environmentally sustainable manner to comply the national environmental law.

1.2 Brief Description of the Project

Narayanganj city is a historical place of the country. The city is of great importance from the commercial & industrial point of view. Several rivers are there in and around the city namely the Shitalakhya, the Balu, the Dhaleshwari and the Buriganga rivers. There are several internal canals also in it. As such, it has got a unique natural landscaping. The River Shitalakhya bisects the city into two parts and it is flowing through the elongated direction of it and the river Dhaleshwari is flowing at the western part of the city corporation. The Buriganga and the Balu are contributing the Dhaleshwari and the Shitalakhya respectively from the up. Most of the internal canals have been encroached by the nearby habitants and have become too much polluted because of the sewage disposal and to some extent by the industrial pollutants. It has become very essential for restoration of all these canals to get rid of further environmental degradation and to make the city a beautiful and habitable one.

The proposed Baburail Canal Restoration Project is an ambitious plan at present to restore to full navigation of two historic inland waterways, the Shitalakhya-Dhaleshwari River connecting Canal. The existing Baburail canal with most of its part filled up with earth, dumping garbage and sewage pit which cause nuisance and foul odors. There are other 4 canals carries household wastewater and rain water enter into the Baburail canal. Finally, all the wastewater carries through Baburail canal and discharge to the Dhaleshwari River. At present NCC intend and taken initiative to restore the Baburail canal only connecting Shitalakhya and Dhaleshwari River. Other canals also restore subsequently. But the canal joining with the two rivers without purifying water will not fulfill the aim of the project. Shitalakhya and Dhaleshwari river water is highly contaminated with huge volume of industrial waste as well as domestic waste and the water quality is degrading day by day. At this moment, the canal water should be protected from the contaminated river water by installing water control device at the both end of the river. When both of the river water will be purified and become non-contaminated, only then the control device can be opened for river water flow through the canal.

The canal restoration and along with appropriate conservation of the environment as well as ensuring the recreation and amusement for all age group of city dwellers.

1.3 Objective of the Study

- The major objective of Environmental Impact Assessment of Baburail Canal as follows. The objectives of the study are to identify potential environmental risks and minimize adverse environmental impacts of the proposed restoration and strengthening of the Baburail Canal works in their area of influence and to ensure that impacts are minimized.
- To reshaping of canal, landscaping, beautification, along with lighting of Shitalakhya-Dhaleswari River via Baburail connecting canal.
- To restore the Baburail Canal with proper Navigation of boating through the canal
- To improve the social, economic and environmental regeneration in areas neighbouring the canal
- Local community development and quality of life by increasing opportunities for recreational and amenity use of the canal and their immediate environs.
- To restore the Jimkhana Lake, slope protection and amusement facilities

- Save the valuable land from land grabbers and improve this encroached area as an open space/ breathing place for retention area of water for avoiding artificial water logging within the City Corporation.

1.4 Scope of EIA Study

- Detailed field reconnaissance of the proposed alignment, with strip maps presenting all the environmental features and sensitive receptors (trees and structures in the Right of Way (ROW), Ponds, Religious Structures, Archaeological monuments, Natural Habitats, Schools, Utility Lines, other sensitive structures) along the corridor of the canal
- Conduct a base line Environmental Monitoring of various Environmental Attributes such as ambient air quality, noise levels, water quality (surface water and groundwater), ecological profile, etc.
- Carry out an assessment of environmental impacts of the Project, including analysis of alternatives for both “with the Project” and “without the Project” scenarios.
- Draw Environmental Management and post Project Monitoring Plan with associated detailed cost estimates,
- The EMP will also provide key criteria for environmental quality monitoring in the project
- Implementation area and suggest an institutional framework for the implementation and monitoring of the recommended measures.

1.5 EIA Study Methodology

This EIA has been conducted by a team of expert prepared by the NCC and submitted to the World Bank for the project.

The methodology followed in preparing the EIA consists of the following steps:

- Review of available details of the Baburail Canal and meeting/discussions with various stakeholders including local communities
- Review of the policy and regulatory requirements; and EMF
- Reconnaissance field visit and initial scoping and screening of the identified proposed investment sites to determine the key environmental parameters and aspects that are likely to be impacted by the project activities. The purpose of such screening is to get a preliminary idea about the degree and extent of potential environmental impacts of a particular sub-project, which would subsequently be used to assess the need for and the scope of further detailed Environmental Impact Assessment.
- Field investigations to collect baseline data using structured questionnaires, and sampling and analysis for air, water and noise
- A detailed assessment of potential impacts of the Project activities and prepare detailed mitigation measures.
- Consultations at both local and national level with various stakeholders including affected communities

1.6 EIA Team

Vitti Sthapati Brindo has prepared this report under the guidance and Supervision of Dr. J C Saha. The other members of the team are Garibel Ripon Peris, Zisan Binte Walid, Md. Mahin Rahman, Mrinmoy Roy, Shampa Saha, Md. Humayun Kabir, Md. Nazmur Rahman, Amarseh Chandra Biswas, Bekash Chandra Sutradhar. The team leader is an Environmental Engineer having PhD in Environmental Engineering. The other members are Chemist, Ecology/biologist, Environmentalist, Civil Engineer, Zoologist, Sociologist and Field officer respectively with the specialization in EIA.

1.7 Structure of the EIA Report

Chapter 1 of the Final EIA Report presents the background information of the Project. This chapter also presents the objectives of the EIA Study, scope of work and the methodology adopted for the Study.

Chapter 2 presents a critical discussion on the policy, legal and administrative framework applicable for this Project.

Chapter 3 presents description of the project and other salient information relevant for Environmental Impact Assessment.

Chapter 4 presents the assessment of the baseline environmental status of the Study Area. It describes in detail the surveys / field studies carried out as part of the Project. The outcome of the surveys / field studies is presented in this Chapter.

Chapter 5 identify and Assessment of potential environmental Impacts issues as well as the appropriate mitigation measures to address these negative impacts have been discussed.

Chapter 6 analysis of alternative present in this Chapter

Chapter 7 presents the proposed EMP. This includes the proposed measures needed to prevent, minimize and mitigate the adverse impacts and improve environmental performance, along with the proposed Implementation Mechanism for the EMP and financial estimates for the implementation of environmental measures proposed in the EMP.

Chapter 8 institutional capacity described in this Chapter

Chapter 9 describes the consultations that have been carried out with the stakeholders and details of disclosure.

Chapter 10 described the conclusion and recommendation

CHAPTER-2: POLICY AND REGULATORY FRAMEWORK

2 Policy and Regulatory Framework

2.1 Introduction

To address the environmental and social risks of any proposed project and its associated components; any protect and conserve the environment from any adverse impacts, the GOB has specified regulations, policy and guidelines. The activities of proposed restoration of Baburail Canal project of Bangladesh Government fall under the Orange B category according to the Bangladesh Environment Conservation Rules (ECR) 1997 and therefore, need to conduct IEE with EMP studies to obtain environmental clearance from the DoE.

2.2 Applicable Environmental Legislation and Policies in Bangladesh

Bangladesh Environmental Conservation Act, 1995 and amended in 2010: The Environmental Conservation Act (ECA) of 1995 is the main legislative framework related to environmental protection in Bangladesh. This umbrella Act includes laws for conservation of the environment, improvement of environmental standards, and control and mitigation of environmental pollution. This Act has established the Department of Environment (DoE), and empowers its Director General to take measures that he considers necessary which includes conducting inquiries, preventing probable accidents, advising the Government, coordinating with other authorities or agencies, and collecting and publishing information about environmental pollution. According to this act (Section 12), no industrial unit or project shall be established or undertaken without obtaining, in a manner prescribed by the accompanying Rules, an Environmental Clearance Certificate (ECC) from the Director General of DoE. In accordance with this Act, the proposed Project will need to be cleared by DoE before commencing the project following procedures given in the Environment Conservation Rules (ECR) 1997 (discussed below).

Other Relevant Acts, Laws and Rules in Bangladesh: Other legislation relevant to the proposed project are listed below.

- **Bangladesh Environment Conservation Rules (ECR), 1997** empowers the GoB to declare ecologically critical areas, classification of industries and projects into various categories, procedures for issuing the environmental clearance certificate, and determination of environmental standards. According to the Rule 7 (1) of the Environmental Conservation Rules 1997; for the purpose of issuance of Environmental Clearance Certificate (ECC), every industrial units or projects, in consideration of their site and impact on the environment, will be classified into the four categories and they are: Category I (green), Category II (Orange-A), Category III (Orange B) and Category IV (Red). Development or restoration or upgradation of Canal are not included in any of these categories.
- **Bangladesh Wildlife (Protection and Safety) Act 2012** protects 1,307 species of plants and animals; and mandates imprisonment and fines for wildlife poaching, capturing, trapping, and trading. There is a risk that construction workers will kill the wildlife. Mitigation measures to address these risks are covered in EMF.
- **Bangladesh Wildlife (Preservation) Order (1973) and Act (1974)** regulates the hunting, killing, capture, trade and export of wild life and wild life products. It

designates a list of protected species and game animals. It empowers the Government to declare areas as game reserves, wildlife sanctuaries, and national parks to protect the country's wildlife. Mitigation measures to address impacts on wildlife are covered in EMF.

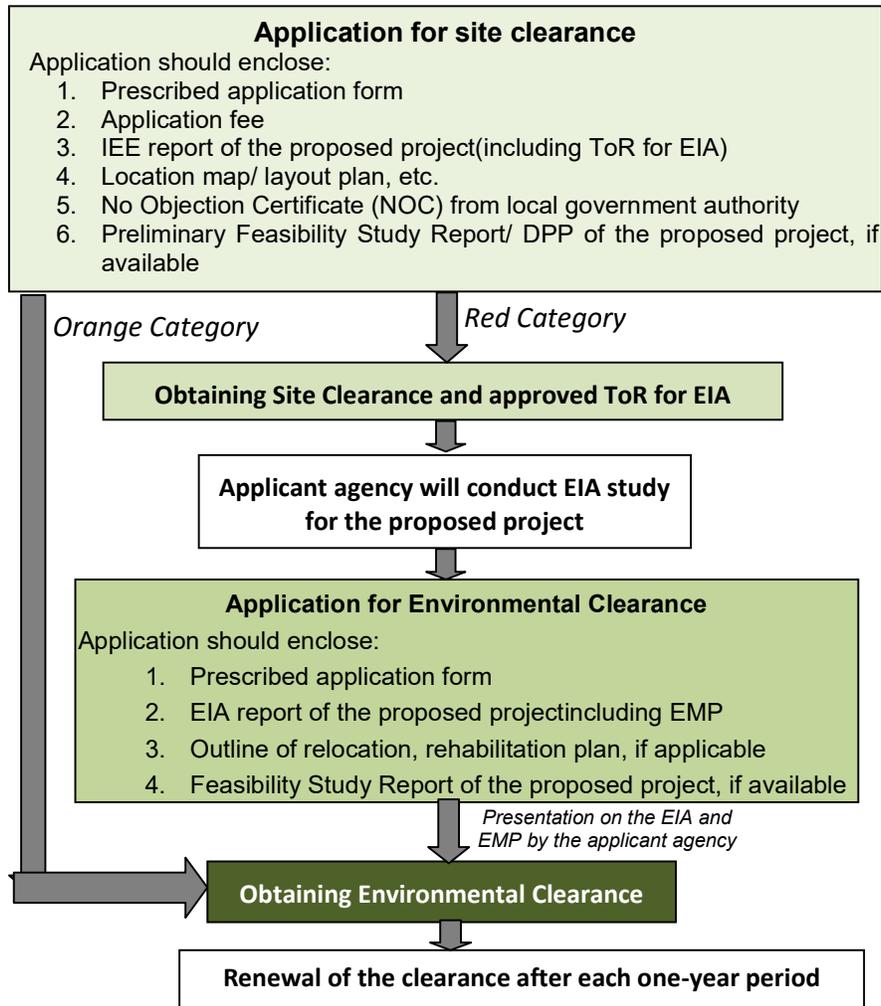
- **The Bangladesh Labor Act, 2006** provides the guidance of employer's extent of responsibility and workmen's extent of right to get compensation in case of injury by accident while working. Mitigation measures to address workers' health and safety are included in the EMF.

2.2.1 Implication of GoB legal and regulations on the Proposed Project

The legislations relevant for Environmental Impact Assessment for development of Canal are the Environmental Conservation Act 1995 (ECA'95) and the Environmental Conservation Rules 1997 (ECR'97). Department of Environment (DoE), under the Ministry of Environment and Forest (MoEF), is the regulatory body responsible for enforcing the ECA'95 and ECR'97.

It is the responsibility of the NCC as a proponent to conduct an Environmental Impact Assessment of development proposal, the responsibility to review this assessment for the purpose of issuing Environmental Clearance Certificate rests on DoE. The Environmental Negative Impact of the proposed Restoration project of Baburail Canal with Landscaping, Beautification & Lighting is found insignificant and falls under Orange B category. The environmental clearance procedure for both Orange B and Red Category projects can be summarized in the Figure 2.1.

Figure 2. 1 Process of obtaining Clearance certificate from DoE



Source: Developed by Consultants

2.3 International Treaties signed by Bangladesh

Bangladesh is a signatory to a number of international environment-related treaties, conventions, declarations and protocols. The following are the relevant international treaties and conventions to which Bangladesh is a party:

- Convention of Biological Diversity, 1992 (Biodiversity convention – Rio de Janeiro). The Convention has three objectives: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of generic resources. All parties are required to cooperate for the conservation of biodiversity, in respect of areas beyond national jurisdiction and other matters of regional interests, and must develop national strategies for the conservation and sustainable use of biodiversity and integrate this into sectional or cross-sectional guidelines.
- 1974 Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR). The Convention requires states to designate at least one wetland site on the basis of its ecology, biology, zoology, limnology or hydrology and requires the conservation of wetlands by establishing nature reserves. There is also a

requirement that any loss of wetland should be compensated for by creating new habitat.

- United Nations Framework Convention on Climate Change, Rio de Janeiro (1992). The convention is broadly applicable due to project construction and operation activities. Mitigation measures to address greenhouse gases emissions are covered in the EMF;
- Vienna Convention for the Protection of the Ozone Layer, Montreal (1987). Mitigation measures to address greenhouse gases emissions are covered in the EMF;
- Convention on Conservation of Migratory Species of Wild Animals (1979). Migratory birds visit the project areas and mitigation measures to address impacts on migratory birds are included in the EMF;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington (1973). This is not directly relevant to the project since the project does not involve in any international trade of endangered species of wild fauna and flora. General restrictions have however been included in the Environmental Code of Practice;
- Convention concerning the Protection of World Culture and Natural Heritage (World Heritage Convention) (1972). Though directly not applicable to the project since there are no such known sites are located in the project area – measures to address chance finds are included in the EMF;
- Kyoto Protocol (1997) and Copenhagen Accord (2009) on climate change. Mitigation measures to address greenhouse gases emissions from the project activities are included in the EMF.
- The Minamata Convention on Mercury (2013) to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. This Convention was a result of three years of meeting and negotiating, after which the text of the Convention was signed by delegates from 140 countries on 19 January 2013. According to this convention, the trade related to mercury containing products will not be allowed through the canal.
- The Paris Agreement (2015) is an agreement on climate change dealing with greenhouse gases emissions mitigation, adaptation for holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change. This agreement may be applicable to the project because use of emissions related to the construction and operation of canal.

2.4 World Bank Safeguard Policies

The World Bank has developed a number of Safeguard Policies to ensure that all possible impacts are considered and mitigation measures are spelled out prior to the implementation of any proposed project. These policies ensure that the quality of operations is uniform across different settings worldwide. If the decision is taken that a Safeguard Policy should be applied, mitigation measures and plans must be developed and should be in place before the implementation of a proposed project.

The Bank requires environmental screening and classification for all investment projects proposed for Bank financing, to help ensure that they are environmentally and socially sound

and sustainable. Screening and classification take into account the natural environment (air, water, and land); human health and safety; social aspects (including especially involuntary resettlement and presence of Indigenous Peoples); cultural property; and trans-boundary and global environmental aspects.

The objectives of environmental screening and classification are: to evaluate the environmental risks associated with a proposed operation; to determine the depth and breadth of Environmental Impact Assessment (EIA); and to recommend an appropriate choice of EIA instrument(s) suitable for a given project. The Bank recognizes that environmental screening and classification is not absolute and involves professional Judgment on a case by case basis. When screening, careful consideration needs to be given to potential environmental impacts and risks associated with the proposed project. Judgment is exercised with reference to the policy expectations and guidance; real impacts on the ground; and established regional and Bank-wide precedence and good practice. The environmental screening is shown in Annex 1.

The applicable WB safeguard policies are described below. In the following section, a table is provided indicating how each policy applies to the proposed investments.

2.4.1 Environmental Assessment (OP/BP 4.01)

EA requirement. The World Bank requires environmental assessment (EA) of projects proposed for Bank support to ensure that they are environmentally sound and sustainable, and thus to improve decision making. The Bank Policy OP/BP 4.01 considers that EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and including the process of mitigating and managing adverse environmental impacts throughout project implementation. EA takes into account the natural environment (air, water and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples and physical cultural resources); and trans-boundary and global environmental aspects. The Bank Policy also envisages that the borrower Government is responsible for carrying out the EA and the Bank advises the borrower on the Bank's EA requirements.

EA classification. The World Bank classifies the proposed project into one of the four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts. These categories are defined below.

- **Category A:** 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.
- **Category B:** 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.

- **Category C:** A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.
- **Category FI:** A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary (FI), in subprojects that may result in adverse environmental impacts.

2.4.2 Projects on International Waterways (OP 7.50)

Projects on international waterways may affect the relations between the World Bank and its borrowers, and between riparian states. Therefore, the Bank attaches great importance to the riparian making appropriate agreements or arrangements for the entire waterway, or parts thereof, and stands ready to assist in this regard. A borrower must notify other riparian of planned projects that could affect water quality or quantity, sufficiently far in advance to allow them to review the plans and raise any concerns or objections.

2.4.3 Involuntary Resettlement (OP/BP 4.12)

The WB's experience indicates that involuntary resettlement under development projects, if unmitigated, often gives rise to severe economic, social, and environmental risks: production systems are dismantled; people face impoverishment when their productive assets or income sources are lost; people are relocated to environments where their productive skills may be less applicable and the competition for resources greater; community institutions and social networks are weakened; kin groups are dispersed; and cultural identity, traditional authority, and the potential for mutual help are diminished or lost. This policy includes safeguards to address and mitigate these impoverishment risks.¹

The overall objectives of the Policy are given below.

- Involuntary resettlement should be avoided where feasible, or minimized by exploring all viable alternative project designs.
- Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits. Displaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs.
- Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

2.4.4 Environment, Health and Safety Guidelines

The Environment, Health, and Safety (EHS) Guidelines² contain the performance levels and measures that are generally considered to be achievable in new facilities or project by

¹ Excerpts from WB OP 4.12 WB Operational Manual. December 2001.

² EHS Guidelines available at:
<http://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES>

existing technology at reasonable costs. In addition, there are also industry specific EHS guidelines.

2.4.5 Applicable World Bank Policies to the Subproject

The applicable World Bank policies for the development of Baburail Canal are given in Table 2.1.

Table 2.1 Triggering the World Bank Policies for Sub projects

Directive	Policy	Applicability for the Subproject	Explanation
Environmental Assessment	OP/BP 4.01	Triggered.	Restoration and operation of Baburail canal expected to cause impact on natural environment (air, water and noise quality) and health and safety of local community and workforce. This project falls into Category B since most of these impacts are site specific and can be mitigated with standard mitigation measures.
Natural Habitats	OP/BP 4.04	Not Triggered.	No natural habitats are located in near the subproject
Pest Management	OP 4.09	Not triggered.	The subproject will not procure any pesticides, nor will they induce an increased use of pesticides.
Physical Cultural Resources (PCR)	OP 4.11	Not triggered.	No PCRs located in the proposed subproject
Indigenous Peoples	OP/BP 4.10	Not triggered	There are no indigenous people near the subproject
Involuntary Resettlement	OP/BP 4.37	Triggered	19.5 acres of Land is required for project infrastructure facilities. A Resettlement Action Plan (RAP) has been prepared under separate cover, detailing the relevant requirements to ensure compliance with this policy.
Forests	OP/BP 4.36	Not triggered.	No forests are located in the proposed port area
Safety of Dams	OP/BP 4.37	Not triggered	No dam are located near the project.
Projects in International Waterways	OP/BP/G P 7.50	Not triggered	No international waterways are located near the project. The Shitalakhya-Dhaleshwari river is connected with the canal.

Directive	Policy	Applicability for the Subproject	Explanation
Projects in Disputed Areas	OP/BP 7.60	Not triggered	The subproject is not located in a disputed area
Child labour		Not Triggered.	National laws on child labour will be strictly followed. No child labour will be hired by the contractors or subcontractors in any of the project activities.
Access to Information		Applicable to the project.	EA will be disclosed in country (on NCC website) and will be sent to WB InfoShop. Public consultations with local community held on at NCC Poura Auditorium (Old) on 11 th April 2017. The executive summary of the EA will be translated to Bangla and which will be available in hard copy in locally accessible locations in the project area, including NCC offices.

Source: Prepared by consultant based on assessment

2.5 Compliance Status with Bangladesh and World Bank Requirements

The present compliance status of the project with Bangladesh legislation and World Bank safeguard policies is indicated in Table 2.2.

Table 2.2 Compliance of the Project with GOB Legislation and World Bank Safeguard Policies

Policy	Legislation/Policy	Actions Taken to Comply
GoB requirements	Environmental Conservation Rules	NCC will submit EIA with EMP to DoE for environmental clearance certificate
	International treaties	Verification of protected sites, Red List and protection of vulnerable habitats in environmental screenings and assessments of the Baburail Canal. No such protected or vulnerable sites are noticed in the project area.
	Public information and disclosure	The EIA report will be disclosed on NCC website. Public consultations meetings held on 11 th April 2017 at NCC Poura Auditorium (Old) (500 m from the Baburail Canal) and to solicit stakeholder feedback.
World Bank requirements	Early Screening and Scoping	Screening using structured questionnaires was carried out during the assessment study of the Project. (Annex-1)

Policy	Legislation/Policy	Actions Taken to Comply
	Participatory approach	Key informant interviews, consultation meetings and focus group discussions were held between March and April 2017.
	Integrate environmental and social assessment	Natural environment, public health, and social aspects are incorporated into EIA.
	Natural Habitats	Verification of protected sites and ecosystems, Red List and endangered flora and fauna has been done for Baburail Canal. No protected ecosystems are located in the project area.
	Risk assessment	Health and safety risks for population and workers are identified in the EIA and management measures will be included in tender documents. NCC capacity will also be strengthened on health and safety risk management.
	Climate Change and Floods	Impact of floods and climate change effects are considered for design of the Baburail Canal .
	Alternatives	Alternatives has been considered for location of proposed restoration of Baburail facilities in the selected area.
	Pollution	Baseline survey of air, noise and water quality has been carried out. Environmental Code of Practices (ECoPs) are included in contractors" bidding documents
	Physical Cultural Resources	No physical, cultural resources which warrant special treatment under the World Bank OP 4.11 were identified in the proposed restoration of area. One mosque and no graveyard is located in the proposed canal area.
	Social impacts	For negative social impacts on land/assets/livelihood/access to resources etc. mitigation plans will be prepared in keeping with the Bank's Operational policies triggered.
	Gender	Women participated in the consultation meetings. In the project design, female waiting rooms and toilets are included.
	Public Health	Public health aspects were studied and public health impacts are covered in EIA
	Consultation and access to information	The EIA will be disclosed on NCC website and will also be sent to WB InfoShop. The executive summary of the EIA has been translated to Bangla and was circulated to local community. Public consultations held on 11 th April 2017 at NCC Poura Auditorium (Old).

Source: Prepared by consultant

CHAPTER -3: PROJECT DESCRIPTION

3 Project Description

3.1 Description of the Project

Narayanganj City Corporation is growing to become one of the urban giant in Bangladesh. Its area is now 73.42 sq.km with a population projection of 1.5 million. Considering the recent national policy on equal development as well as the economic growth of the country and due to benefit of proposed Padma bridge and Jatrabari flyover, it is expected that Narayanganj will become important in generating its own economic and demographic pull in the south-east district and will be the dominant city adjacent to Dhaka, the capital city of Bangladesh. Considering good communication system, peaceful atmosphere and availability of trade & commerce, Industries are being grown up along with the rapid urbanization.

Due to rapid urbanization, industrialization and population growth, Narayanganj is facing pressure to address the various issues i.e. severely aggravate the management of essential urban services and impede the existing facilities providing for the citizen.

3.2 Justification on Selection of Project Location

The existing canal with most of its part filled up with earth, dumping garbage and sewage pit which causes nuisance and foul odors. Due to years of negligence and sewage dumping in the canal it had become a dumping ditch & an eyesore to the people of city. The canal is now disconnected from the river Shitalakhya and Dhaleshwari. The environment of the surrounding area is heavily polluted. Hence economic activities become slow, lifestyle become poor and aesthetic values reduces significantly.

Restoration of Baburail canal with navigate facilities will ensure easy, pleasant and safe time, money and movement of traffics in the city; reduce traffic jam, save the fuel cost as well as working hour against existing communication network, and will make an easier way of communication within city area.

So, the restoration of the 2.8 Km Baburail canal is very important and justified at the existing Baburail canal location in order to increase the economic and social development of the City in a wider scope and benefit.

3.3 Location of the Project

The proposed canal is locally termed as 'Baburail & Jhelepara Bangla Bazaar Canal', which is 2.8 km long and 15-30m wide in different sections connecting Shitalakhya River at the East and Dhaleshwari River at the West. At present the canal is disconnected with earth fill and unauthorized inhabitant occupying the canal area. The canal is situated under word no 15 and 16 of NCC. While connected with the rivers, the canal would flow East to West at monsoon and West to East at the lean period. Jimkhana Lake is also connected perpendicularly to the canal and approximately 405 m long and 75 m wide surrounded by Deobogh Pucca Road and Bangabandhu Road. The canal is adjacent to RK Mitra Road at South and Mubarak Shah Road at North; crossed the Bangabandhu Road at Mondal Para Intersection, the SM Maleh Road at Hangsha Cinema Hall Bridge, Deobogh Pucca Road at Zallerpar Bridge and Dhaka-Munshiganj Highway at Jhelepara Bridge (Kashipur). The Basic Information of the Project is shown in Table 3.1. Location of the 2.8 km Baburail Canal

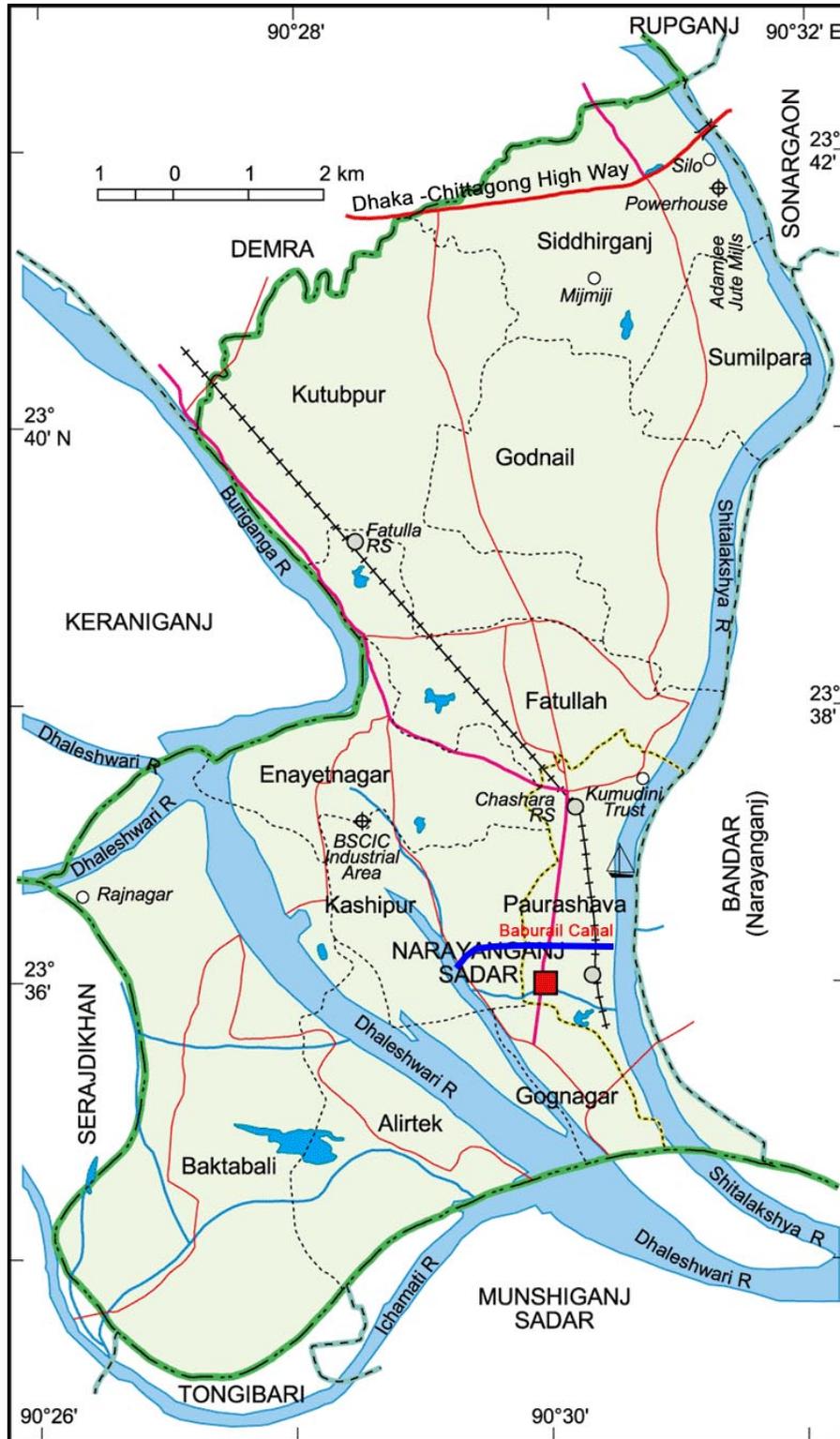
Restoration Project is shown in Figure 3.1 The location of Baburail Canal with Catchment area is shown in Figure 3.2. Existing location of Baburail canal is shown in Figure 3.3 and Figure 3.4 and proposed canal is shown in Figure 3.5, proposed Gymkhana lake is shown in Figure 3.6 and entire project overview is shown in Figure 3.7.

Table 3.1 Basic Information of the Project

Name of Information	Description of Information
Name of Project	Reshaping of canal, landscaping, beautification, and lighting of Shitalakhya to Dhaleshwari River via Baburail in Narayanganj City Corporation
Implementation agency	NCC/LGED
Finance by	World Bank
Project Consultants	Vitti Sthapati Brindo Ltd.
Nature of traffic pass through	Light boat
Length of Canal	2.8 km
Width of Canal	15-30 m
Number of Bridge	18 nos, Width 3-7 m
Number of Overpass	3
Project Cost	BDT 2,302,163,325.92

Source: Project data sheet

Figure 3.1: Location of the 2.8 km Baburail Canal Restoration Project



Source: Banglopedia

Figure 3.2: The location of Baburail Canal with Catchment Area

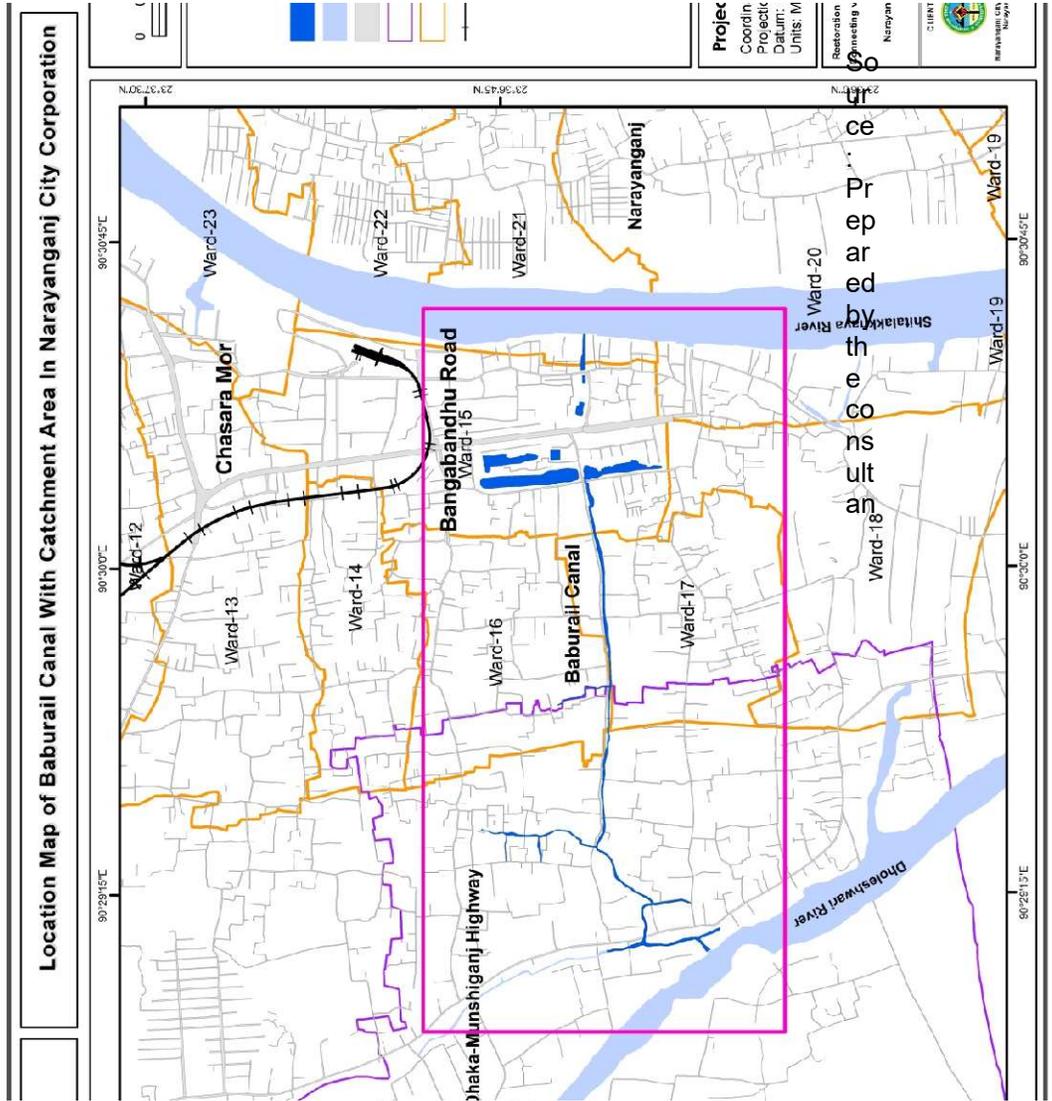


Figure 3.3: Location of the 2.8 km Baburail Canal Restoration Project



Figure 3.4 :Existing Pictures of Baburail Canal at (Dhaleswari River) Portion



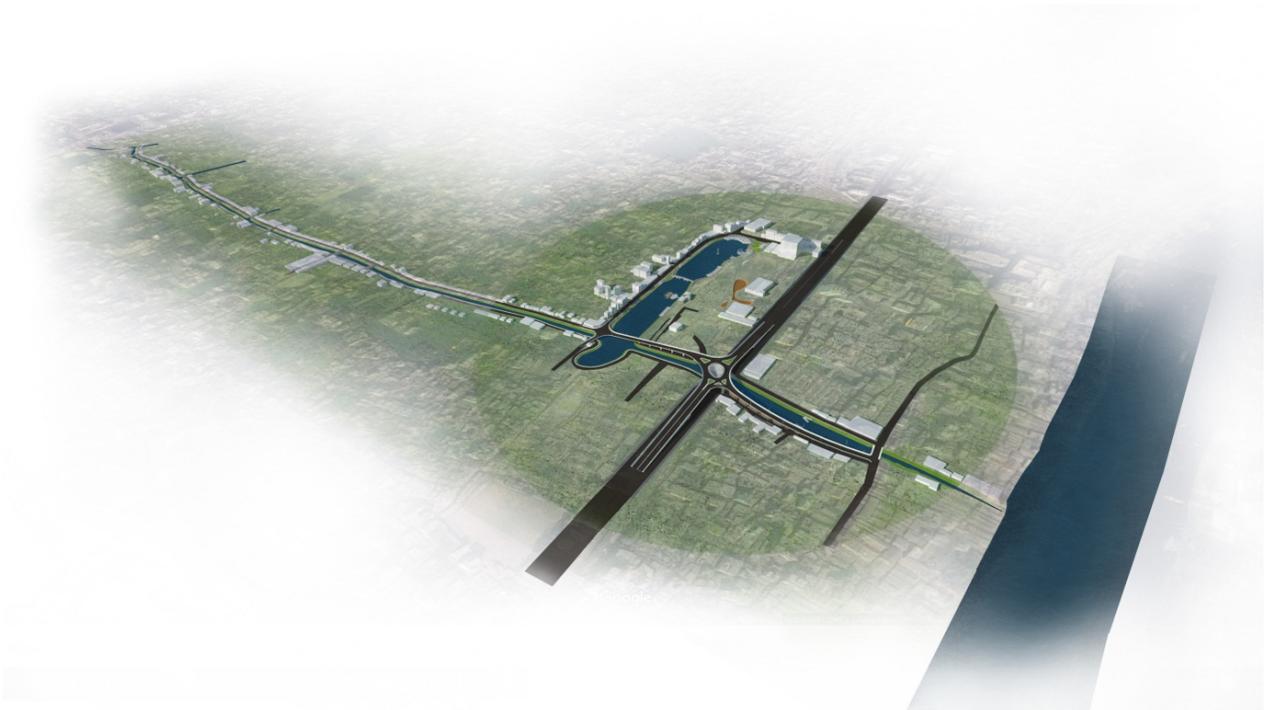
Figure 3.5: Proposal of Baburail Canal beside R. K. Mitra Road



Figure 3.6: Proposal of Jimkhana Lake



Figure 3.7: Design of the enter Project overview of Baburail Canal Restoration.



3.4 Project Category

According to the Environmental Conservation Rule (ECR, 1997) the proposed Restoration of Baburail Canal fall under Orange B Category that requires an Initial Environmental Examination study to obtained environmental clearance certificate from DoE.

According to the EIA guideline of DoE, it is mandatory to carry out Initial Environmental Examination (IEE) for Red Category projects prior to conducting EIA. For the proposed project the IEE report with EMP should be submitted to obtain environmental clearance.

3.5 Project Component

The following are the major component of the project

1. Approx 3 km long Both side open drain
2. 07 Nos Foot Bridges
3. 09 Nos Road Bridges
4. Recreational facility
5. Footpath/ Walkway
6. Foot-overbridge
7. Landscaping
8. Water Control Devices at both end of the river side
9. Canal slope protection
10. Ghat
11. Viewing Deck
12. Floating Folded Deck
13. Lighting
14. Public Toilet

The following are the major component of the project

1. Drain Construction (2.8 km long both side of the Canal)

This component of the project will facilitate the rain water drainage facilities in the project area and protect the slope of the canal. In urban areas, drainage congestion is a big issue of concern for SDG and development project players and considering the point, this component will help to meet the SDG goal 11. It has minimal impact during the construction phase that will be mitigated according to the mitigation plan explained in Chapter 8.

2. Foot Bridges (07 Nos)

This component of the project will motivate people to walk to see the beautification of the canal and its surrounding environment within a shorter distance which will improve the physical and mental health of the people in the project area that is also explained a an important goal of SDG.

3. Road Bridges (09 Nos)

This component of the project will decrease the transportation time and distance causes to reduce the fuel consumption which reduces the cost of travel and greenhouse gas. This will also reduce the traffic congestion in the area during the project operation phase which is the major problem of our country.

4. Recreational facility

It will have a good warm up facility for the visitors. This component will help people to have recreation with a healthy breathing.

5. Footpath/ Walkway

This component of the project will motivate people to walk to see the beautification of the canal and its surrounding environment within a shorter distance which will improve the physical and mental health of the people in the project area that is also explained an important goal of SDG.

6. Landscaping

For sustainable development, landscaping is another important component for this project. It will create a good sense of innovation for master planning.

7. Water Control Devices (Sluice Gate at both end of the river side)

Two sluice gates will be constructed at both ends of the canal which can control the contamination of polluted river water because Shitalakkha and Dholeswary both are polluted.

8. Canal slope protection

This component of the project will facilitate the rain water drainage facilities in the project area and protect the slope of the canal. In urban areas, drainage congestion is a big issue of concern for SDG and development project players. It has minimal impact during the construction phase that will be mitigated according to the mitigation plan explained in Chapter 8.

9. Viewing Deck

This component of the project will motivate people to move to see the beautification of the canal and its surrounding environment in night time which will improve increase the visibility in the area in night time.

10. Lighting

This component of the project will motivate people to move to see the beautification of the canal and its surrounding environment in night time which will improve increase the visibility in the area in night time.

11. Public Toilet & Drinking water

This component of the project will help people to have their refreshment facilities during the site seeing providing toilet and safe drinking water in the project area. This will enhance the quality of life of the city dweller of the area.

3.6 Construction Materials

Construction materials for restoration of Baburail Canal are following. These will be procured from different markets.

- Soil
- Bitumen
- Asphalt
- Cement
- Sand
- Stone chips
- MS rod

- Water
- PVC pipe
- G.I Pipe
- Wood
- Bricks
- Hollow block
- Gunny Bag
- Stone
- Geo Textile
- Clay soil

3.7 Resource and Utilities Require

- Land reshaping
- Construction material
- Utilities (water, electricity, sewerage, waste disposal and others)
- Other infrastructure road, drain, electricity to support the project

The location of construction camps and stack yards will be used in the vacant place of the East of the Gymkhana Lake of proposed project site.

During construction, the site for the proposed restoration of Baburail Canal will be used for establishing construction camps and stack yards facilities. About 63063.29cubic meters of earth need to be excavated for restoration of canal. The silted earth material will be used for filling up NCC own lowland. The existing structure of the NCC is shown in Figure 3.8

3.8 Project Schedule

The project has already been started and will complete in 2019. The detail of project work schedule is shown in Figure 3.9.

3.9 Present Status of the Project

The project is now in initial stage. Physical development and construction works has not yet started which was observed during site visit on 1st March 2017. The project proponent has applied for issuing environmental clearance certificate from DoE and No Objection Certificate (NOC) from local body has already been obtained.

Figure 3.8 Existing structure type of Map of Baburail Canal with Catchment area

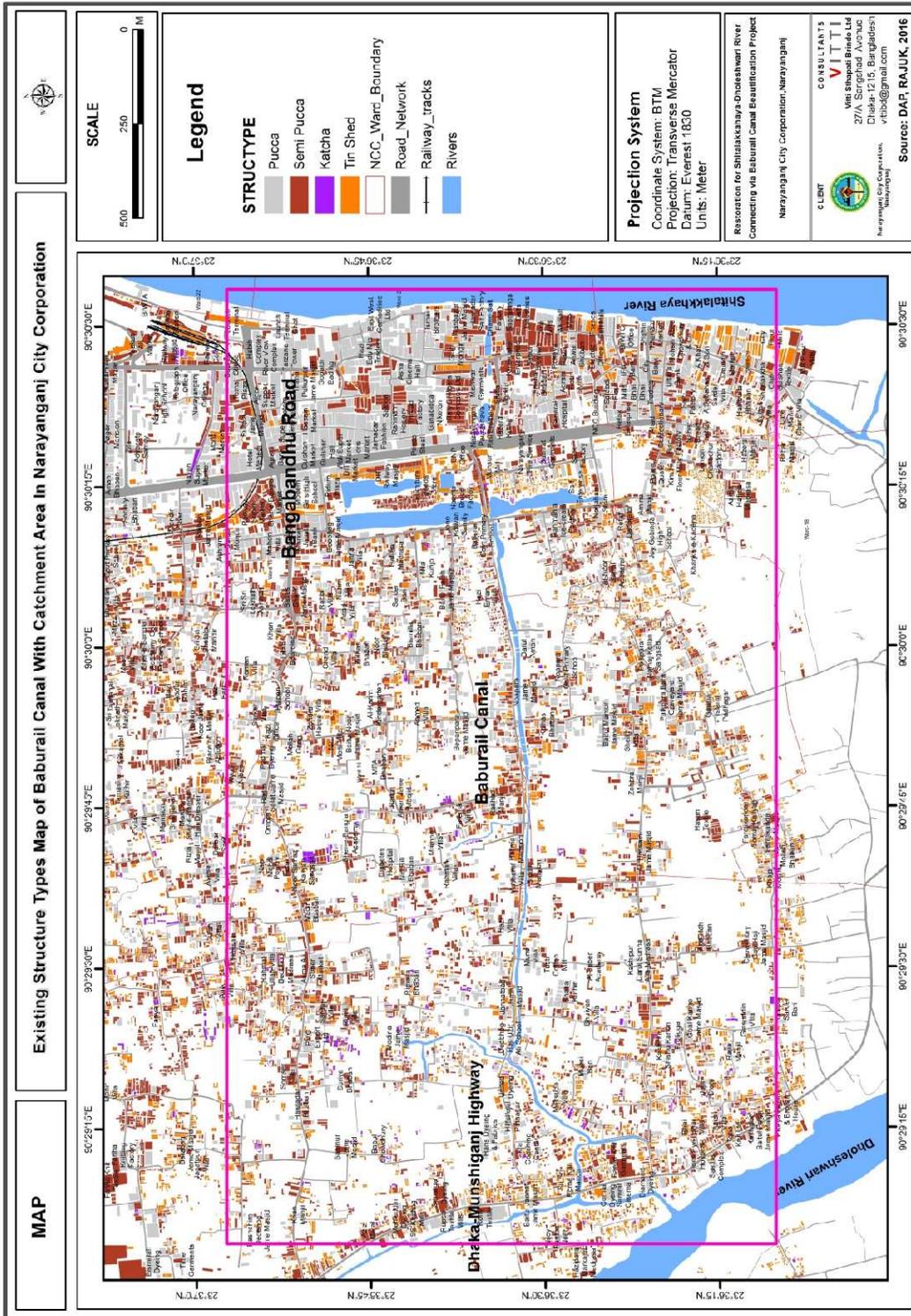
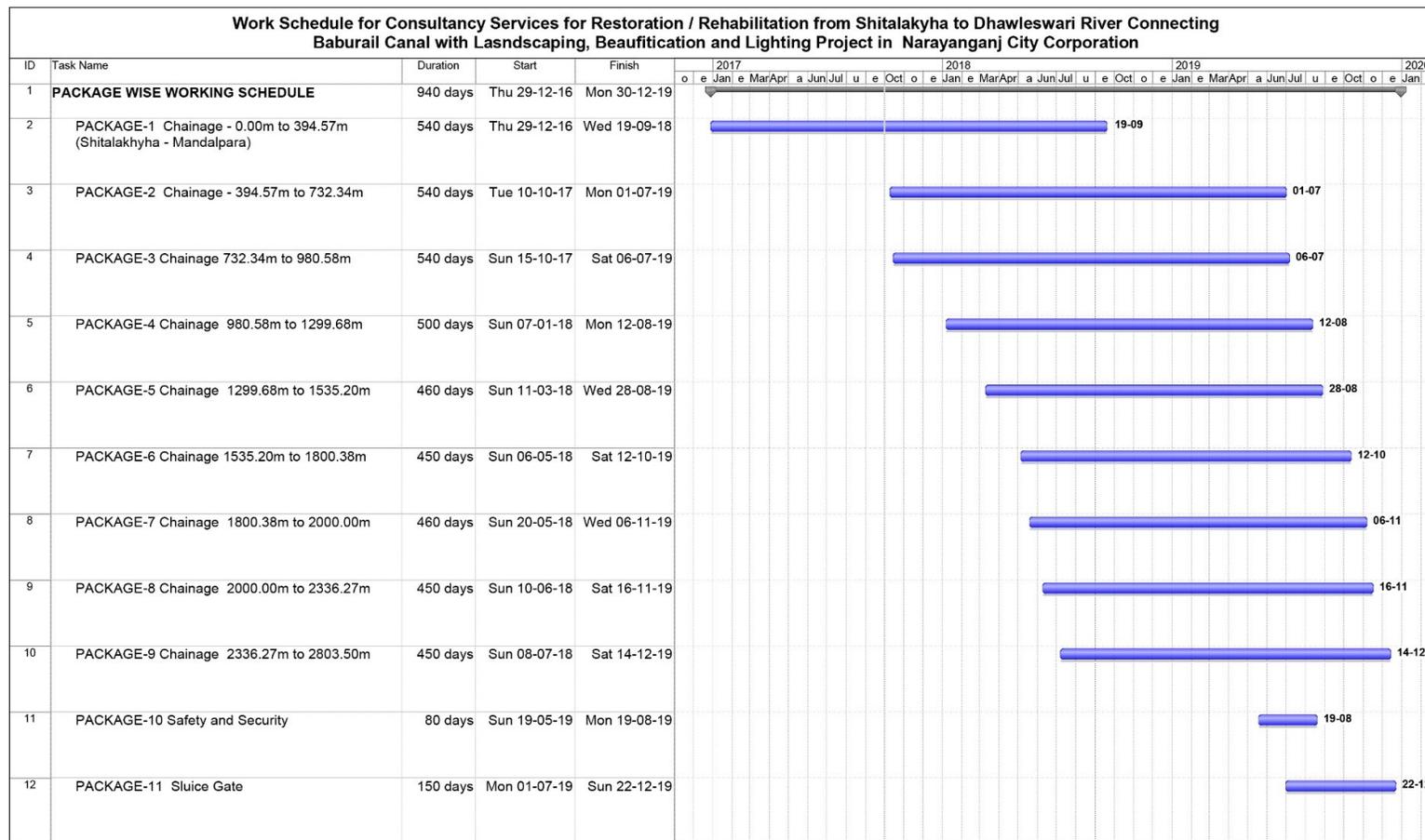


Figure 3.9 Detail of Project Schedule



CHAPTER -4: BASELINE ENVIRONMENT

4. Baseline Environment

4.1 Physical Environment

4.1.1 Geology

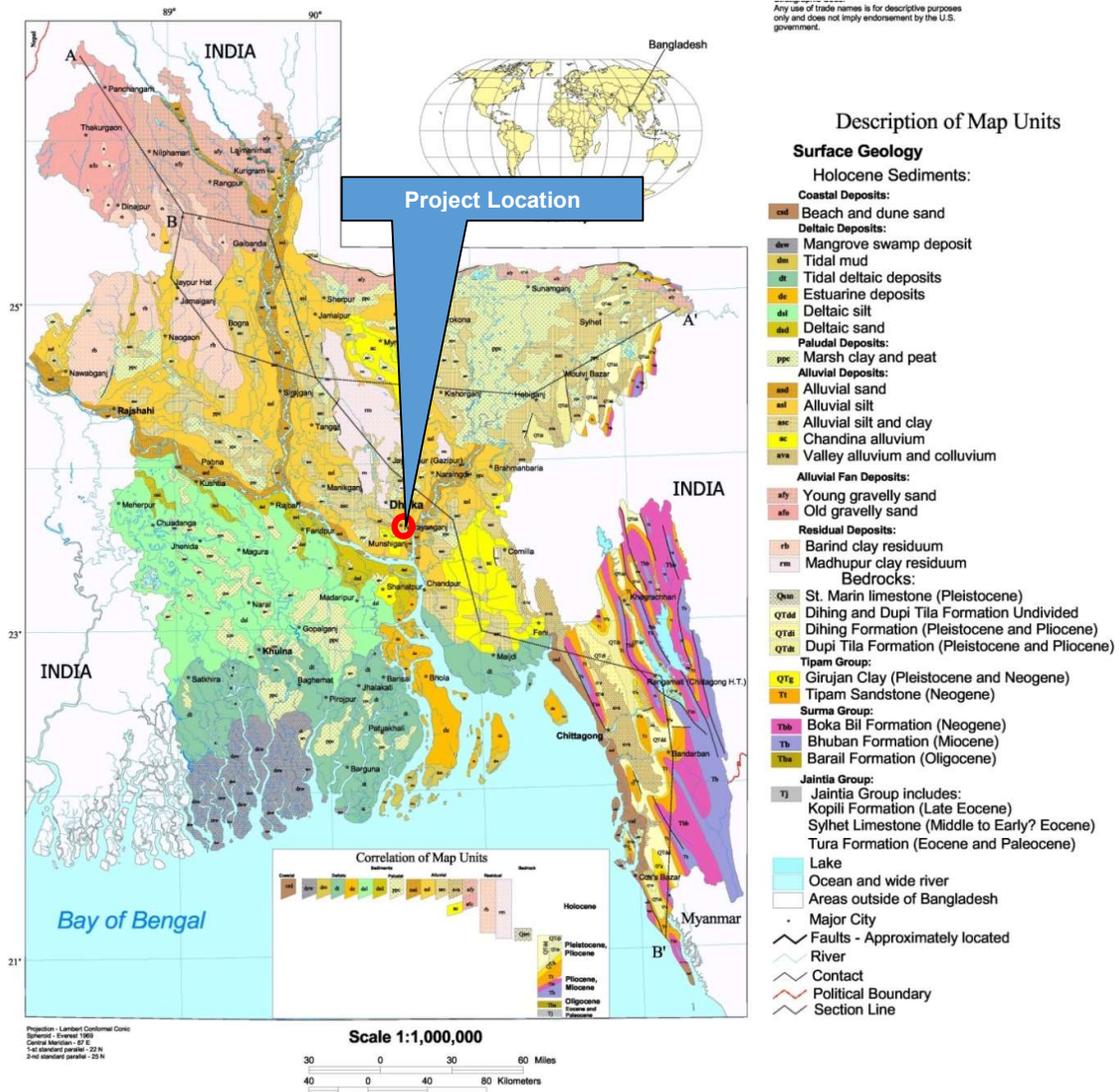
Bangladesh covers a major part of the Bengal delta, one of the largest in the world. The Ganges-Brahmaputra delta basin or the Bengal basin includes part of the Indian state of West Bengal in the west and Tripura in the east. Narayanganj is situated on the southern tip of a Pleistocene terrace, the Madhupur Tract. Two characteristic geological units cover the Narayanganj city and surrounding areas; the Madhupur Clay of the Pleistocene age and alluvial deposits of recent age. The Madhupur Clay is the oldest sediment exposed in and around the city area and characterized by reddish plastic clay with silt and very fine sand particles. This Madhupur Clay unconformably overlies the Dupi Tila Sand of Plio-Pleistocene age, which is composed of medium to coarse yellowish-brown sand and occasional gravel.

The channels and depressions within the city are floored by recent alluvial floodplain deposits and are subdivided into Lowland Alluvium and Highland Alluvium. The alluvial deposits are composed of fine sand, silt and clay in different combinations.

The area of the proposed restoration Baburail Canal at the city centre will cross the Shitalakhya River. This river has had a significant impact on the geology and geotechnical properties of the soils because they cover the whole investigation area with alluvial deposits related to the floodplains

The alluvial soils of these floodplains mainly consist of ridges of loamy material like silty clays and silty sands with large areas of shallow clays in the basins. The soil pattern can become more irregular close to river channels due to more recent deposits. With regard to the youngest activities (natural as well as anthropogenic) organic soils of swamps may be found locally as well as areas where the ground level has been raised using loose sands (hydraulic sand filling) dredged and pumped from nearby rivers. Figure 4.1 shows the geological formation of Bangladesh as well as the project area.

Figure 4. 1: Geological Map of Bangladesh



(Source: Geological Survey of Bangladesh)

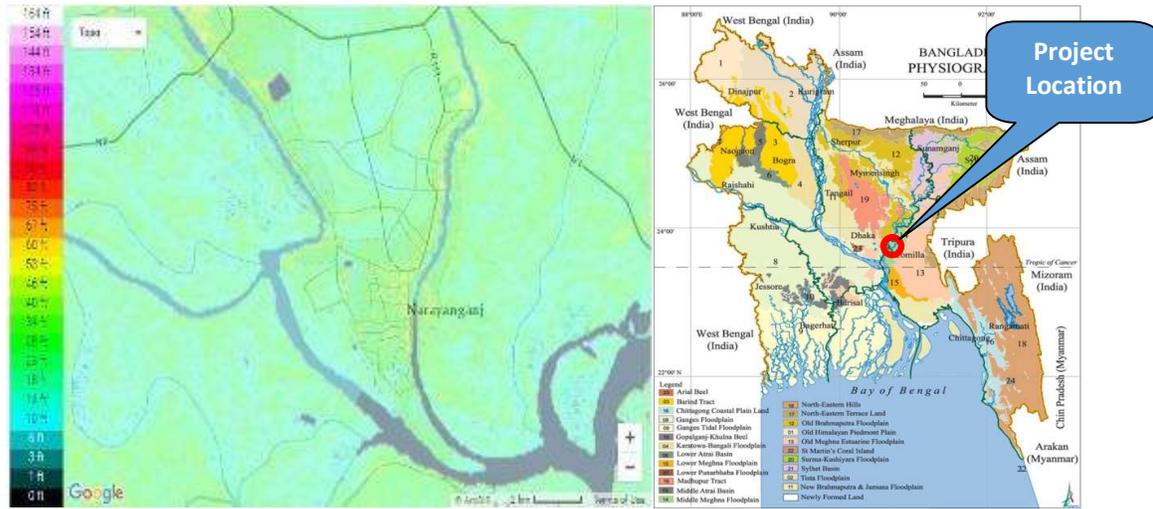
4.1.2 Topology

Narayanganj is located mostly on river deposits at the southern fringe of the Madhupur Tract, which is an elevated Pleistocene inlier. Large parts of the city are located on this inlier, which is surrounded by very young riverine sediments occupying the surrounding valleys. The elevation of the inlier tract varies from 2 to 14 m above mean sea level, and the drainage patterns within can be either dendritic or trellis. The terraces are surrounded by the Ganges-Meghna floodplain in the south, the old Brahmaputra floodplain in the east, and the Jamuna floodplain in the west.

The topographic elevation in the project area is reflected in specific landforms as “high” lands, lowlands, depressions, and abandoned channels. Around the outskirts of Narayanganj, the rivers Shilakhya and Dhaleswari drain a complex of low areas, which are a system of low-lying alluvial plains. The average elevation here is less than 2 m above mean sea level. Broad streams cut through the central high area and fall into this unit. The broad streams are locally known as *khals*, and the broad depressions are called *bils*.

The project area is spread over the Madhupur tract and old Brahmaputra Flood plain. Topographic view of Bangladesh and the project area shown in Figure 4.2.

Figure 4. 2: Topographic view of Bangladesh and the Project area.



(Source: Geological Survey of Bangladesh)

4.1.3 Climate

Bangladesh is located in the tropical monsoon region and its climate is characterized by high temperature, heavy rainfall, often excessive humidity, and fairly marked seasonal variations. The most striking feature of its climate is the reversal of the wind circulation between summer and winter, which is an integral part of the circulation system of the South Asian subcontinent. From the climatic point of view, three distinct seasons can be recognized in Bangladesh - the cool dry season from November through February, the pre-monsoon hot season from March through May, and the rainy monsoon season which lasts from June through October. The month of March may also be considered as the spring season, and the period from mid-October through mid-November may be called the autumn season.

As there is no meteorological station available in Narayanganj, the climatic variables monitored at the Dhaka station (approx. 20 km from the site) have been assumed to represent the climatic condition of the project area. Different meteorological data like rainfall, temperature, relative humidity and wind speeds monitored at the meteorological station in Agargaon, Dhaka are described in the following sub-sections.

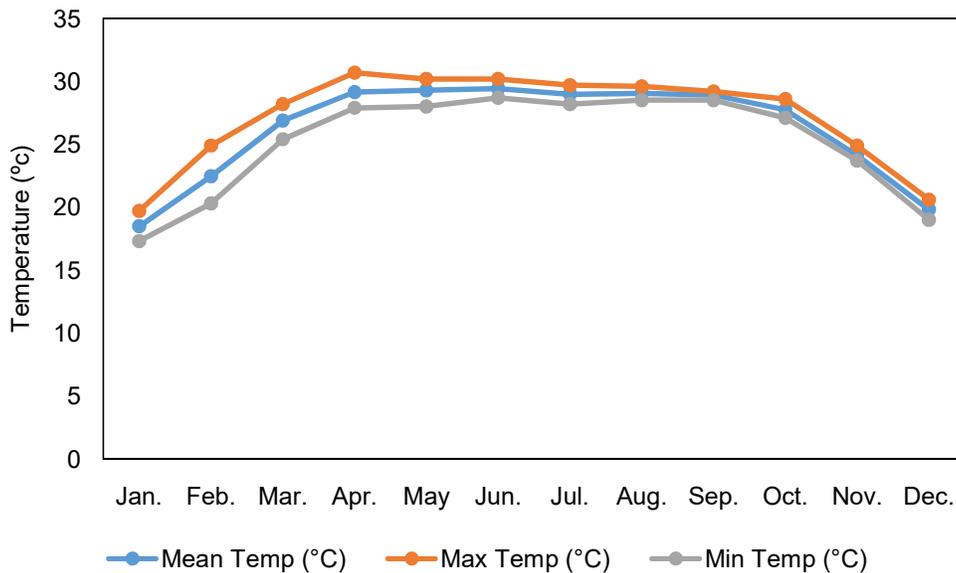
Temperature

January is the coldest month in Bangladesh. Average temperatures in January vary from about 17°C in the northwestern and northeastern parts to 20°-21°C in the coastal areas. As the winter season progresses into the pre-monsoon hot season, temperature rises, reaching the maximum in April, which is the middle of the pre-monsoon hot season. Maximum temperature in summer season rises up to 40°C or more. After April, temperature decreases slightly during the summer months, which coincides with the rainy season. Widespread cloud covers causes dampening of temperature during the later part of the pre-monsoon season.

Average temperatures in July vary from about 27°C in the southeast to 29°C in the northwestern part of the country.

From the previous 10 years monthly temperature data it can be observed that the minimum temperature was observed 17.3 degree centigrade in January of 2011 and maximum temperature 30.7 degree centigrade was observed in April 2014. The Monthly Average Maximum, Minimum and Mean Temperature during 2006-2016 is shown in Figure 4.3.

Figure 4. 3: Monthly Average Maximum, Minimum and Mean Temperature during 2006-2016



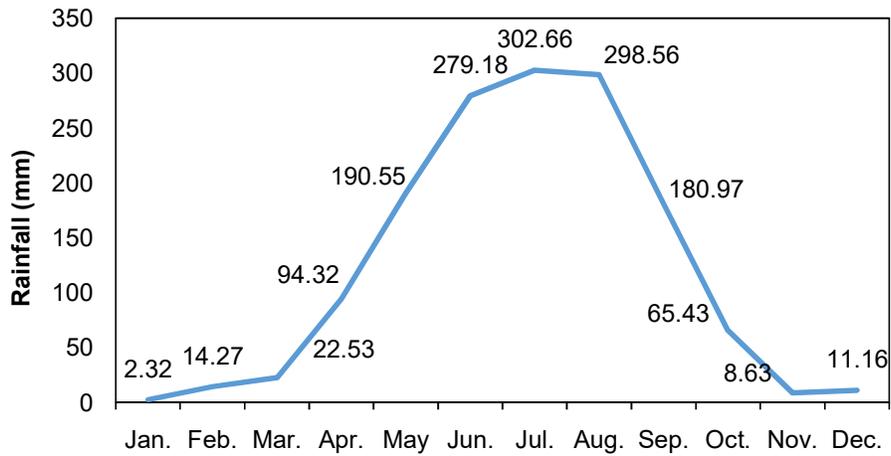
Source: Bangladesh Meteorological Department (BMD)

Rainfall

The single most dominant element of the climate of Bangladesh is the rainfall. Because of the country's location in the tropical monsoon region, the amount of rainfall is very high. However, there is a distinct seasonal pattern in the annual cycle of rainfall, which is much more pronounced than the annual cycle of temperature.

From the previous 10 years monthly rainfall data it can be observed that the minimum average rainfall was observed 2.32mm in January and maximum average rainfall was observed 302.66mm in July. The Monthly Average Rainfall Pattern during 2006-2016 is shown in Figure 4.4.

Figure 4. 4: Monthly Average Rainfall Pattern during 2006-2016



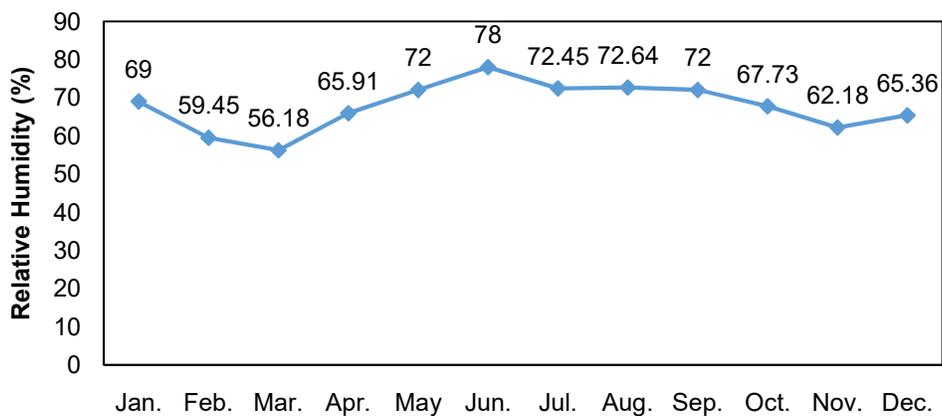
Source: Bangladesh Meteorological Department (BMD)

Humidity

March and April are the least humid months over most of the western part of the country. The lowest average relative humidity (57%) has been recorded in Dinajpur in the month of March. The least humid months in the eastern areas are January to March. Here the lowest monthly average of 58.5% has been recorded at Brahmanbaria in March. The relative humidity is everywhere over 80% during June through September. The average relative humidity for the whole year ranges from 78.1% at Cox's Bazar to 70.5% at Pabna.

From the previous 10 years monthly humidity data it can be observed that the minimum average humidity was observed 56.18mm in March and maximum average humidity was observed 78.00mm in June. The Monthly Average Humidity of the Project Site during 2006-2016 is shown in Figure 4.5.

Figure 4. 5: Monthly Average Humidity of the Project Site during 2006-2016



Source: Bangladesh Meteorological Department (BMD)

4.1.4 Hydrology

From the hydrological study discharge data of Shilakhya, Balu, Dhaleswari and Buriganga River has been observed. There are several internal canal also in it. As such, it has got a unique natural landscaping. The river Shitalakhya bisects the city into two parts and it is flowing through the elongated direction of it and the river Dhaleshwari is flowing at the western part of the city corporation. The Buriganga River and the Balu River are contributing the Dhaleshwari and the Shitalakhya respectively from the up. Most of the internal canals have been encroached by the nearby habitants and have become too much polluted because of the sewage disposal and to some extent by the industrial pollutants. And it has become very essential for restoration of all these canals to get rid of further environmental degradation and to make the city a beautiful and habitable one. According to Hydrological study data Table (Hydrological Report, 2017) In Balu River maximum and minimum discharge at Demra station was observed 744.10 cumec in 1998 and 159.58 cumec in 2011 respectively. In Lakhya River maximum and minimum discharge at demra station was observed 2742.2 cumec in 1998 and 755.57 cumec in 2006 respectively. Combined maximum and minimum discharge at demra station was observed 3486.3 cumec in 1998 and 877.18 cumec in 2012 respectively.

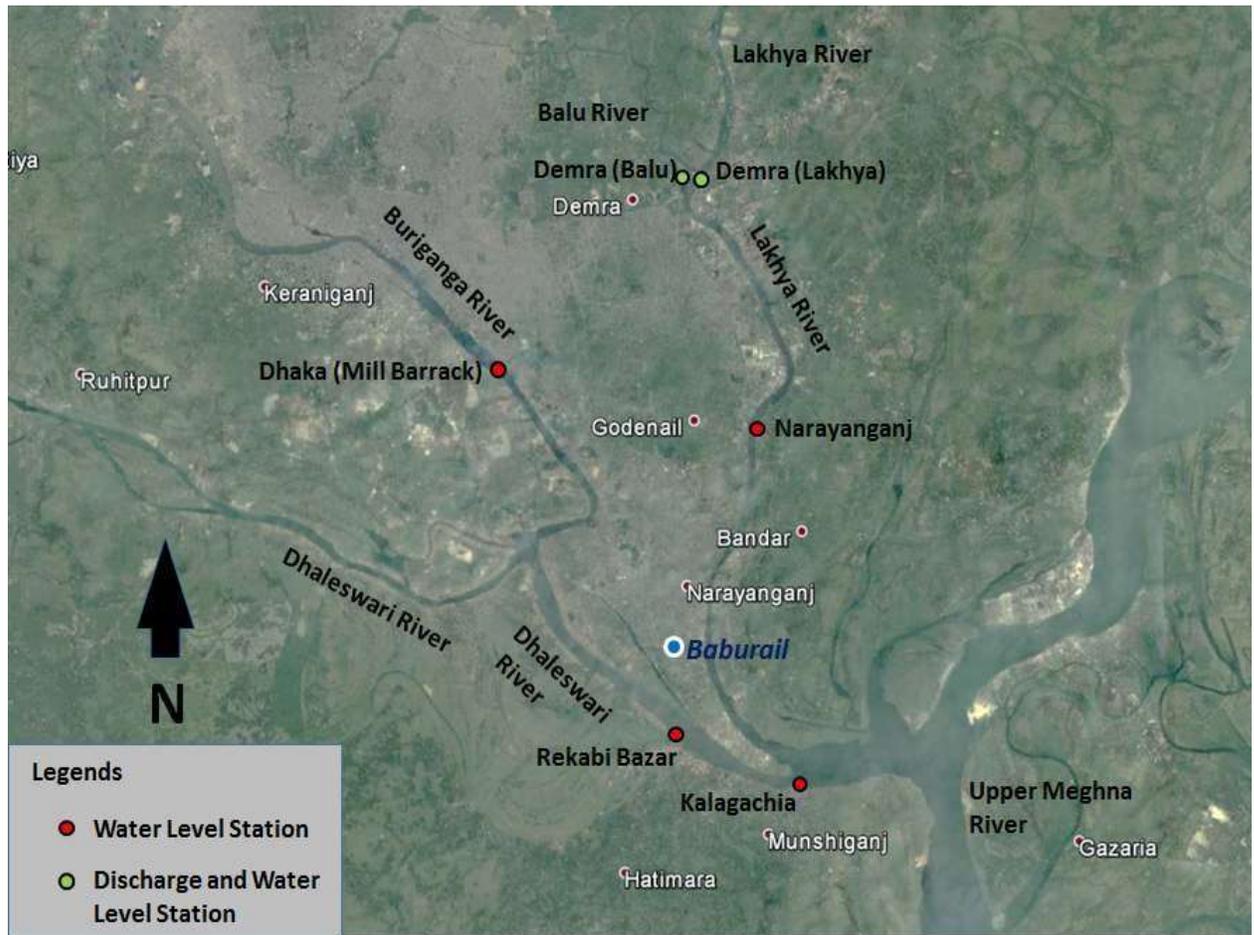
Again water level data of five stations of Dhaleshwari, Lakhya, Buriganga Rivers were observed. Table 4.1 shows the Standard high water level (SHWL) and standard low water level of the five stations. The Hydrological Measurement Network is shown in Figure 4.6. The detail of hydrology study is presented in Separate report.

Table 4.1 SHWL and SLWL of Dhaleshawari, Lakhya, Buriganga River

River Name	Station	SHWL	SLWL
Buriganga	Dhaka (Mill Barrack)	7.06 mPWD	0.37mPWD
Dhaleswari	Rekabi Bazar	6.62 mpWD	0.47 mPWD
Dhaleswari	Kalagachia	6.14 mPWD	0.36 mPWD
Lakhya	Demra	6.88 mPWD	0.60 mPWD
Lakhya	Narayanganj	6.75 mPWD	0.43 mPWD

Source: Hydrological study by the consultant

Figure 4. 6:Hydrological Measurement Network

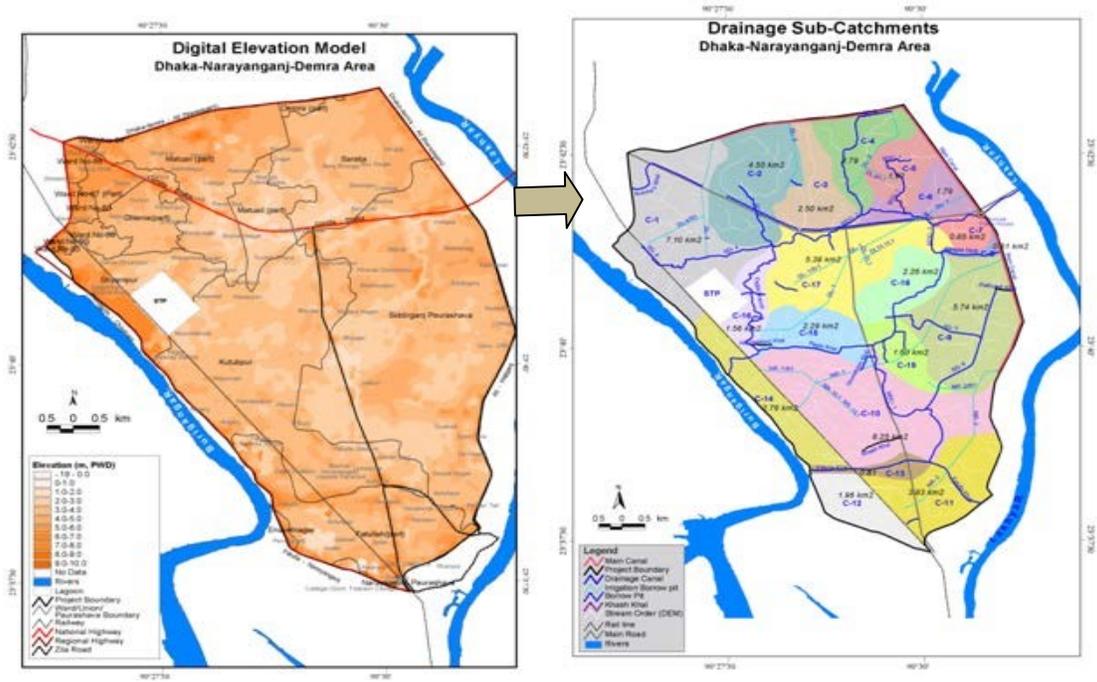


Source: Prepared by the consultant

4.1.5 Drainage System

The most significant feature of Bangladesh landscape is provided by the rivers. Rainwater and wastewater are discharge to the nearby canal and finally into the river. Rainwater and wastewater will not connected into the Baburail Canal. Wastewater will be discharge through the pipeline and finally to the nearby rivers through regulated side surface drainage system of the proposed project. There are existing 229.44 km of surface drain in the city corporation area in order to quick discharge of water. Out of 229.44 km of drain 112.2 km of brick, 49.85 km of RCC, 2.89 km of pipe, and 45.50 km of Katcha drain. Drainage elevation and sub-catchment of Dhaka-Naryanganj-Demra area is shown in Figure 4.7.

Figure 4. 7: Drainage elevation and sub-catchment of Dhaka-Narayanganj-Demra area



Source: International Journal of Scientific & Engineering Research, Volume 4, Issue 10, October-2013

4.1.6 Flood in the Project Area

Floods are more or less a recurring phenomenon in Bangladesh and often have been within tolerable limits. But occasionally they become devastating. From the hydrological study following (Table 4.2) flood scenario can be observed.

Table 4.2 Flood Levels under different scenario

Flood Level (in mPWD) At Different Scenario								
Location	Q_100yr freq	Q_50yr freq	HWL	WL_100yr freq	SHWL	NFL/ Avg.FL	SLWL	LWL
Baburail Canal_ Lakhya end	7.27	6.95	6.76	6.72	6.36	5.44	0.39	0.30
Baburail Canal_ Dhaleshwari end	-	-	6.92	7.46	6.92	5.59	0.45	0.45
Flood Level(in mMSL) At Different Scenario								
Location	Q_100yr freq	Q_50yr freq	HWL	WL_100yr freq	SHWL	NFL/Av g.FL	SLWL	LWL
Baburail Canal_ Lakhya end	6.81	6.49	6.30	6.26	5.90	4.98	-0.07	-0.16
Baburail Canal_ Dhaleshwari end	-	-	6.46	7.00	6.46	5.13	-0.01	0.00
Flood Level(in mMSL) At Different Scenario with 1m freeboard								
Location	Q_100yr freq	Q_50yr freq	HWL	WL_100yr freq	SHWL	NFL/Av g.FL	SLWL	LWL
Baburail Canal_ Lakhya end	7.81	7.49	7.30	7.26	6.90	5.98	-0.07	-0.16
Baburail Canal_ Dhaleshwari end	-	-	7.46	8.00	7.46	6.13	-0.01	0.00

Source: Base data from WDB and Prepared by the consultant

4.1.7 Landscape

The surrounding Landscape of the proposed project site is mainly residential area along both side. The proposed canal is locally termed as 'Baburail & Jhelepara Bangla Bazaar Canal', which is 2.8 Km long and averagely 15-30m wide in different sections connecting Shitalakhya River at the East, which is disconnected with earth fill and Dhaleshwari River at the west under ward no- 15 & 16, of Narayanganj City Corporation. While connected with the rivers, the canal would flow east to west at monsoon and west to east at the lean period. Jimkhana Lake is connected to the canal and approximately 405 m long and 75 m wide

surrounded by Deobogh Pucca Road and Bangabandhu Road. The canal is adjacent to RK Mitra Road at south and Mubarak Shah Road at north; crossed the Bangabandhu Road at Mondal Para Intersection, the SM Maleh Road at Hangsha Cinema Hall Bridge, Deobogh Pucca Road at Zallerpar Bridge and Dhaka-Munshiganj Highway at Jhelepara Bridge (Kashipur).

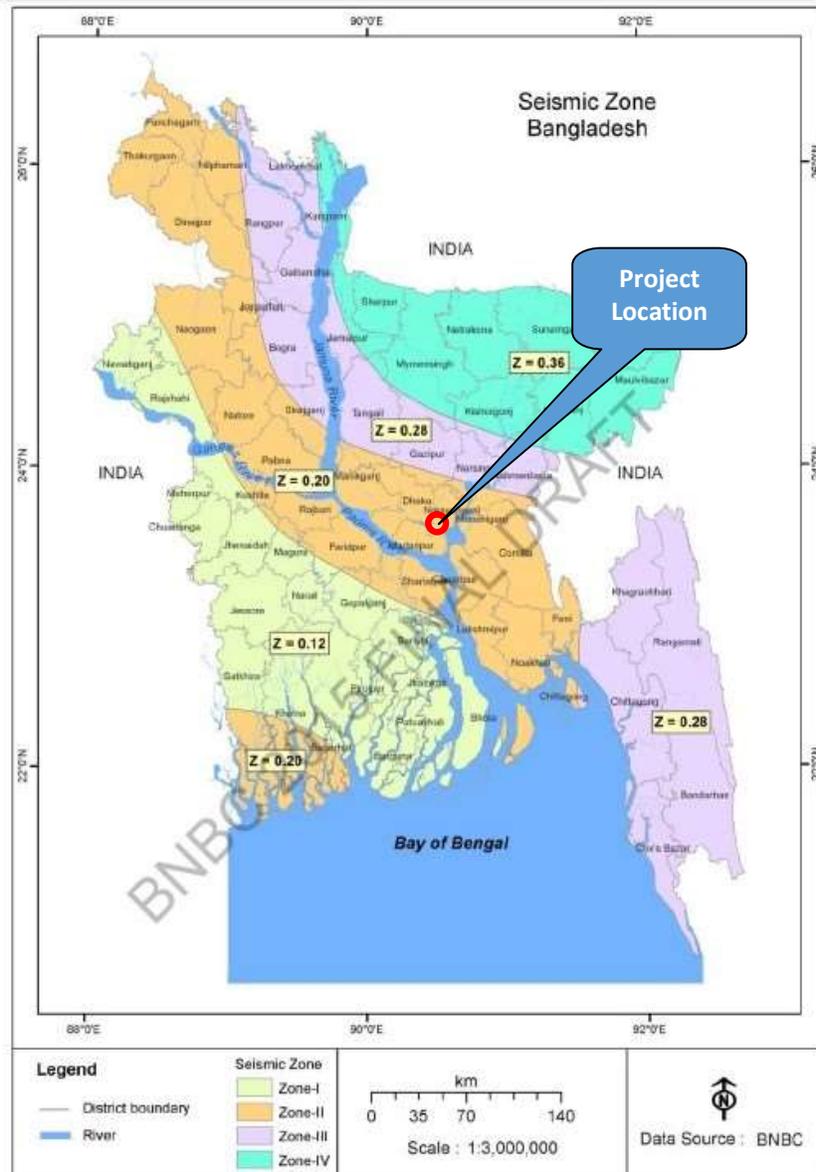
4.1.8 Seismology

The intent of the seismic zoning map is to give an indication of the Maximum Considered Earthquake (MCE) at different parts of the country. In probabilistic terms, the maximum considered earthquake motion may be considered to correspond to having a 2% probability of exceedance within a period of 50 years. The country has been divided into four seismic zones with different levels of ground motion. Table 4.3 includes a description of the four seismic zones. Figure 4.8 presents the boundaries of the four seismic zones. According to seismic zone map of Bangladesh, The proposed sub-project is located in seismic zone 2 is 0.20 and seismic zone coefficient of Narayanganj is 0.20, which is a moderate seismic zone.

Table 4.3 Seismic Zones of Bangladesh

Seismic Zone	Location	Seismic Intensity	Seismic Zone Coefficient, Z
1	Southwestern part including Barisal, Khulna, Jessore, Rajshahi	Low	0.12
2	Lower central and Northwestern part including Noakhali, Dhaka, Narayanganj, Pabna, Dinajpur as well as southwestern corner including sundarbans	Moderate	0.20
3	Upper central and northwestern part including Brahmanbaria, Sirajganj, Rangpur	Severe	0.28
4	Northwestern part including Sylhet, Mymensingh, Kurigram	Very Severe	0.36

Figure 4. 8: Seismic Zoning Map of Bangladesh



4.1.9 Navigation

In the project area navigation facility will be available in the nearby Dhaleswari River at the West side and Shitalakhya River in the East Side. After the completion of the proposed restoration of Baburail Canal project boat service will be started within the Canal for recreation facilities for 8 Months and navigation facility will be started after the Shitalakhya and Dhaleswari River water when clean and pollution free and will run continuously for 7th Months.

4.2 Ecological Perspective of the Study Area

4.2.1 Approach and Methodology

An ecological survey was carried out as a part of the EIA in order to assess the floral and faunal diversity in the area surrounding the proposed restoration of Baburail canal project 2.8 km long starting from Shitalakhya to Dhaleshwari River.

The main purposes of the ecological survey were (i) to enlist the plant and wildlife species with their national and international status, (ii) to enlist keystone, rare and threatened flora and fauna, (iii) to investigate the distribution and abundance of flora and fauna including fish species, and (iv) to make an assessment of the impacts for the proposed project activities on the ecological environment.

Floral and faunal diversity fluctuates seasonally due to environmental reasons. Seasonal survey (spanning over a year) could provide detailed information on ecological diversity for the study area. However, in the present study, a rapid survey was conducted in March 2017 during daytime. The Ecologist of the EIA team visited the area surrounding the project site (approximately 3.5 km surrounding the project site) to collect first-hand information on floral and faunal diversity.

Field visit, Literature review and informal interviews with local people were also conducted as a part of the study. Hereto-

faunal and mammalian survey was done through visual search and also through discussion with local people. Aural and visual search were the main survey methods for ornithological survey. Fish and fishery information were collected through field study, fisherman interview as well as local fish market survey. Floral survey was conducted through visual and rapid field surveys.

Bio-ecologically the study area falls under Brahmaputra-Jamuna Floodplain (IUCN-Bangladesh, 2002). On the other hand, agro-ecologically it falls under Old Meghna Estuarine Floodplain (BARC/UNDP/FAO, 1995).

4.3 Floral and Faunal Diversity

4.3.1 Floral Diversity

Plant species that grows in the wild in habitat for a particular period is known as flora. It plays vital socio-economic and ecological roles for a particular type of habitat ecosystem. On the basis of habitat, the floral species are divided into two major categories viz. (a) aquatic flora, and (b) terrestrial flora. This Section describes the floral diversity in areas within and surrounding the project site with their status in Bangladesh.

4.3.1.1 Aquatic flora

Aquatic flora is divided into three major types - tree, shrub and herb. Aquatic floral species grow in rivers, canals, ditches, seasonal wetland and low lying agricultural lands in submerged, free-floating, or rooted floating states.

The proposed restoration of Baburail Canal is filled up with earth for long and remained unused for many years. During this time some adaptive floral species have grown at western site, which in turn are being utilized as habitat by some adaptive faunal species. Within the project site, most of the floral species are primarily planted and these are also used by adaptive faunal species as a part of their habitat.

Field visits indicate that the proposed project site and adjacent areas have been significantly altered. Domestic wastewater, river water has been polluted seriously which ultimately causes a decline in the aquatic flora.

Changes in the physical characteristics of river bank land and aquatic environment have direct impacts on its dependent flora. Most of the river-bank areas have well established industrial structures and current ecological feature of these areas seems to be very minimal.

Figure 4. 9: Aquatic Flora at the proposed project site



4.3.1.2 Terrestrial flora

The study area supports various terrestrial floras, some of which of these grown naturally, while most have been planted. Generally, terrestrial flora makes a complex ecosystem; with which wild life develops direct relationship through their ecological niche. Terrestrial flora in the study area presented in Table 4.4.

Figure 4. 10: Terrestrial flora (tree) close to the project site



Table 4. 4:List of Tree Species with Socio-economic & Ecological Value, Size and Number of Trees along the Project location of Baburail Canal Restoration Project:

SI No	Name of Tree (Local/English)	Scientific Name	Size			Total no.	Remarks
			Large	Medium	Small		
01	Akashi		10			10	
02	Papaya	Carica papaya		02		2	
03	Chalta	Dilleniaindica			01	1	
04	Kadam	Neolamarckiacadamba	17	10		27	
05	Bot (Banyan)	Ficusbenghalensis	09	10		19	
06	Koroi	Albizialebbeck	43	01	02	46	
07	Coconut	Cocos nucifera	28	07	07	42	
08	Mango	Mangiferaindica	11	11	01	23	
09	Tamarind	Tamarindusindica	02			2	
10	Dumur (Fig)	Ficusracemosa	10			10	
11	Gab	Diospyros blancoi	01	02		3	
12	Jia		01	04		5	
13	Mehegony	Swieteniamacrophylla	12	20		32	
14	Hijol	Barringtoniaacutangula		01		1	
15	khoi	Streblus asper	02	01		3	
16	Supari (Betel Nut)	Areca catechu	01	06		7	
17	Jackfruit	Artocarpusheterophyllus	01	06		7	
18	Jam (Black Palm)	Syzygiumcumini	01			1	
19	Neem	Azadirachtaindica		02		2	
20	Tal (Pulm)	Arecaceae	05			5	
21	Unidentified Tree		10			10	
Total						258	

4.3.2 Faunal Diversity

Animal and fish which grow in the wild are known as fauna. The study area has various assemblages of animal communities; some species use the area as a permanent habitat, while others as a temporary habitat. Based on habitat, faunal species are divided into two major categories viz. (a) aquatic fauna, and (b) terrestrial fauna.

4.3.2.1 Aquatic fauna

Aquatic fauna refer to wild life and fish species that fully or partially depend on a aquatic environment to live or to get food, shelter, nest, and breed and produce offspring.

Since there is no water in the Baburail Canal hence no fish found. Fish is still reasonably available in the nearby Shitalakhya side and Dhaleshwari River, given the overall and increasing scarcity of fish in the country. Small fishes, which are very popular also in overall Bangladesh, are available and caught and used widely, particularly during early monsoon

and pre-winter season. Among reptiles, narrow headed soft-shell turtle deserves special mention. Among birds, Bok, Finge, Machranga etc. deserve special mention. Currently no fishes are available in the Baburail Canal. A total of 21 faunal species have been identified in the study area, which include 2 amphibia, 4 reptile, 1 aves, 1 mammal, and the rest are fresh water fish.

The fishes include catfishes (Magur and Shing), major carps (Katla, Rui and Mrigal), minor carps (Puti), Telapia, other (Tengra, Boal, Mola, Taki, Shol). Also prawn, particularly the popular small prawns, locally known as Ichha. The Fish Species in the Study is shown in Table 4.5.

Table 4.5: Fish Species in the Study Area

Fish Group	Scientific Name	Local Name
Cat Fish	Macrobrachiummalcolmsoni	Ichha
	Mystusvittatus	Tengra
	Mystusvittatus	GolishaTengra
	Wallago attu	Boal, Pangash, Telapia
Major Carps	Labeorohita	Rui
	Catlacatla	Catla
	Cirrhinusmrigala	Mrigel
Minor Carps Snakehead	Puntius sophore	Puti
	Channa punctatus	Taki
	Mastacembelusarmatus	Bain
Eel	Amblypharyngodonmola	Mola
Others	Pscudeutropicusatberinoides	Batasi

Figure 4. 11: Fish trader with native aquatic fauna (fish)in the study area



4.3.2.2 Terrestrialfauna

Wild animal that depend on terrestrial habitat is known as terrestrial fauna. Several species of amphibian, reptile, bird and mammal are the main components of terrestrial fauna. Areas surrounding the project site have different types of land, including agricultural dryland/seasonal wetland, homestead land, fallowland, ditches, which provide typical environment for terrestrial fauna. Terrestrial wildlife is divided into 4 major groups viz. mammal, bird, reptile and amphibian. A total of 33 faunal species have been identified in the study area which include 3 amphibians, 3 reptiles, 22 aves and 5 mammals. During the site visit only Terrestrial fauna (Pigeon at the project site) found and is shown in Figure 4.12).

Figure 4. 12: Terrestrial fauna (Pigeon at the project site)



4.4 Threatened Flora and Fauna

Floral and faunal species that exist as threatened (endangered, critically endangered, etc.) condition are known as threatened species. There are specific criteria to declare a species as threatened. A total of 54 fresh water fish and 147 inland wildlife species are threatened species in Bangladesh. Tentative list of 40 plant species are also threatened in Bangladesh. No threatened floral species has been identified in the study areas. A couple of threatened wildlife species have been identified in the study area, and these are listed in Table 4.6. A systematic research work in different seasons may provide a more complete status of flora and fauna within the project areas.

Table 4.6: Threatened wildlife and fish in the study area with their status in Bangladesh

Class (Zoological)	English Name	Scientific Name	CE	E	V
Reptilia	Yellow Monitor	<i>Varanus salvator</i>		Y	

[Legend: O=Observed, CE=Critically Endangered, E=Endangered, V=Vulnerable]

4.5 Protected Areas, Wildlife Sanctuaries, Game Reserves

4.5.1 Protected Area (PA)

Protected Area (PA) refers to an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means. i.e. PA is predominantly a natural area established and managed in perpetuity, through legal or customary regimes, primarily to conserve their natural resources (IUCN, 1990). No PA exists at or near any of the study areas.

4.5.2 National Park (NP)

It is a reserved land, usually declared and owned by a national government, protected from most human development and pollution. No NP exists at or near the proposed project sites.

4.5.3 Game Reserve (GR)

It is an area of land set aside for maintenance of wildlife for tourism or hunting purposes. No GR exists at or near the study areas.

4.5.4 Ecologically Critical Area (ECA)

It is an environmental protection zone, defined by the Government of Bangladesh under the Bangladesh Environment Conservation Act, 1995, where ecosystem is considered to be threatened to reach a critical state. In September 2009, the Bangladesh Government declared Shitalakhya River and its floodplain as "ecologically critical areas", according to the provisions of the environmental Conservation Act 1995 and the Environmental Conservation Rules 1997. The Gazette notification to this effect (see Appendix IX) imposes restrictions on a number of activities in the rivers and their foreshores. These include all types of hunting, collection of all types of aquatic species living in the rivers, all activities that could result in the destruction of floral or faunal habitats, all activities that could destroy natural characteristics of water and soil, activities detrimental to fishery, installation of polluting industrial units, and discharge of domestic/industrial liquid waste. Water intake and discharge from the Shitalakhya River for the proposed project will depend on the permission of the respective authority (e.g. DoE/GoB). However, it is expected that the respective authority will allow NCC to connect both the river through Baburail Canal. The river water will flow through Baburail Canal will improve the current ecosystem degradation process. In Chapter 7, efforts have been made to assess possible changes in ecological characteristics of the project areas due to project implementation.

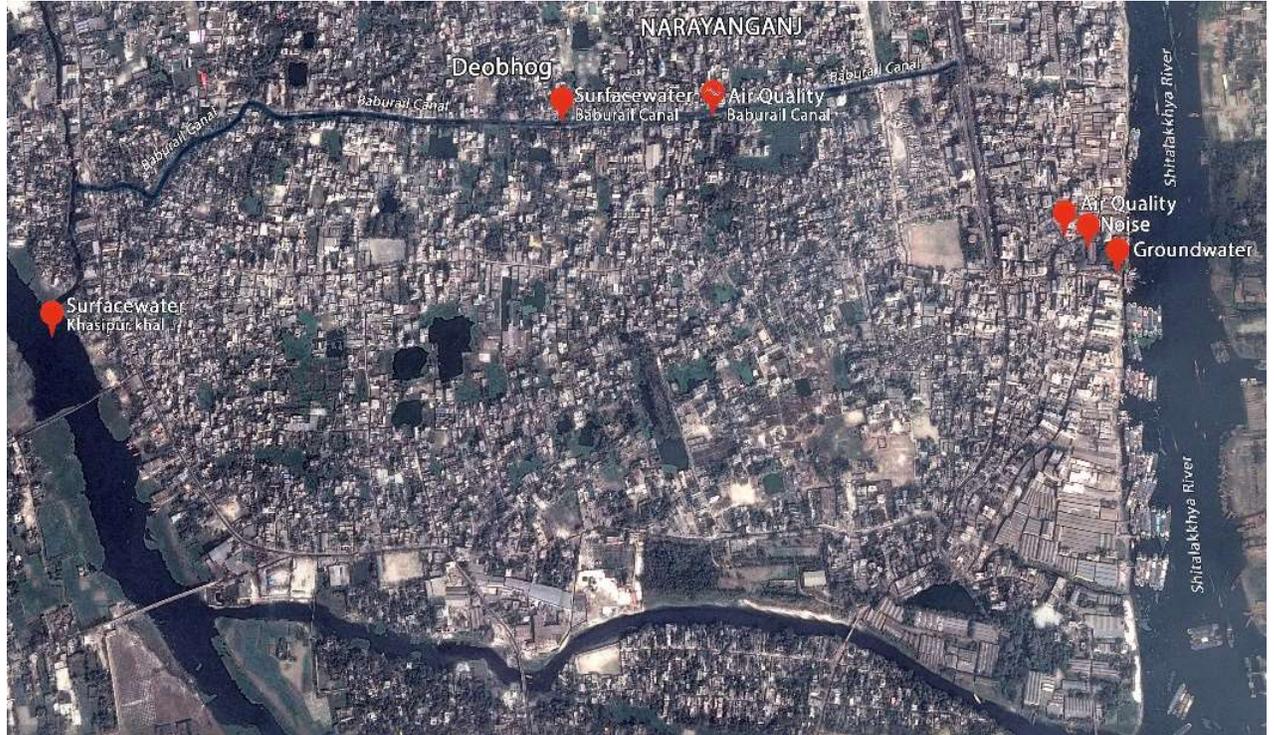
4.5.5 Wildlife Sanctuary (WS)

It is an area that assures the natural conditions necessary to protect nationally significant species, groups of species, biotic communities, or physical features of the environment, where these require specific human manipulation for their perpetuation. No WS exists at or near the study areas.

4.6 Environment Quality

Sampling and analysis is carried out for air, noise and water quality. The locations of sampling sites are shown in Figure 4.13. The standard of environmental quality is shown in Annex-2.

Figure 4. 13: Air, Water and Noise Sampling locations



4.6.1 Air Quality

Ambient air quality in the project area was monitored in two locations whose GPS reading area tabulated as below. In Baburail road ambient air quality parameter SPM, PM₁₀, PM_{2.5}, SO₂, NO_x and CO are within the DOE standards but concentration of SPM exceeds DOE standard. In Nimtola bazar all ambient air quality parameter exceeds DOE standard except CO. Air Quality Monitoring Locations shown in Figure 4.14 and GPS location is shown in Table 4.7. and ambient air quality in Table 4.8.

Figure 4. 14: Ambient Air Quality Monitoring



Table 4. 7: Air Quality Monitoring Locations

Sample Type	Place of GPS	GPS Coordinate
Air Quality Monitoring	Nimtoli Bazar	23°36'22.31"N, 90°30'17.60"E
	Baburail Road	23°36'35.38"N, 90°29'45.35"E

Table 4.8: Ambient Air Quality

SN	Location	Ambient Air Pollutants Concentration in $\mu\text{g}/\text{m}^3$					CO ppm
		SPM	PM ₁₀	PM _{2.5}	SO ₂	NO _x	
01	Baburail Road	436.66	81.11	35.98	36.41	246.74	Nil
02	Nimtolla Bazar	530.55	211.66	78.76	72.83	373.75	0.9
Duration (hrs)		8	8	8	8	8	1
DoE (Bangladesh) Standard		200	150	65	365	100	35
Method of Analysis		Gravimetric	Gravimetric	Luminous Flux Scatter sensor	West-Geake	Jacob &Hochheiser	CO Meter

Source: Enviro Quality Lab under Enviro Consultants Ltd.

4.6.2 Noise

As a part of EIA, baseline noise level measurements were conducted at few different locations within the project complex during day and nighttime's. Noise level was also measured continuously at the Baburail road and Nimtola bazar located near the proposed site. At Nimtola Bazar both day and night readings exceeds DOE standard but in Baburail road noise readings are within DOE standards. GPS readings of the sampling locations are

provided below. Ambient Noise Quality Monitoring location is shown in Figure 4.15 and GPS location Table 4.9 and Ambient Noise Quality results are shown in Table 4.10.

Figure 4. 15: Ambient Noise Quality Monitoring



Table 4.9: Noise Monitoring Locations

Sample Type	Place of GPS	GPS Coordinate
Noise	Nimtola Bazar	23°36'22.23"N, 90°30'18.17"E
	Baburail Road	23°36'35.41"N, 90°29'46.04"E

Table 4.10: Ambient Noise Quality

SN	Location	Results in dB – A Weighted	
		Time	
		11:00 AM – 3:00 PM 1.03.2017	9:30 PM – 11:30 PM 1.03.2017
01	Baburail Road	69.0	60.3
02	Nimtola Bazar	74.1	66.5
DoE (Bangladesh) Noise Standard for Commercial Area (Schedule-4)		70 Day Time (6 am-9 pm)	60 Night Time (9 pm-6 am)
Methods/Instruments		Sound Level Meter (DT-8850) Calibration at 94dB	

Source: Enviro Quality Lab under Enviro Consultants Ltd.

4.6.3 Water Quality

Analysis of surface water carried out in this study show that the measured parameters satisfy the Bangladesh drinking water standard. Surface water collected from three locations and BOD₅ of all sample do not satisfy DOE standard. The Surface Water of Baburail Canal, Kashipur Khal and Shitalakhya River are shown in Table 4.11 and sampling location is shown in Figure 4.16.

Figure 4. 16: Surface water sampling



Table 4.11: Surface Water (SW) Quality

SN	Parameter	Unit	Concentration of SW Baburail Canal	Concentration of Kashipur Khal	Concentration of Shitalakhya River	Bangladesh (DoE) Standard for Surface Water (Schedule- 3-A)
01	pH		7.3	8.1	7.8	6.5 – 8.5
02	DO	mg/l	0.6	0.9	1.7	≥5
03	BOD ₅	mg/l	28.2	24.6	21.6	≤10
04	COD	mg/l	80	75	56	NYS
05	TDS	mg/l	696	553	696	NYS
06	EC	μS/cm	1478	1099	1478	2250
07	TSS	mg/l	368	274	234	NYS

Source: Enviro Quality Lab under Enviro Consultants Ltd.

Note:

NYS - Not Yet Set

Ground Water:

Analysis of ground water samples collected from three locations within the project area was made. From the analysis it can be observed that the ground water parameters are within allowable limit. The Ground Water of Baburail Mosque, Deobogh Area and Nimtola Bazar is shown in Table 4.12 and sampling location is shown in Figure 4.17.

Figure 4. 17: Ground water sampling



Table 4.12:Ground Water Quality of Baburail Mosque, Deobogh andNimtola Bazar

SN	Parameter	Unit	Concentration of Baburail Mosque	Concentration of Deobogh	Concentration of Nimtola	Bangladesh (DoE) Standard for Ground Water (Schedule-3-B)
01	pH		7.5	7.6	7.6	6.5 – 8.5
02	DO	mg/l	6.8	6.6	6.5	6
03	COD	mg/l	3.0	3.4	2.9	4
04	TDS	mg/l	146	144	160	1000
05	EC	μS/cm	370	306	387	NYS
06	Fe	mg/l	0.17	0.16	0.19	0.3-1
07	As	mg/l	< LOD	< LOD	< LOD	0.05

Source: Enviro Quality Lab under Enviro Consultants Ltd.

Note:

NYS -Not Yet Set

LOD - 0.01 mg/L for Iron

LOD - 0.001 mg/L for Arsenic

4.6.4 Soil Quality of Canal Bed Sediment

A hand auger was used to collect the soil from Gymkhana Lake and Baburail Canal at Bowbazar area. Pre-cleaned zipper bags were used to store the canal bed sediment samples and the samples were kept in a cooler box which was sent to Soil Resources Development Institute (SRDI) laboratory. Hand gloves were used during sampling of soil materials collection. Canal Bed sediment sample collection from Gymkhana Lake is shown in Figure 4.18. The test results of canal bed sediment sample are provided in Table 4.13. The test results of Canal Bed Sediment were compared with EU Directive 86/278/EEC for land Application. The test result of Pb, Cd, Cr and Zn parameters of sediment samples was found less than EU Directive and hence it is suitable for land application.

Figure 4. 18: Canal Bed sediment sample collection from Gymkhana Lake



Table 4.13: Canal Bed Sediment Material of GymkhanaLake and Baburail Canal

Sl No.	Parameter	Unit	Concentration of Gymkhana Lake	Concentration of Baburail Canal	Bangladesh (DoE) Standard for Soil	EU Directive 86/278/EEC for land Application
1	pH		5.9	6.1	NYS	NYS
2	Lead (Pb)	PPM	17.08	2.45	NYS	1200
3	Cadmium (Cd)	PPM	0.05	0.03	NYS	40
4	Chromium (Cr)	PPM	22.40	18.20	NYS	NYS
5	Zinc (Zn)	PPM	7.51	4.50	NYS	NYS

4.6.5 Solid Waste

The major solid waste is municipal waste, construction waste, metal chips, waste plastic, wood shavings, waste glass and waste oil, can bottle, paper, cartoon, rubbish, kitchen waste, food waste which impact the environment. Such waste is inadequately handled, underground water and Riverwater are contaminated, and sanitation problems will arise.

Measures should be taken include adequate classification of waste and adequate disposal at the disposal site for each type of waste. To reduce the amount of solid waste discarded by the workers during the construction work, efforts will be made to employ the local workers wherever possible, so that the amount of household solid waste will be minimized. The aforementioned measures will be taken to ensure that water pollution or sanitary problems resulting from waste do not arise.

About 350 Tons of solid waste generates every day from the city. Most of them are inorganic 80% (280 ton) and organic 20% (70 ton). At present, there is no specific dumping station for disposal of solid waste. Most of the solid waste are dumping at Charukala low land and also found low land available nearby solid waste collection places. NCC authority has been proposed a dumping station for inorganic waste an at Jalkuri area which is now under approval process. Recently there is a project completed in June 2016, implemented by

Department of Environment (DoE) named CDM program using organic waste under climate change trust fund. Under this project organic fertilizer are producing through composting of organic waste. In this project about 22 ton of organic waste mainly from kitchen market are collected after separation and segregation and send to the Panchabati composting site.

From the house hold solid waste till not started collection. 3000 bin with green and red color received from DoE for collection of waste from the household. Organic waste will collect from next month in the green bin and inorganic waste will collect in red bin. After collection of all bin only green bin containing organic waste only will be send to the composting site. The whole composting project was leased to a third party through tender process for management of the composting plant. The awarded third party name is Mati organic is a Joint Venture Company who will perform the total activities. NCC responsibility is to provide the separated organic waste to the site only. The rest part will be responsibility of the Mati Organic company.

4.7 Socio Economic Environment

4.7.1 Population

Narayanganj Municipality was established on 8 September 1876 to control an area of 4.5 square miles with a population of 27,876. Now, it is densely populated area near Dhaka. The total area of Narayanganj City Corporation is **72.43 sq.km (including the river Shitalakhya)** The total population of Narayanganj City Corporation is 7,09,381. (Source: www.ncc.org.bd). No ethnic people are affected by the proposed project. A detail of social study was performed for this project and separate report prepared.

4.7.2 Demography

Demographical data analysis of any area is a crucial part of any plan preparation process of any area. Any planning decisions have been taken based on the population and economy of any area. Population is also necessary to calculate the demand and future need of the city. This section is attempts to analyze the population to calculate future population on the basis of socio-economic data. At a glance demographic information for NCC area is given below in **Table 4.14**.

Table 4.14: Demographic Information at a Glance

Criteria Description

Census Population	<ul style="list-style-type: none"> - Total population in 2011 is 709380 with 51.49% male - Population in the Narayanganj Zone is 37.48% with population density of 137 persons per acre - Population in the Siddhirganj Zone is 39.08% with population density of 43 persons per acre - Population in the Kadam Rasul Zone is 23.44% with population density of 50 persons per acre
Age Structure	<ul style="list-style-type: none"> - 38.15% people are within 25 – 49 age range - 21.02% people are within 15 – 29 age range - 11.13% people are within 50 – 65+ age range

	- 20.52% people are within 5 – 14 age range
Household Size	4.28
Marital Status	49.75% people are married
Educational Status	- Literacy rate is about 57.52%
Religious Status	- 91.19% Muslim - 8.71% Hindu

Source: Bangladesh Bureau of Statistics (BBS), 2011

4.7.3 Settlement and housing

Total affected land is 2.8 km long and 15-30 m wide in different sections connecting Shitalakkha River at the East and Dhaleswari River at the West. A resettlement action plan has been developed and total resettlement budget is Tk. 290056795.

4.7.4 Traffic and Transport

Bangabandhu Road is the major artery of Narayanganj which connected the important localities with each another. At Mondolpara point, there is another important connector-Mobarak Shah road which connected the city with Dhaka-Munshiganj Highway. The canal is parallel to this road and situated at the south side of this road. At Mondolpara Point, the canal crossed Bangabandhu Road. So, this project will have an impact on the most important transport corridors of Narayanganj. Beside these, R. K. Mitra Road, S. M. Maleh Road, B. Dash Road, Majar Road, Jimkhana Road, Deovogue Pucca Road, Jollarpar Road, Bhuianpara (Boubazar) Road and Bearipara Road are the roads within this transport network which would be affected by this development. For traffic impact analysis, the roads of this area has been segmented to have a better understanding about the present scenario as different segments of this transport network have different characteristics. The segments and intersections are shown on the following figure in green and red.

4.7.5 Public Utilities

4.7.5.1 Water Supply

The main source of water supply in NCC area for civic people is Dhaka WASA. It is found that tube-well is the major source of drinking water in the zila, urban and rural areas. Tube-well as a source of drinking water of the general household has decreased from 83.98% to 78.86%, from 76.66% to 58.72% and from 94.00% to 89.38% in the zila, urban and rural areas respectively during the decade.

4.7.5.2 Sanitation

It is observed that general household availing sanitary facilities have 100% in the project area. 78.10% in the zila and, 85.31% in urban area and 74.33% in rural area. Household in the non-sanitary group have 20.20% in the zila, 14.00% in urban and 23.45% in rural area. The 'none' group is 1.70% in the zila, 0.69% in urban area and 2.22% in rural area.

4.7.6 Education

Average literacy 57.10%; male 59.48%, female 54.56%. Educational institutions: college 16, technical college 2, marine technology centre 1, vocational school 2, secondary school 127, primary school 458, kindergarten 76, collegiate school 1, madrasa 56.

4.7.7 Electricity

According to population and housing census 2011, general household reported to have electricity connection in the zila are 95.25% in 2011 compared to 82.78% in 2001 which shows an increase of 12.47 percentagepoint during the decade 2001-2011.

4.7.8 Economy and Employment

Main sources of income Agriculture 14.38%, non-agricultural labourer 3.91%, industry 7.33%, commerce 23.87%, transport and communication 6.34%, service 23.13%, construction 2.52%, religious service 0.19%, rent and remittance 3.77% and others 14.56%.

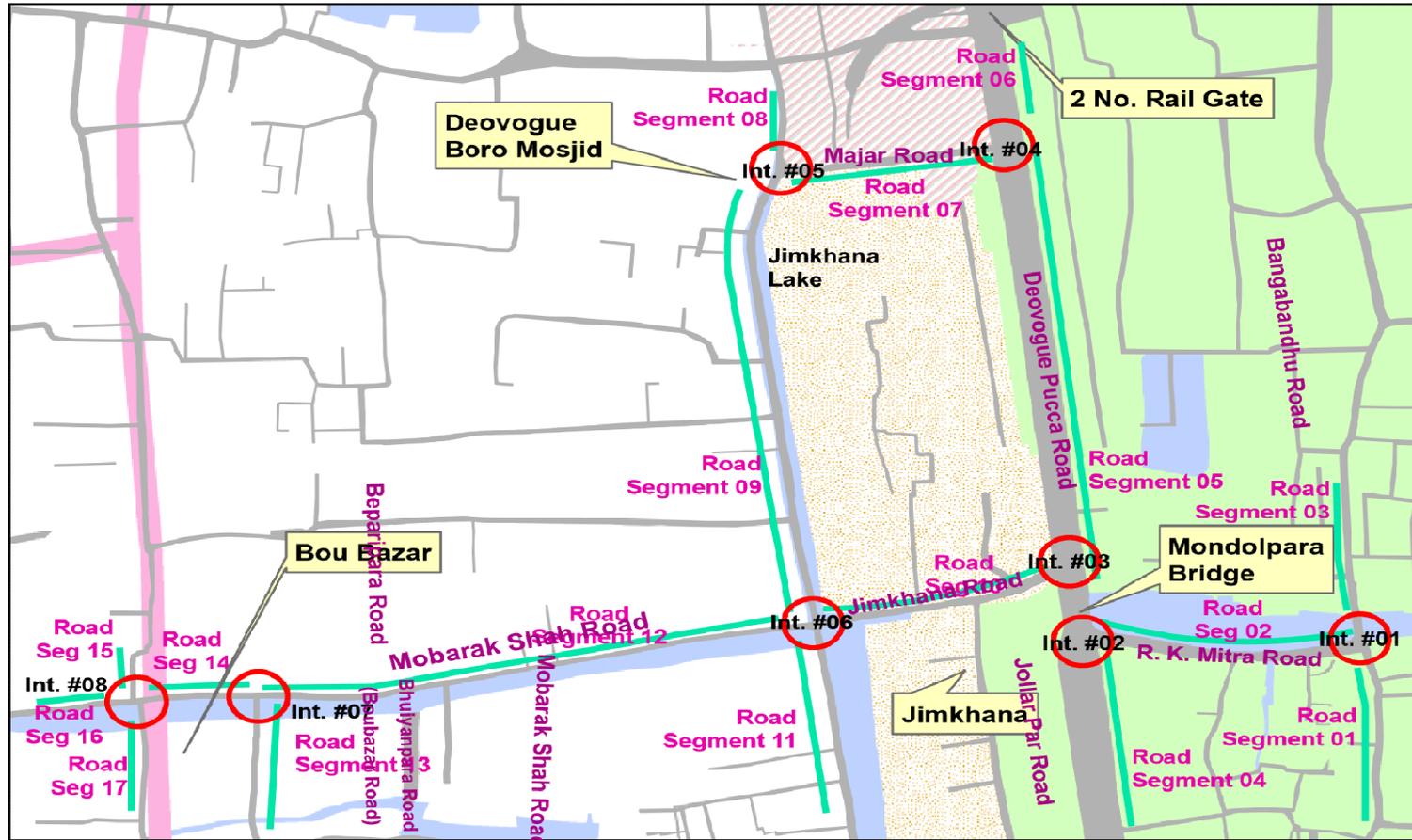
4.7.9 Fisheries

In the river, canal, beels, and ponds there are various kinds of fish, but because of water pollution, it is very hard to see fish in the river.

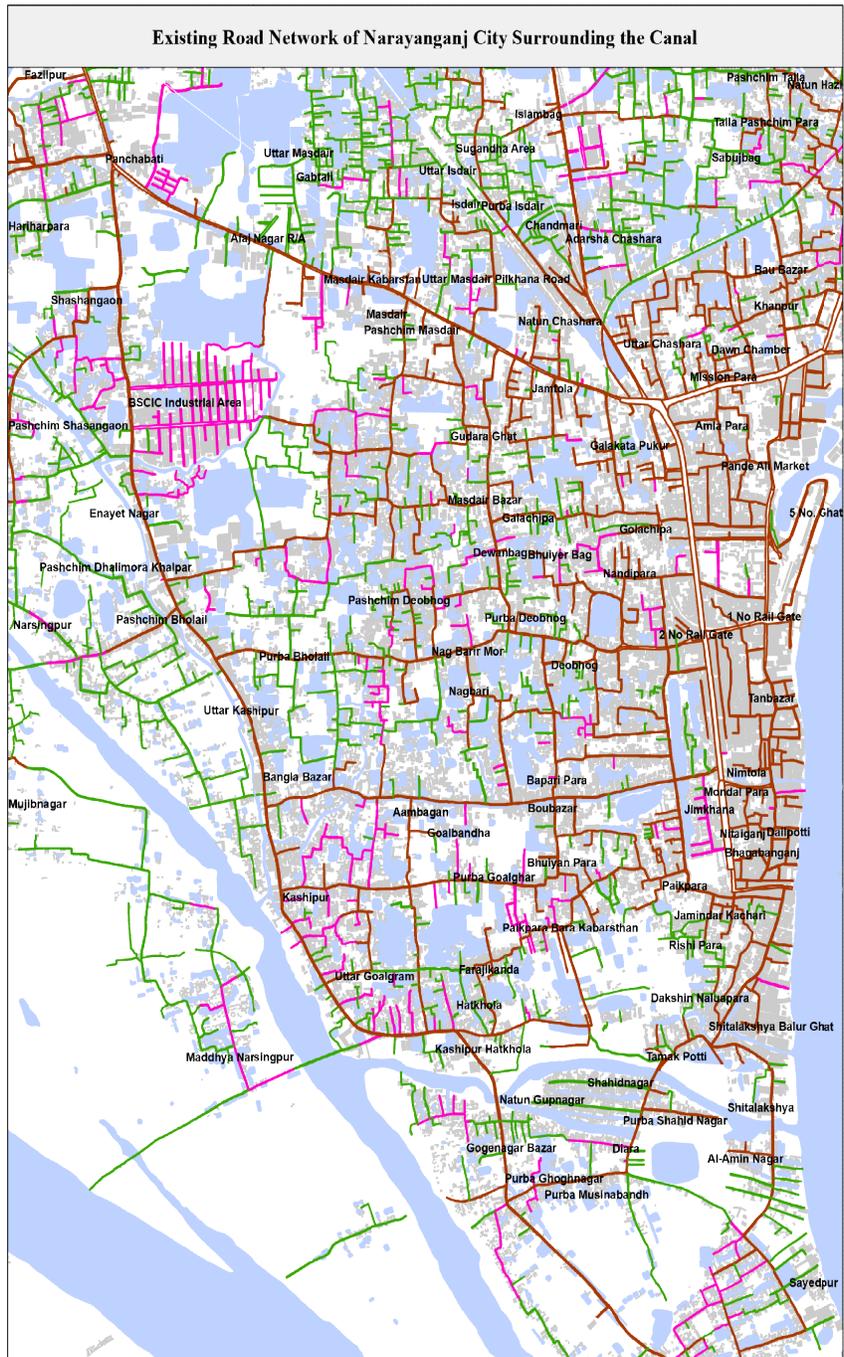
4.7.10 Transportation

The major transportation mode of the city is Rickshaw, CNG, Tempo, Private car. Now-a-days, all the Upazilas are connected to the zila headquarters by paved roads. Bus, minibus and three wheelers ply over the zila. The city is connected with Dhaka by Railway and Road. Bus, Minibus, country boat ply, and other Upazila is ply by Bus, Minibus, country boat etc. The road network is shown in Figure 4.19. The existing road network surrounding the Baburail Canal is shown in Figure 4.20. The detail of transport study is perform in separate transport study report.

Figure 4. 19: Existing Road network



Source: Developed by the consultant



Source: Developed by the consultant

4.7.11 Indigenous people

In the project area there is no indigenous people found.

CHAPTER-5: POTENTIAL IMPACTS AND MITIGATION MEASURES

5.1 Impact Identification

An environmental impact is defined as any change to an existing condition of the environment. Findings of the assessment are presented according to site preparation, construction and operation phases.

The EA study, based on the review of similar Environmental Impact Assessment reports, baseline monitoring and stakeholder consultations, has identified some major environmental and social concerns that are expected from the project.

The impacts are broadly classified into following 4 rating during construction and operation stage:

- Physical Impact
- Ecological Impact
- Impact on Human Interest
- Quality of Life Values

This chapter describes the rating and environmental impacts caused by the project both tentatively during construction and permanently during operation.

5.2 Pre-Construction Stage

5.2.1 Resettlement & land acquisition

The existing Baburail canal restoration project will implement on the NCC own land. No land acquisition will be required and there is no scope for resettlement. No loss of land will occur. Only compensation will be made to affected persons for removal of structure and temporary business and trees loss.

5.2.2 Trees and Vegetation

During Implementation Phase

There are 258 numbers of trees and vegetation throughout the length of the Canal. Among of which around 258 number of trees need to be cut down during reshaping of the canal. Due to cutting of trees and removal of vegetation will cause significant soil erosion. The degree of impact has been assessed to be -3. [Table 5.1].

Mitigation:

Tree plantation and re-vegetation program should be taken during implementation of the project. A total of 1150 tree shall be planted both side of the canal with 6 meters interval. At the end of the implementation of the project tree plantation should starts. Detail of tree plantation is presented in Annex 3.

During Operation Phase

During operation of the project tree plantation will be done and lot of tress will be planted for aesthetic view and increase scenic beauty of the area. The degree of impact has been assessed to be +2. [Table 5.2].

5.2.2.1 Ecological Impacts

Restoration of proposed Baburail Canal would have some impacts on the existing ecological environment. Activities such as land clearing and alteration, movement of people and vehicle, material placement, reshaping, accident, etc. have direct or indirect impacts on the existing ecological environment. During construction phase, small scale impacts could be identified by studying or monitoring the associated flora and fauna. Large scale impact, if any, could be identified after completion of the proposed project through careful long-term study and monitoring. In this study, at first possible general impacts of project activities on 3F (flora, fauna and fish) have been assessed, which has been followed by more specific evaluation of ecological impacts and risk assessment.

5.2.2.2 Impact on Flora

Restoration of Baburail canal has negligible impacts on the existing aquatic and terrestrial flora. Within the project sites, magnitude/ intensity of these impacts may vary from place to place, and some could easily be identified, while others require long-term study / monitoring. However, general impacts on project works on flora are briefly described below.

Aquatic Flora

The proposed Baburail restoration project site has no aquatic habitat which supports few common aquatic floral species and none of them are threatened in Bangladesh. All aquatic floral species are grown in the wild within the proposed project site. Due to proposed project activities, all aquatic flora inside the proposed project would not be affected. During clearing the site vegetation may cause damage or may uproot from the ground.

Terrestrial Flora

The proposed project site has terrestrial habitat which supports diversified terrestrial floral species, and none of them are threatened in Bangladesh. During site preparation, some naturally grown floral species (herb and shrub) would have to be cleared; but cutting or clearing of trees would be required, as there are 258 trees within the project site. These herbs and shrubs within the project site are used by certain adaptive wildlife as habitat for certain time, and therefore, removal of these would have some potential impact. Terrestrial undergrowth has great contribution to the existing ecosystem, and clearing or removal of the undergrowth would also have some adverse impacts.

5.2.2.3 Impact on Fauna including Fish

Restoration of Baburail canal has no impact on fish since there is no water in the canal.

Faunal species that are sensitive to direct (human activity and traffic) or indirect disturbance (noise) would be impacted most. Habitat disturbance would reduce habitat availability and effectiveness for a certain period for mammals, reptiles, amphibians, birds and their predators. Quantification of these losses is difficult; however, the impact is expected to be low and short-term in nature. However, fish habitat is not likely to be affected during the construction phase of the project. No Impact.

Removal of House, Structure and Shop

Restoration of Baburail Canal will require 349 temporary houses, shop which need to be removed. Most of them are illegally constructed on the Baburail canal. The degree of impact has been assessed to be -3. [Table 5.1].

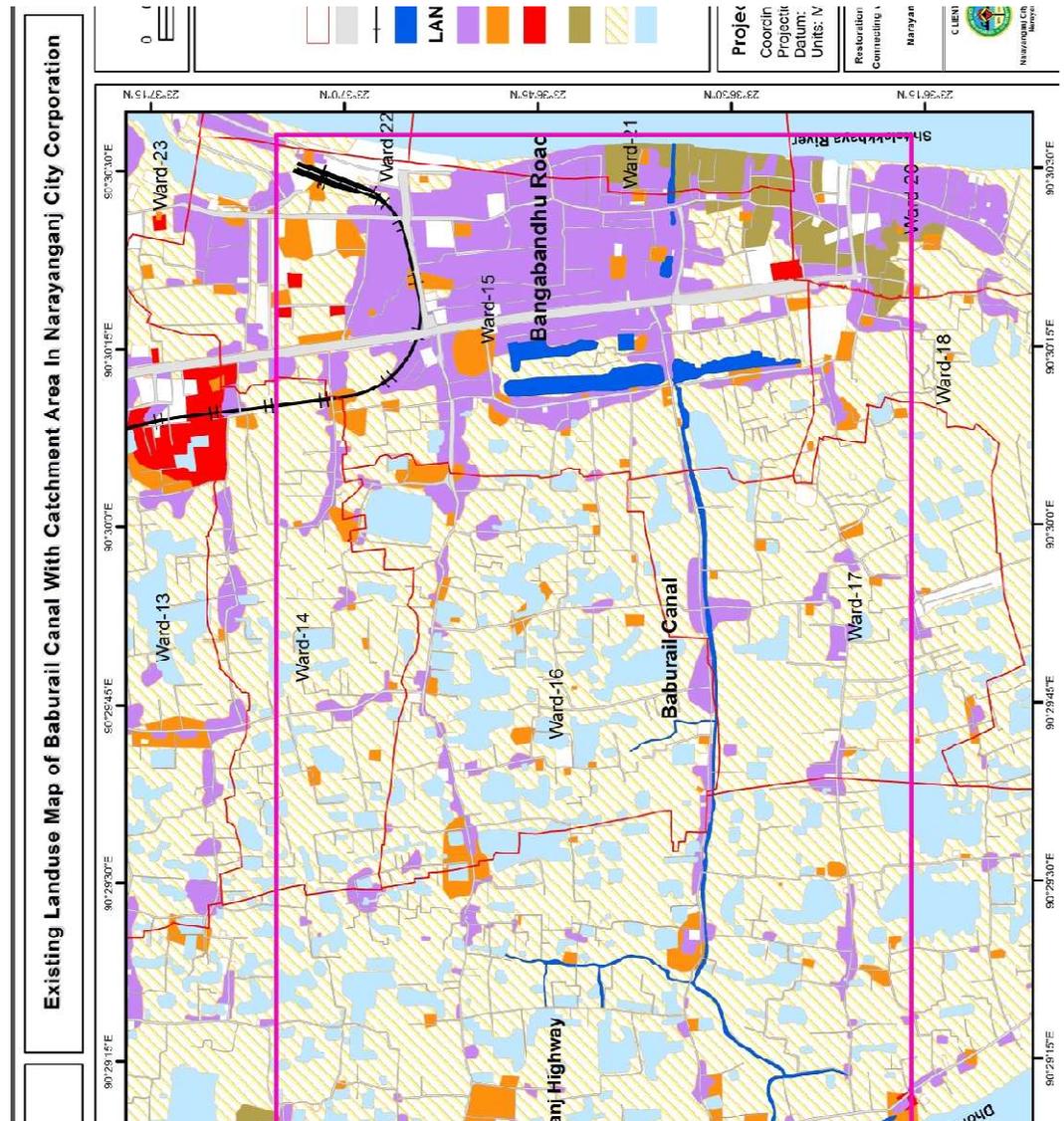
Mitigation:

Proper compensation will be provided to the affected people for loss of structure, business and income.

5.2.3 Land Use Change

Since it is a restoration project of a natural water body which has been encroached, there will be no change of land use. The degree of impact thus, has been assigned a value in Table 5.1 and Table 5.2 of "0" (i.e., no impact). Contractors to follow the change find procedures in the EMP table and Annex 4. The existing land plan of Baburail Canal with Catchment area of NCC is shown in Figure 5.1.

Figure 5. 1: Existing Landuse Plan of Baburail Canal with Catchment area



5.2.4 Reshaping of Canal

The existing Baburail canal is filled up with earth. The earth need to be remove to a suitable place during reshaping of the canal. The total volume of excavated earth of Package 1 to Package 12 and Gymkhana is 63063.29 cum, out of this 58180.60cum will be dispose to Panchabati more and Jalkuri which is 5 km away from the city. Total earth filling for canal bank is 4882.69 Cum will be used from excavated material and total sand filling 6748.42cum for Khal Bank construction. The depth of Canal is 5 meter. A part of excavated earth shall be used for filling of canal bank. The remaining part of filling the canal bank shall be collected form the contractor. Major part of excavated earth need to be dispose. Transportation of earth shall be done by truck with cover the earth material by tarpaulin so that no dust emits in the road. During disposal on the land fill site it should compact every

EIA of Restoration of Baburail Canal with Landscaping, Beautification & Lighting layer of disposal. The area of the land fill site is about one acre. The filled-up earth quality was tested for various parameters mainly heavy metal in the Laboratory.

The degree of impact thus, has been assigned a value in Table 5.1 of “-4”

Mitigation:

During reshaping of Canal, the machineries which produce less sound and emit less air pollutant will be involved. Water will be spray to suppress the dust pollution.

5.3 Construction and Operation stage

5.3.1 Physical Impact

Impacts from land cutting and filling during Construction Phase

Reshaping of canal and filling the banks of Baburail Khal will be needed for the proposed Baburail Khal restoration projects. During soil reshaping erosion and land slide may happen during monsoon period. The degree of impact thus, has been assigned a value in Table 5.1 of “-4” (i.e., high impact).

Mitigation:

After reshaping of canal and filling the banks, grass and trees should be plant on the banks. Drains in the nearby roads should be constructed properly for quick and controlled discharge of the rain water into the canal so that it could not cause soil erosion.

During Operation Phase

It has estimated that during operational stage the project will not cause any soil erosion and land slide due to proper protection measure. The table also shows that there would not be any significant change in soil erosion and land slide. The degree of impact thus, has been assigned a value of ‘0’ (i.e., no impact). (Table 5.2).

5.3.2 Regional Hydrology and Flooding

During Implementation Phase

It has been estimated that during implementation of the project will not cause rise in flood level. The degree of impact thus, has been assigned a value of “0” (i.e., no impact).

During Operation Phase

It has been estimated that during operation the project will not cause rise in flood level. The degree of impact thus, has been assigned a value of “0” (i.e., no impact).

5.3.3 Drainage

During Construction Phase

During construction phase, some extend of drainage problem in the surrounding area will occur. Therefore, impact (-2) is foreseen.

Mitigation:

During construction, temporary drainage facilities will be constructed.

During Operation Phase

As the proposed project will connect the two rivers as well as being fully operated the Khal will play very important role in the drainage network of the project area. The degree of

EIA of Restoration of Baburail Canal with Landscaping, Beautification & Lighting
impact thus, has been assigned a value of '4' (Table 5.2).

Mitigation:

Waste water and rain water of the surrounding area will not directly fall into the Canal. Rather waste and rain water will be controlled and transported to the rivers.

5.3.4 Erosion and Siltation

It was identified that unstable slopes will have soil erosion during rain and consequently increase sedimentation. Careful monitoring will be required to estimate both soil erosion and siltation impacts. The degree of impact thus, has been assigned a value of "-3"

Mitigation:

Properly designed slope protection works will be adopted for erosion and siltation protection.

5.3.5 Water Pollution

During Construction Phase

Construction activities of Khal restoration project will make the available water turbid hence there will be major water pollution. During reshaping of canal soil become loose, mud and soil which may increase turbidity of the existing water bodies. Solid waste and effluents generated from the construction site may not create pollution during dry season. The net impact therefore has been assigned a value of (-1). [Table 5.1]

Mitigation:

Construction activities will be performed so that less water will be turbid.

During Operation Phase

After construction during operational phase the impact on water quality will be negligible. Some pollution may occur from the oil leaching of the water transportation facilities. Thus a value of -1 can be assigned. [Table 5.2].

Mitigation:

Proper monitoring of the transportation facilities will be performed.

5.3.6 Air Quality

During construction

The project site is located in urban area which is densely populated area. This population will be exposed to dusts that will be generated during construction activities. The degree of impact has been assessed to be "-3", which is low. [Table 5.1].

Mitigation:

For controlling the dust pollution water will be sprayed over the loose soil.

During Operation Phase

After construction, the level of air pollution will decrease. But there will be a rush of vehicles which will emit dust to the nature which will create air pollution producing particulate matter, CO, NO_x, SO₂. So, therefore the degree of impact during operation phase has been assessed to be "2", which is very low. [Table 5.2].

Mitigation:

5.3.7 Noise Pollution

During Construction Phase

The noise generated during construction activities may cause problem in the project area as the project area is highly populated. Because of reshaping of canal and others construction activities many machineries and vehicles need to be operated, which in terms may cause noise pollution. So, the degree of impact during construction has been assessed to be "-2", which is very low. [Table 5.1].

Mitigation:

Less noise producing machineries will be involved in excavating soil.

During Operation Phase

The noise generated from the engine operated boats after completion of the proposed project may also cause problem in the project area. As the Khal will link the two rivers and create navigation facilities, some noise pollution will occur from the water transportation vehicles. The degree of impact has been assessed to be "2", which is very low. [Table 5.2].

Mitigation:

During operation phase for controlling noise pollution proper imposition of laws and regulations for vehicle will be made.

5.3.8 Disposal of Soil

During Implementation Phase

The reshaping of canal, soil from Baburail Canal may cause impact during transportation and disposal. During reshaping of canal major part of excavated earth shall be used for filling of canal bank. A minimum quantity of excavated earth need to be dispose. The location of disposal of earth is Panchabati more which is 5 km away from the city. Transportation of earth shall be done by truck with cover the earth material by tarpaulin, so that no dust particle emits in the road. The degree of impact is -4.

Mitigation:

During transportation of reshaping of loose soil by truck it should be cover by triple and dispose in Panchabati more 5 km away from the city center.

During Operation Phase

The operation phase there is no impact.

5.3.9 Solid waste

During Construction Phase

During construction lot of solid waste will generate. The degree of impact has been assessed to be "-2".[Table 5.1].

During Operation Phase

Solid waste should collect by 15 dust bin and disposal through NCC regular disposal system. The degree of impact has been assessed to be "0", which is very low. [Table 5.2].

5.3.10 Impact on Human Interest

5.3.10.1 Loss of Lands

Since it is a canal restoration project there will be no loss of land. the degree of impact has been assessed to be '0' (no impact).

5.3.10.2 Industrial Activities

During Construction Phase

There are no industries in the project site area. So, the degree of impact has been assessed to be '0' (no impact).

During Operation Phase

The proposed project will significantly improve the communication facilities and therefore the project is very likely to spur more industrial activities in the project site area. An impact of "+1" has been assigned.

5.3.10.3 Employment Opportunity

During Construction Phase

The restoration of the canal itself will generate some employment. So, it will be helpful for the unemployed people of project site area. The net impact has been assessed as "+4".

During Operation Phase

The operation of the Canal will generate some employment. As a result of increasing industrial activities, there will be more employment opportunities in project site area. The net impact has been assessed as '+2'.

5.3.10.4 Transportation and Communication

During Construction Phase

During construction period, there will be some problem in the communication in the side roads along the bank of the Khal. So, the net impact has been assessed as '-1'

Mitigation:

Proper construction safety signs will be installed for safety of the passengers.

During Operation Phase

During operation phase the project will be important for communication between the two rivers. The impact has been assessed to be positive (18).

5.3.10.5 Navigation and Boat Communication

During construction

The proposed project will connect two rivers named Shitalakhya and Dhaleshawari. At present, there is no navigation and boat communication. Therefore, the negative impact has been assessed to be zero (0).

During Operation Phase

During operation phase the project will be important for communication between the two rivers. The impact has been assessed to be positive (3).

5.3.11 Quality of Life Values

5.3.11.1 Travel Safety

During Construction Phase

During construction stage there may be accident due to construction material and also accident may occur because of the vehicles working on the construction site. So, the impact has been assessed to be very low (-1).

Mitigation:

Construction vehicle will be operated by trained operators. Proper safety will be provided to the construction workers. Also proper and sufficient safety signs will be installed in the construction sites.

During Operation Phase

Due to local traffic, many accidents occur like accidents, robbery. Therefore, travel safety is a major concern of the local population. Impact has been assessed to be moderately positive (+2).

5.3.11.2 Education and Literacy

During Construction Phase

During construction communication, will be hampered but it will not create problem for the students studying around the project. So, the degree of impact has been assessed to be '-0'.

During Operation Phase

As the Communication will increase having the road, so it will increase the education rate around the project site. The degree of impact has been assessed to be '+3'.

5.3.12 Positive socio-economic

This project will have both positive as well as negative impacts on the socio-economic environment of the area. During construction phase, many allied activities will increase rapidly in the project area. During the construction phase a large labour force, including skilled, semi-skilled and un-skilled labour force is expected from local area. Preference will be given to employ local labour. Although some labour force would come from other parts of the nearby area, locals would also be employed to work as semi- skilled or unskilled workers in the project. Labour camp will be used for day time for taking rest and taking food water etc. A sanitary toilet should be install within the camp site.

Besides the direct employment, the opportunities will also be generated for indirect employment and this will provide an impetus to the economy of the local area.

The locals will avail these opportunities arising from the project and increase their income levels. The degree of impact has been assessed to be '+2'.

5.3.13 Community and worker health and safety

Influx of construction work-force to project area will lead to sanitation, health and hygiene related issues and their impacts on the laborers and the local people. Untreated effluent disposal from labour camps will lead to increased incidences of water borne diseases already prevalent in the local population in the area. Transmission of diseases by immigrant labour population. Unscientific solid waste disposal from construction / labour camps may

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contaminate the groundwater and impact the existing bird population in the vicinity. The degree of impact has been assessed to be '-4'.

Mitigation:

Healthy and hygienic Labour camps will be made for the construction workers. Temporary medical camps will also be made at the camps of construction workers.

5.3.14 Recreational facilities

The proposed project will increase the recreational facilities of the City Corporation. People of the project area will be able to pass their leisure time in a healthy fresh environment. The project also involve sitting sufficient sitting facilities, playground, walkway etc. The degree of impact has been assessed to be '3'.

5.4 Environmental Impact Evaluation

Table 5.1 and Table 5.2 present the environmental impact valuation (EIV) against various environmental parameters during construction and operation period respectively. The assigned importance values are in line with proposed values in guideline of Narayanganj City Corporation, while impact values are assigned using expert judgment on the expected impacts. It is seen that during construction negative impact (-49) and positive impact is +24. The EIV during construction stage is -25. During operation stage, positive impact is +73 whereas negative impact is -9. Total EIV during operation is +64.

Table 5.1: Environmental Impact Valuation (EIV) of the proposed project during Construction

Parameters	Relative Importance Value	Degree of Impact	Relative Impact		EIV
			Positive	Negative	
1. Physical					-31
Loss of land	2	0			
Vegetation, shrub and trees removal	4	-3		-4	
Structure removal	4	-3		-3	
Soil removal	6	-4		-4	
Soil transport and disposal of soil in low land filling	6	-4		-4	
Regional Hydrology and Flooding	2	0		-2	
Drainage Congestion/ Water Logging	4	-3		-3	
Air Quality	3	-3		-3	
Water Quality	1	0		-1	
Drainage	4	-2		-3	
Noise Pollution	2	-2		-4	
2. Ecological					-7
Fish	1	0		0	
Forest	4	-2		-2	
Wildlife and Biodiversity	4	0			
Solid Wastes	2	0		-2	
Nuisance Plant/ Eutrophication	1	-2		-1	
Wetland and Wetland Habitat	4	0			
Terrestrial Habitat	2	0			
Trees and Vegetation	2	-2		-2	
Wastewater	1	0			
3. Human Interest					+20
Loss of Lands	6	0			
Loss of Top Soil of Agricultural Lands	2	0			
Employment Opportunities	6	+4	+24		
Industrial Activities	3	0			
Irrigation Facilities	2	0			
Navigation	2	0			
Transportation and Communication	4	-1		-4	
Agricultural Development	2	0			
Landscape	2	0			
4. Quality of life					-7
Travel Safety	3	-1		-3	

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Parameters	Relative Importance Value	Degree of Impact	Relative Impact		EIV
			Positive	Negative	
Aesthetic view& recreational facilities	4	-2		-4	
Education and Literacy	3	0			
Sanitation & pure water supply					
Cultural Heritage and Recreation					
Total EIV			24	-49	-25

Table 5.2:Environmental Impact Valuation (EIV) of the proposed project during Operation

Parameters	Relative Importance Value	Degree of Impact	Relative Impact		EIV
			Positive	Negative	
1. Physical					3
Tree Plantation	4	+2	+4		
Soil Erosion	4	0			
Regional Hydrology and Flooding	4	0			
Drainage Congestion/ Water Logging	2	0			
Canal Bank Erosion	2	0			
Water Pollution	4	0		-1	
Water scarcity in canal	4	-2		-8	
Drainage	2	0	+4		
Air Quality	2	-1	+2		
Noise Pollution	2	1	+2		
2. Ecological					6
Fish	1	0	+2		
Forest	4	0	+2		
Wildlife and Biodiversity	4	0			
Solid Wastes	2	0			
Wetland and Wetland Habitat	2	0			
Terrestrial Habitat	2	0			
Trees and Vegetation	2	+1	+2		
Wastewater	1	0			
3. Human Interest					+40
Loss of Lands	6	0			
Employment Opportunities	6	+2	+12		
Departmental Store	4	+1	+4		
Industrial Activities	3	+1			
Transportation and Communication	6	+3	+18		
Irrigation facility/ Agricultural Development	2	0			

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Parameters	Relative Importance Value	Degree of Impact	Relative Impact		EIV
			Positive	Negative	
Navigation					
Landscape	2	+3	+6		
4. Quality of life					+15
Travel Safety	3	+2	+6		
Aesthetic view& recreational facilities	3	+2	+6		
Education and Literacy	3	+1	+3		
Sanitation & pure water supply					
Cultural Heritage and Recreation					
Total EIV			73	-9	64

CHAPTER -6: ANALYSIS OF ALTERNATIVE

6.1 The 'No Project' Scenario

From a purely physical environmental point of view, the 'do-nothing' is preferable to any project implementation, since it would avoid creation of any of the adverse impacts associated with the project. However, the potential socio-economic benefits to the nation would be foregone and recreational, improvement of life style and industrial and transportation growth would be hampered.

It is concluded that the 'No build' alternative is unacceptable, and the potential socio-economic benefits of implementation of such project far outweigh the adverse impacts, all of which can be controlled and minimized to an allowable level.

6.2 Site Alternatives

During identification of project site it was consider the followingfourfactors. These are i) The land for canal reshaping is already available, ii) the canal is existing but not operational. iii) River connection is possible for flow of water iv) Infrastructure facility available to tourist (Road, Rail, River transport, telecommunication, etc). All the above mentioned four major facilities are fulfilled and available at this Baburail canal restoration project site.

Based on the above factors earlier that the project site is finalized for the proposed project. Baburail project is located in an area, which have every scope for all types of recreation facilities. The canal aesthetic looks are modern and environment compatible, the site is environmentally acceptable, site clearance certificate received from DoE, and the plant is under construction and the IEE carried out earlier concluded about the suitability of the project location. So, there is no logical need to look into alternative sites. Hence this has not been done in the present EIA.

CHAPTER-7: OUTLINE ENVIRONMENT MANAGEMENT PLANS

7.1 Environmental Management Plan

The basic objective of the EMP is to manage adverse impacts of proposed project interventions in a way that minimizes the adverse impact on the environment and people at the project sites. The Canal will be developed into next two years and the canal will open for operation in 2019. The specific objectives of the EMP are to:

- Facilitate the implementation of the mitigation measures discussed earlier in the document.
- Maximize potential project benefits and control negative impacts;
- Draw responsibilities for NCC, contractors, consultants, and other members of the project team for the environmental and social management of the Project;
- Define a monitoring mechanism and identify monitoring parameters in order to:
- Ensure the complete implementation of all mitigation measures,
- Ensure the effectiveness of the mitigation measures;
- Maintain essential ecological process, preserving biodiversity and where possible restoring degraded natural resources; and
- Assess environmental training requirements for different stakeholders at various levels.

The EMP will be managed through a number of tasks and activities and site specific management plans. One purpose of the EMP is to record the procedure and methodology for management of mitigation identified for each negative impacts of the Project. The management will clearly delineate the responsibility of various participants and stakeholders involved in planning, implementation and operation of the Project.

7.2 Inclusion of Relevant Components of EMP in Contract Documents

The EIA to be prepared for Projects should include a section on special environmental clauses to be incorporated in the Tender Document under General/Particular Specification. These clauses are aimed at ensuring that the Contractor carries out his responsibility of implementing the environment management plan (EMP), monitoring plan as well as other environmental and safety measures. Such clauses may specify, for example, penalties for non-compliance as well as incentives to promote strong compliance. The various contractors must be made accountable to implement the plans and mitigation measures which pertain to them through contract documents and/or other agreements of the obligations and importance of the environmental and social components of the project.

7.3 Environmental and Social Management

Details of further tasks to be carried out and various plans to be prepared during the course of implementation and operation of the project are given in the

Table 7. 1: Management Plans/ Additional Tasks for the Project

	Plan/Task	Responsibility			Timing
		Plan Preparation	Plan Approval	Review/ Implementation	
1.	Environmental Codes of Practice (ECPs)	EIA Consultants	NCC /WB	NCC through contractors	Already prepared (Annex 6)
2.	Inclusion of environmental clauses in bid documents for various contracts	EIA Consultants	NCC /WB	NCC through contractors	2017-2019
Plans to be prepared by contractors for construction phase					
3.	OHS Plan	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor
4.	Pollution Prevention Plans (related to air, noise, soil, water resources)	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor
5.	Waste Disposal and Wastewater Management Plan	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor
6.	Drinking Water Supply and Sanitation Plan	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor
7.	Traffic Management Plan	All Contractors	CSC and PIU	All contractors	Before mobilization of each contractor
8.	Construction Camp Management Plan	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor
9.	Fuels and hazardous substances management plan	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor
10.	Emergency and contingency Preparedness Plan	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor

	Plan/Task	Responsibility			Timing
		Plan Preparation	Plan Approval	Review/ Implementation	
	(for construction phase)				
Plans to be prepared for O&M Phase					
11.	O&M Phase Environmental Code of Practices	CSC	NCC/WB	NCC	Prior to completion of construction
12.	Environmental Management System (waste disposal, air and noise quality, etc.)	NCC (through consultants)	-	NCC	Prior to completion of construction
13.	Safety Management Systems (OHS Management)	NCC (through consultants)	-	NCC	Prior to completion of construction
14.	Land use planning around the canal facilities	NCC (through consultants)		NCC	Prior to completion of construction

7.3.1 Environmental Codes of Practice

The environmental codes of practice (ECoPs) are generic, non-site-specific guidelines. The ECoPs consist of environmental management guidelines and practices to be followed by the contractors for sustainable management of all environmental issues. The contractor will be required to follow them and also use them to prepare site-specific management plans (discussed later in the Section). The ECoPs are listed below and attached in **Annex 6**.

- ECoP 1: Waste Management
- ECoP 2: Fuels and Hazardous Substances Management
- ECoP 3: Water Resources Management
- ECoP 4: Drainage Management
- ECoP 5: Soil Quality Management
- ECoP 6: Erosion and Sediment Control
- ECoP 7: Top Soil Management
- ECoP 8: Topography and Landscaping
- ECoP 9: Borrow Areas Management
- ECoP 10: Air Quality Management
- ECoP 11: Noise and Vibration Management
- ECoP 12: Protection of Flora
- ECoP 13: Protection of Fauna

- ECoP 14: Protection of Fisheries
- ECoP 15: Road Transport and Road Traffic Management
- ECoP 16: Construction Camp Management
- ECoP 17: Cultural and Religious Issues
- ECoP 18: Workers Health and Safety

7.3.2 Mitigations and Compliance Monitoring Plans

The mitigation and compliance monitoring plans are the key element of EMP to be prepared on the basis of impact assessment described in Chapter 5. The project will be implemented under 5 separated packages. The plans describe the potentially negative impacts of each Project activity, lists mitigation and control measures to address the negative impacts, and assigns responsibilities for implementation and monitoring of these measures. Mitigation and Compliance Monitoring Plan – Pre-Construction/Design Phase, Construction Phase, and operation phase shown in Table 7.2.

7.3.3 Construction Stage Site Specific Management Plans

Pollution Prevention Plan will be prepared and implemented by the contractors on the basis of the ECoPs and WBG EHS Guidelines (2007) that will be part of the bidding documents. The Plan will be submitted to the CSC for their review and approval before contractor mobilization.

Waste Disposal and Effluent Management Plan will be prepared and implemented by the Contractor on the basis of the EMP, ECoP, and WBG EHS Guidelines (2007), which will be part of the bidding documents. The Plan will be submitted to the CSC for their review and approval before contractor mobilization.

Storm water Drainage: Storm water will be discharge through internal drainage system of the area and connected to pipeline of the both sides of the Baburail canal.

Drinking Water Supply and Sanitation Plan: Separate water supply and sanitation provisions will be needed for the temporary facilities including offices, labor camps and workshops so that it does not shortages and/or contamination of existing drinking water sources. The plan will be submitted to the CSC for their review and approval before contractor mobilization.

Occupational Health and Safety (OHS) Plan will be prepared and implemented by each contractor on the basis of the WBG EHS Guidelines (2007), ECoPs, and other relevant standards. The Plan will be submitted to the CSC for their review and approval before contractor mobilization.

Borrow Area Management Plan will be prepared and implemented by each contractor on the basis of the WBG EHS Guidelines (2007), ECoPs, and other relevant standards. The Plan will be submitted to the CSC for their review and approval before contractor mobilization

Construction Camp Management Plan will be prepared by each contractor. The Plan will include the camp layout, details of various facilities including supplies, storage, and disposal. The plan will be submitted to the CSC for their review and approval before camp establishment.

Fuel and Hazardous Substances Management Plan will be prepared by each contractor in accordance with the standard operating procedures, relevant guidelines, and where applicable, material safety data sheets (MSDS). The plan will include the procedures for handling the oils and chemical spills. The plan will be submitted to the CSC for their review and approval before contractor mobilization.

An **Emergency and Contingency Preparedness Plan** will be prepared by each contractor after assessing potential risks and hazards that could be encountered during construction. The plan will be submitted to the CSC/NCC for their review and approval before contractor mobilization.

7.3.4 Traffic Management Plan

Traffic Management Plan will be prepared by each contractor after discussion with NCC and authorities responsible for roads and traffic. The plan will be submitted to the CSC for their review and approval before contractor mobilization. The plan will identify the routes to be used by the contractors, procedures for the safety of the local community particularly pedestrians, and monitoring mechanism to avoid traffic congestion.

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Environmental and sustainability issue	Issues/Impacts/impact sources	Mitigation Measures/Action Plan	Responsibility	
			Execution	Monitoring
		World Bank clearance.		
• Mitigation and Compliance Monitoring Plan – Construction Phase				
Clearing the vegetation, shrub, and trees	Loss of biodiversity and ecological values	<ul style="list-style-type: none"> Plantation program should be taken for vegetation, and trees. Plant atleast three trees for one trees cut. 	Contractor NCC	NCC
Remove house, shop and structure	Loss of income, loss of house	<ul style="list-style-type: none"> Compensate proper compensation for loss of house/shop/structure and loss of income. 	Contractor NCC	NCC
Reshaping of existing filled up canal	<ul style="list-style-type: none"> Dust pollution Create nuisance Road damage 	<ul style="list-style-type: none"> Excavate the canal in dry season If transported by truck, then Cover the soil by tipple of the truck during transportation Spray of water is suggested in the road and construction sites As per capacity of road use the below capacity of truck load 	Contractor	CSC, PIU
Construction of component of the project (Bridge, overpass, sluice gate, elevated walkway, floating folded bridge and lighting.	<ul style="list-style-type: none"> Construction related impact Dust emission Noise pollution <p>Pedestrian and vehicle movement</p>	<ul style="list-style-type: none"> Implement measures related all in ECoPs. 	Contractor	CSC, PIU
Air Quality	<ul style="list-style-type: none"> Emissions from construction related traffic and machinery. Dust from works, other machinery, concrete mixing, and traffic from 	<ul style="list-style-type: none"> Implement measures in ECoP 10 Air Quality Management. Dust generation will be restricted as much as possible and water sprinkling carried out as appropriate, 	Contractor	CSC, PIU

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Environmental and sustainability issue	Issues/Impacts/impact sources	Mitigation Measures/Action Plan	Responsibility	
			Execution	Monitoring
	trucks and vehicles.	especially where earthmoving, and reshaping of canal are carried out. <ul style="list-style-type: none"> Emissions from construction equipment and traffic will comply with World Bank EHS guidelines and will be monitored. 		
Surface and ground water	<ul style="list-style-type: none"> Waste water from construction camps, offices and houses. Spillage of fuels, oils, and other chemicals, and wastewater from market, shops Erosion from construction works	<ul style="list-style-type: none"> Implement measures in ECoPs 3, 4 and 6 Manage wastewater from labour camp properly Maintain proper slope to prevent erosion 	Contractor	CSC, PIU
Noise	During construction on the canal, noise levels produced by vehicles, machinery, concrete mixing, and other construction activities will exceed the applicable standards and may cause nuisance to local community	<ul style="list-style-type: none"> Limit the noisy construction activities to daylight hours Maintain the equipment and vehicles as per manufacturer guidelines 	Contractor	CSC, PIU
Solid Waste Management	May create nuisance and odor	<ul style="list-style-type: none"> Place adequate dust bin along the canal for collection of solid waste. NCC conservancy department shall collect the solid waste every day, and put in the NCC SWM system and dispose properly. 	Contractor	CSC, PIU
Health and Safety	<ul style="list-style-type: none"> Workers health and safety hazards associated with construction activities Community health and safety hazards at the construction sites, including exposure to sexually transmitted diseases such as HIV/AIDS	<ul style="list-style-type: none"> Implement ECoP 18 pm Workers Health and Safety, ECoP 16: Construction Camp Management Require all contractors to specify a code of conduct for expectations of worker behavior at site and with local communities 	Contractor	CSC, PIU

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Environmental and sustainability issue	Issues/Impacts/impact sources	Mitigation Measures/Action Plan	Responsibility	
			Execution	Monitoring
		<ul style="list-style-type: none"> • Separation of people from vehicles and making vehicle passageways one-way, to the extent practical • Traffic management • Require personal protective equipment (PPE), as well as required health and safety awareness orientation and training, for all workers. • To ensure the works contract incorporate minimum health and safety provisions and is being monitor by NCC with the support from CSC during construction. 		
Child labour	Risk of contractors or subcontractors hiring child labour in the construction activities.	<ul style="list-style-type: none"> • National laws on child labour will be strictly followed. No child labour will be hired by the contractors or subcontractors in any of the project activities. 	Contractor	CSC, PIU
Mitigation and Compliance Monitoring Plan – Operation Phase				
Air Quality	Dust from the access roads and Canal facilities	<ul style="list-style-type: none"> • Regularly sweeping the overpass yards • 	E&S Cell	NCC
Noise	Noise sources from moving vehicle around the canal and increase vehicular traffic.	<ul style="list-style-type: none"> • Consideration should also be given in the planning stage for developing vegetation and walls around the Canal facilities to reduce noise levels. • Alter operations schedules to avoid noise pollution during nights and weekends • Provide awareness signboard to restrict the noise level 	E&S Cell	NCC

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Environmental and sustainability issue	Issues/Impacts/impact sources	Mitigation Measures/Action Plan	Responsibility	
			Execution	Monitoring
Occupational health and safety	<ul style="list-style-type: none"> Physical hazards associated with handling and use of associated machinery and vehicles. Noise from vehicular traffic 	<ul style="list-style-type: none"> Development of Safety System. This safety system should include procedures to regulate the safe movement of vehicle within the Canal facilities, protect the general public from dangers arising from traffic, and prevent events that may result in injury to workers, the public, or the environment. The Safety Management System should include comprehensive emergency and contingency preparedness and response plans that provide a coordinated response 	Terminal Operator	NCC with support from CSC
Trash	Trash from Canal/outside Canal by visitors, service providers, employees, others;	<ul style="list-style-type: none"> Conduct a reduce/recycle/reuse (waste minimization) study to identify sources of current waste streams and alternatives to disposal; include a perimeter (and beyond) survey of trash to identify its origins; Place marked trash containers at locations convenient to visitors, vehicle operators and employees; 	Canal Operator, E&S Cell	NCC
Solid Waste Management	May create nuisance and odor	<ul style="list-style-type: none"> Place adequate 15 dust bin along the canal for collection of solid waste collection. NCC conservancy department shall collect the solid waste every day, and put in the NCC SWM system and dispose properly. 	Canal Operator, E&S Cell	NCC

7.4 Monitoring Program

As one of the key elements of the EMP, a two-tier monitoring program has been proposed comprising compliance monitoring and effects monitoring. The main purpose of this monitoring program is to ensure that the various tasks detailed in the EMP particularly the mitigation measures are implemented in an effective manner, and also to evaluate program impacts on the key environment and social parameters. Various types of EMP monitoring are discussed below.

7.4.1 Compliance Monitoring

The purpose of the compliance monitoring is to ensure that the contractor implements the mitigation measures given in the EMP are effectively and timely implemented. This monitoring will generally be carried out by the CSC with the help of checklists prepared on the basis of the mitigation measures given in Chapter 5.

7.4.2 Effects Monitoring

Effects monitoring is a very important aspect of environmental management to safeguard the protection of environment. The effects monitoring plan proposed for the Projects is presented in which will be revisited and revised during EIA studies. The monitoring will comprise surveillance to check whether the contractor is meeting the provisions of the contract during construction and operation of the project including the responsible agencies for implementation and supervision. Compliance indicators or threshold limits for the monitoring are also given in Table 7.3.

Table 7. 3: Effects Monitoring Plan

Parameter/ Activity	Location	Means of Monitoring	Compliance indicator/ threshold limits	Frequency	Responsible Agency	
					Imple- ment- ation	Super- vision
During Construction						
Traffic Safety	Access Roads and overpass	Visual inspection to see whether proper traffic signs are placed and flag-men for traffic management are engaged	Smooth flowing of traffic; and placement of traffic signs and flag-men	Monthly	Contractor	CSC
Dust	Construction sites	Visual inspection to ensure good standard	No dust generation from the	Daily	Contractor	CSC

Parameter/ Activity	Location	Means of Monitoring	Compliance indicator/ threshold limits	Frequency	Responsible Agency	
					Impleme- ntation	Super- vision
		equipment is in use and dust suppression measures (e.g., spraying of waters) are in place.	construction activities			
	Material storage sites	Visual inspection to ensure dust suppression work plan is being implemented	No dust generation from the material storage sites	Monthly	Contractor	CSC
Air quality (SPM, PM _{2.5} , PM ₁₀ , CO ₂ , SO _x , NO _x)	Near the Canal	24 hours continuous monitoring with the help of appropriate instruments and analyzers	Compliance with the DOE standards	Quarterly during the construction phase	Contractor	CSC
Water Pollution	During Construction	Measurement of pH, EC, Turbidity, DO, Coli form, BOD, NH ₄ N Oil and Grease. Sampling point is outlet of open drain.	Compliance with the DOE standards	Quarterly during the construction phase	Contractor	CSC
Noise	Construction sites	Noise measurement using noise meter; Ensure work restriction between 21:00-06:00 close to the residential	Compliance with DOE standards	Monthly	Contractor	CSC

Parameter/ Activity	Location	Means of Monitoring	Compliance indicator/ threshold limits	Frequency	Responsible Agency	
					Impleme- ntation	Super- vision
		areas				
Water quality (For all drinking water parameters including arsenic, iron and coliforms)	Locations of tube-well installation installed for each Canal	Depth of tube well should be more than 30m. Test water for arsenic and iron before installing of casing. If the quality is found not suitable further deepening will be done.	Compliance with DOE drinking water standards	During drilling of wells	Contractor through a nationally recognized laboratory	CSC
	Water wells to be used by contractors for drinking	Laboratory analysis of all drinking water parameters specified in national standards	Compliance with DOE drinking water standards	After developme nt of wells	Contractor through a nationally recognized laboratory	CSC
Solid Waste Managemen t	Construction camps and construction sites	Visual inspection that solid waste collection facilities are in place and waste is disposed at designated site	Facilities are clean and waste collection and disposal facilities are in place	Monthly	Contractor	CSC
Drinking water and sanitation	Camps, offices	Ensure the construction workers are provided with safe water and sanitation facilities in the site	Availability of safe drinking water and sanitation facilities	Monthly	Contractor	CSC
Cultural and archeologic	At all work	Visual observation for	Indication of	Daily	Contractor	CSC,

Parameter/ Activity	Location	Means of Monitoring	Compliance indicator/ threshold limits	Frequency	Responsible Agency	
					Impleme- ntation	Super- vision
al Sites	sties	chance finds	chance finds			NCC
Restoration of Work Sites	All Work Sites	Visual Inspection	The facilities are clean with no waste at the works sties	After completion of all works	Contractor	CSC, M&E Consult ant, NCC
Safety of workers Monitoring and reporting accidents	At work sites	Usage of Personal Protective equipment and implementation of contractor OHS plan	All workers should use necessary PPEs	Monthly	Contractor	CSC, NCC
Grievances	In the project area	Number of grievances registered and addressed	Minutes of grievance redress meetings	Monthly	PIU	CSC, NCC
Reporting on Environmen tal Monitoring	During Construction	All parameters	To meet the compliance requirement	Quarterly	PIU	NCC
During Operation and Maintenance						
Dust	At all Canal facilities and access roads	Visual inspection	No visible dust	Weekly	EHS Officer of respective Canal	NCC
Traffic safety	At all Canal facilities and access roads	Visual inspection	NO traffic congestion	Weekly	EHS Officer of Canal	NCC
Cleanliness	At all Canals	Visual Inspection	Facilities are clean with no garbage	Weekly	EHS Officer of respective Canal	NCC

Parameter/ Activity	Location	Means of Monitoring	Compliance indicator/ threshold limits	Frequency	Responsible Agency	
					Imple- mentation	Super- vision
Solid waste collection	At all Canals	Visual inspection that waste collection facilities are in use	Waste collection and disposal facilities are in place	Weekly	EHS Officer of respective Canal	NCC
Workers and community health and safety	At all Canals	Visual inspection on health and safety issues	Use of necessary PPEs by workers	Monthly	EHS Officer of respective Canal	NCC
Accidents	At all Canals	Visual assessment and Interviews with involved people	Accident reports	As and when happened	EHS Officer of respective Canal	NCC
Drinking water and sanitation facilities	At all Canals	Visual inspection and interviews	Availability of safe drinking water and sanitation facilities	Monthly	EHS Officer of respective Canal	NCC
Air quality (SPM, PM _{2.5} , PM ₁₀ , CO ₂ , SO _x , NO _x)	Near the Canal	24 hours continuous monitoring with the help of appropriate instruments and analyzers	Compliance with the DOE standards	Quarterly	EHS Officer of respective Canal	NCC
Water Pollution	During Operation	Measurement of pH, EC, Turbidity, DO, Coli form, BOD, NH ₄ N Oil and Grease	Compliance with the DOE standards. As per Annex 2.	Quarterly	EHS Officer of respective Canal	NCC
Noise	During Operation	Noise measurement using noise meter; Ensure	Compliance with DOE standards	Monthly	EHS Officer of respective Canal	NCC

Parameter/ Activity	Location	Means of Monitoring	Compliance indicator/ threshold limits	Frequency	Responsible Agency	
					Impleme- ntation	Super- vision
		work restriction between 21:00-06:00 close to the residential areas				
Waste Management	Operation of the Canal	Visual inspection that solid waste collection facilities are in place and waste is disposed at designated site	Facilities are clean and waste collection and disposal facilities are in place	Monthly	EHS Officer of respective Canal	NCC

7.5 Performance Indicators

For evaluating the performance of the environmental management and monitoring plan, performance indicators are identified for efficient and timely implementation of measures/actions proposed in EMP. The indicators are defined both for implementation phase and for operation phase. CSC will be responsible for compiling the information on these indicators and report to NCC.

To measure the overall environmental performance of the project, a list of performance indicators is given below; however, a detailed list of indicators will be prepared by EIA studies

- Number of inspections carried out by CSC per month
- Number of non-compliances observed by CSC or E&S.
- Availability of environmental specialists in E&S.
- Availability of environmental specialists in CSC.
- Availability of environmental specialists with contractors.
- Timely reporting of documents (as defined in EMP and monitoring plan)
- Number of trainings imparted to stakeholders/other capacity building initiatives
- Timely disbursement of compensation/ timely resettlement of projectaffected
- Timely implementation of resettlement schedule.
- Number of grievances received.
- Number of grievances resolved.
- Number of construction related accidents.

7.6 Grievance Redress Mechanism

NCC will establish a project level Grievance Redress Mechanism (GRM)³ based on its existing institutional mechanism and Social Management Framework (SMF). Generally, the grievance redress committee (GRC) are of two types (i) formal courts of appeal and (ii) a locally constitutes GRC for dispute resolution. The second may not totally avoid but may reduce the problem significantly.

As suggested in the Social Management Framework (SMF), a locally constitutes Grievance Redress Committee (GRC) should be formed. The GRC shall ensure proper presentation of complaints and grievances, as well as impartial hearings and transparent decisions. The following the structure of the committee, in line with the proposition contained in the SMF.

The redress committee will be formed with five members. The committee will solve the grievances which have been raised by the PAPs and Project community. The members of the committee are Representative of NCC (1), NGO representative (1), LGED representative (1), Affected persons' representatives (2). From the affected persons' representatives, one will be a male and the other one be female. The Grievance Redress committee (GRC) headed by an officer of Resettlement Unit (RU)/Social Development Unit of project area equivalent to Assistant Director in the NCC.

The committee will receive the application from the affected stakeholders about their grievances and they will solve the grievances every month other than disputes relating to ownership rights under the court of law. The GRC will review grievances involving all resettlement benefits, relocation, other assistance and social issues.

The project affected persons can register their grievances at the complaint cell. All cases will be registered, categorized and prioritized by the NCC authority and by the Environmental Specialist at central level. The GRCs will meet periodically to discuss the merit of each case and fix a date for hearing and notify the PAP to submit necessary documents in proof of her/his claim/case and resolve grievances within one month of receipt of complain. Additional details regarding the functioning of GRC is presented in the separated SMF.

7.7 Capacity Building

Capacity building for effective implementation of the environmental and social safeguard requirements based on Environmental Management Framework (EMF) and Social Management Framework (SMF) which is a key element of the EMP and SMP. Capacity building for environmental and social safeguard management will need to be carried out at all tiers of the project, including NCC, E&S Cell, CSC, and contractors. At the construction site, CSC will take the lead in implementing the capacity building plan, though the contractors will also be responsible to conduct trainings for their own staff and workers. The various aspects that are covered under the capacity building will include general environmental and social awareness, key environmental and social sensitivities of the area, and key environmental and social impacts of the project, EMP requirements, OHS aspects, and waste disposal. Table 7.4 provides a

³ Further details on GRM are available in RPF.

summary of various aspects of the environmental and social trainings to be conducted at the construction site. E&S Cell may revise the plan during the project implementation as required.

During the O&M phase of the project, these trainings will continue to be conducted by NCC staff for all relevant O&M personnel and community.

Table 7. 4: Environmental and Social Trainings

Contents	Participants	Responsibility	Schedule
General environmental and socioeconomic awareness; Environmental and social sensitivity of the project influence area; Mitigation measures; Community issues and workers' code of conduct; Grievance Mechanism; EMP Awareness of transmissible diseases Social and cultural values.	PIU; CSC; selected contractors' crew	CSC	Prior to the start of the field activities. (To be repeated as needed.)
EMP; Waste disposal; List of Acronyms.	Construction crew	Contractors	Prior to the start of the construction activities. (To be repeated as needed.)
Road/waterway safety; Defensive driving/ Waste disposal; Cultural values and social sensitivity.	Drivers; boat/launch crew	Contractors	Before and during the field operations. (To be repeated as needed.)
Camp operation; Waste disposal; OHS Natural resource conservation; Housekeeping.	Camp staff	Contractors	Before and during the field operations. (To be repeated as needed.)

Contents	Participants	Responsibility	Schedule
Restoration requirements; Waste disposal.	Restoration teams	Contractors	Before the start of the restoration activities.

7.8 Documentation

The E&S Cell with assistance from CSC and contractors will produce the following environmental reporting documentation:

Environmental Monitoring Reports: The environmental monitoring reports will include environmental mitigation measures undertaken, environmental monitoring activities undertaken, details of monitoring data collected, analysis of monitoring results particularly the non-compliances, recommended mitigation and corrective measures, environmental training conducted, and environmental regulatory violations observed. The environmental monitoring reports will be submitted quarterly during the construction period and annually for two years after completion of construction.

Project Completion Environmental Monitoring Report: One year after completion of construction, the E&S Cell will submit a Project Completion Environmental Monitoring Report which will summarize the overall environmental impacts from the project.

For the Canals that will be identified and designed during implementation, EIA and RAP will be submitted by the NCC for World Bank review and clearance.

7.9 EMP Implementation Cost

The mitigation measures that are already part of the design such as drainage, canal slope areas have already been included in the construction cost. The cost of establishing E&S Cell in the PMU and environmental staff of the CSC consultants have also been included the overall Project's EMF. Detailed cost estimates for environmental mitigation is given in Table 7.5 for 2 years) and costs for monitoring during construction are given in Table 7.6. Environmental Monitoring Cost during O&M Phase of Baburail Canal is shown in Table 7.7.

Total costs of EMP implementation for Baburail Canal will be (USD 0.0575 million).

Table 7. 5: Environmental Management Cost (Mitigation) of Restoration of Baburail Canal

Sl. No.	Description of Item	Unit	Quantity	Unit Rate (BDT)	Package 1	Package 2	Package 3	Package 4	Package 5	Package 6	Package 7	Package 8	Package 9	Item Total (BDT)
01	During excavated earth/soil carrying for low land filling for dust management by water sprayer	List of Acronym	400	1000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	450,000
02	Low land filling management	LS	100	2000	20000	20000	20000	20000	20000	25000	25000	25000	25000	200,000
03	Maintenance and protection of traffic including construction of diversion road, warning signs, posting of signboard detaining project activities	LS		25000	20000	20000	20000	20000	20000	25000	25000	25000	25000	200,000
04	Campsite solid waste disposal facilities	Nos.	9	10000	10000	10000	10000	10000	10000	10000	10000	5000	5000	80,000
05	Tree plantation and green area development plan	LS	1200	250	25000	50000	25000	25000	25000	25000	25000	25000	25000	250,000
06	Water quality protection measures:	LS	9	100000	20000	30000	20000	20000	30000	20000	20000	20000	20000	200,000

Sl. No.	Description of Item	Unit	Quantity	Unit Rate (BDT)	Package 1	Package 2	Package 3	Package 4	Package 5	Package 6	Package 7	Package 8	Package 9	Item Total (BDT)
	soil erosion at the construction site, wastewater discharge and prevention of spillages, leakages of polluting materials, etc. to be satisfaction of the engineer.													
07	Stripping topsoil from borrowed agricultural lands, stockpiling and replacing the same to growth of trees and vegetation of the land to the entire satisfaction of the owner and the engineer.	LS	9	50000	20000	30000	20000	20000	30000	20000	20000	20000	20000	200,000
08	Rehabilitation of ancillary sites including stockpile sites, brick crushing sites, borrow areas, work force camps/ site office, etc	Sq. m	9	25000	20000	30000	20000	20000	30000	20000	20000	20000	20000	200,000

Sl. No.	Description of Item	Unit	Quantity	Unit Rate (BDT)	Package 1	Package 2	Package 3	Package 4	Package 5	Package 6	Package 7	Package 8	Package 9	Item Total (BDT)
	and turfing to the entire satisfaction of Engineer.													
09	Orientation to the technical personnel/ construction worker associated with the Canal about the key issues of EMP & Environmental Monitoring		2	100000		75000	75000		50000					200,000
10	Capacity building of NCC staff for general and cumulative impact mitigation		2	150000	150000		150000							300,000
	Total in Tk. Twenty-Two Lac Eighty Thousand Only				335,000	315,000	410,000	185,000	265,000	195,000	195,000	190,000	190,000	2,280,000

Table 7. 6: Environmental Monitoring Costs during Construction of Restoration of Baburail Canal

Component	Stage	Item	Unit Cost (BDT)	Quantity (Yearly)	Package 1	Package 2	Package 3	Package 4	Package 5	Package 6	Package 7	Package 8	Package 9	Total Costs (BDT)
Awareness, Warning signs, labels and signals Accident	During Construction	Ensuring that HSMP works right on the track	20,000	--	20,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	100,000
Campsite waste disposal facilities	During Construction	Avoid disease	20,000	2	40,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	200,000
First aid box, PPE	During Construction	Avoid accident	20,000	LS	10,000	20,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	100,000
Air Pollution	During Construction	Measurement of SPM, PM ₁₀ , PM _{2.5} , NO _x , SO ₂ , CO.	40,000	2	80,000	80,000		80,000		80,000		80,000		400,000
Water Pollution	During Construction	Measurement of pH, EC, Turbidity, DO, Coli form, BOD, NH ₄ N Oil and Grease	15,000	4	60,000			60,000		60,000			60,000	240,000

Component	Stage	Item	Unit Cost (BDT)	Quantity (Yearly)	Package 1	Package 2	Package 3	Package 4	Package 5	Package 6	Package 7	Package 8	Package 9	Total Costs (BDT)
Waste	During Construction	Collection, transportation and dumping of waste at authorized dumping sites. Minimization of volume and recycling.	20000	--	20,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	100,000
Noise	During Construction	Periodical maintenance of construction vehicles and installation of sound insulation cover	2,000	4	8000	8000	8000	8000	8000	8000	8000	8000	8000	72,000
Drinking Water supply and sanitation	During Construction	Arsenic free water/ Treatment and test cost	1,000	12	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	63,000
Reporting on Environmental Monitoring	During Construction	Quarterly Monitoring Report	100,000	4	75,000		75,000		75,000		75,000		65,000	365,000
Grand Total	In Word Tk. Sixteen Lac Forty Thousand Only				320,000	155,000	140,000	205,000	140,000	205,000	140,000	145,000	190,000	1,640,000

Table 7. 7: Environmental Monitoring Costs during O&M Phase of Restoration of Baburail Canal

Component	Stage	Item	Unit Cost (BDT)	Quantity (Yearly)	Total Costs (BDT)
Road side drain Cleaning	During operation	Avoid clogging of drain	10,000	12	120,000
Over all cleaning of Lake water and its surrounding area and structure	During operation	Keep cleaning of the lake water as well as surrounding area.	10,000	12	120,000
Air Quality Monitoring	During operation	PM ₁₀ , PM _{2.5} , NO _x , SO ₂ , CO.	75,000	2	150,000
Water Quality Monitoring	During operation	pH, EC, Turbidity, DO, BOD, COD, NH ₄ N, Phosphate.	10000	4	40,000
Reporting on Environmental Monitoring	During Operation	Semi-annual Monitoring Report	100,000	2	200,000
Grand Total	In Word Tk. Six lac thirty thousand only				630,000

7.10 EIV without EMP and with EMP

Environmental impact assessment of the Baburail canal has been carried out as per DoE and WB guideline. The environmental impact valuation shows that positive impacts out weight the negative impacts. The EIV of the Canal stands at -33 and -11 without EMP during construction and operation phase respectively. The valuation can be further improved to up to +14 and +41 during construction and operation phase by undertaking mitigation measures for negative measures and enhancement measures for positive impacts as outlined in the environmental management plan for the Canal restoration project. NCC will have to monitor important environmental variables and compliance to ensure environmental quality during and after the project. Environmental Impact Value (EIV) with and without EMP for the Proposed Canal in Construction Period is shown in Table 7.8

Table 7. 8: Environmental Impact Value (EIV) with and without EMP for the Proposed Baburail Canal in Construction Period

Parameters	Relative Importance Value	Degree of Impact		EIV	
		Without EMP	With EMP	Without EMP	With EMP
1. Physical				-18	-2
Loss of land	4	0	0		
Vegetation, shrub & trees removal	2	-1	0		
Structure removal	4	-3	0		
Reshaping of Canal bed material	4	-2	0		
Transport of reshaping of canal bed material to low land filling	4	-2	0		
Regional Hydrology and Flooding	4	0	0		
Drainage congestion/ water logging	2	0	0		
Air Quality	2	-2	-1		
Water Quality	2	-4	0		
Drainage	4	-2	0		
Noise Pollution	2	-2	-1		
2. Ecological Impact				-7	0
Fish	2	0	0		
Forest	2	0	0		
Wildlife and Biodiversity	2	0	0		
Solid Wastes	4	-2	0		
Nuisance plant/ Eutrophication	1	-1	0		
Wetland and wetland Habitat	2	0	0		
Terrestrial Habitat	2	-1	0		
Trees and Vegetation	2	-1	0		
Wastewater	2	-2	0		
3. Impact on Human Interest				-1	+10
Loss of Lands	4	0	0		
Employment Opportunities	6	+2	+4		

Parameters	Relative Importance Value	Degree of Impact		EIV	
		Without EMP	With EMP	Without EMP	With EMP
Industrial Activities	2	0	+2		
Irrigation Facilities	2	0	0		
Navigation	2	-1	+4		
Transportation and Communication	4	-2	0		
Agricultural Development	4	0	0		
Land scape	2	0	0		
4. Quality of life				-7	+6
Travel Safety	3	-1	+2		
Aesthetic view& recreational facilities	3	-2	+2		
Education and Literacy	3	0	0		
Sanitation & pure water supply	3	-2	0		
Cultural Heritage and Recreation	3	-2	+2		
Total EIV				-33	+14

Table 7. 9: Environmental Impact Value (EIV) with and without EMP for the Proposed Baburail Canal in Operation Period

Parameters	Relative Importance Value	Degree of Impact		EIV	
		Without EMP	With EMP	Without EMP	With EMP
1. Physical				-21	+6
Tree Plantation	4	-2	+4		
Canal Edge Erosion	4	-3	0		
Regional Hydrology and Flooding	2	-2	+2		
Drainage Congestion/ Water Logging	4	-2	+2		
Water Pollution	2	-1	0		
Water scarcity in canal	4	-4	0		
Drainage	4	-3	0		

Air Quality	2	-2	-1		
Noise Pollution	2	-2	-1		
2. Ecological Impact				-5	+3
Fish	4	0	0		
Forest	4	0	0		
Wildlife and Biodiversity	2	0	0		
Solid Wastes	2	-2	0		
Nuisance plant/ Eutrophication	2	-1	0		
Wetland and wetland Habitat	4	0	0		
Terrestrial Habitat	2	0	0		
Trees and Vegetation	2	-2	+3		
Wastewater	1	0	0		
3. Impact on Human Interest				+3	+15
Loss of Lands	4	0	0		
Employment Opportunities	4	+2	+4		
Department store	2	0	+2		
Industrial Activities	3	+2	+2		
Transportation and Communication	4	+2	+3		
Irrigation Facilities	2	0	0		
Agricultural Development	2	0	0		
Navigation	4	-2	+2		
Landscape	4	-1	+2		
4. Quality of life				+12	+17
Travel Safety	3	+3	+4		
Aesthetic view& recreational facilities	3	+3	+4		
Education and Literacy	3	+3	+3		
Sanitation & pure water supply	3	+1	+2		
Cultural Heritage and Recreation	3	+2	+4		
Total EIV				-11	+41

7.11 Responsibility of the Contractor

The Contractor shall carry out the project related activities as specified in contract agreement. NCC shall ensure that contractors take due responsibility to mitigate those negative impacts. Environmental awareness creation, particularly about the direct construction impacts and for the health, pollution and safety issues will be Contractor's responsibility. Consultants' supervisory roles will be in conformity to relevant Clauses incorporated in road construction contracts and national legislation. Clauses that may be incorporated with tender documents are:

- The Contractor shall take all steps to protect environment and avoid causing damages of water bodies, and public nuisances of all types during implementation operations.
- Contractor shall be responsible for safe transportation and disposal of all types wastes generated out of his activities in a manner so that no environmental pollution or hazard to health is caused to the workers and local people. In case any third party is employed to dispose of wastes, Contractor shall even in such case be considered as if he has discharged the responsibilities himself under this Clause until the wastes leave the site under his control. He remains legally bound to exercise due diligence to ascertain that the proposed transport and disposal mechanism do not cause pollution or public health hazards.
- Contractor shall comply with the existing statutes and regulations concerning the execution of works as per requirements of DoE and donor's environmental guidelines
- Contractor shall be responsible for familiarizing himself with the legislation relating to environmental protection that is relevant to his activities. Reference to rational environmental quality guidelines should be made.
- Contractor shall be responsible for bearing the costs of cleaning up any environmental pollution resulting from his activities if methods for doing that are available and effective.
- Precautionary signboards /danger signals/ propitiatory billboards shall be placed in appropriate places to notify people about the possible dangers.
- Contractor in case of surface water pollution from his activities, shall take adequate prevention measures not to pollute water and in case pollution of surface water occurred he shall be liable to revert the original quality of water particularly so where surface water has potential use. Cost both for tests and purification shall be borne by Contractor.
- Contractor shall at all times maintain the camp and construction sites under his control in clean and tidy conditions and shall provide appropriate and adequate facilities for temporary dumping all types of wastes before disposed properly.
- Remove equipment, surplus material, rubbish and temporary works and leave the site in a clean condition to the satisfaction of the company's representatives after completion of construction activities.
- Be responsible to pay compensation upon the appropriate monetary evaluation applicable to the local market if any damage is incurred to agricultural land or surrounding homesteads outside of the requisitioned land

- Contractor shall not allow waste oil, lubricant or other petroleum derivatives to be used as dust suppressants and shall take all reasonable precautions to prevent accidental spillage of petroleum products, contact of such materials with soil or water course through discharge, run-off and seepage.
- Contractor shall be responsible for provision of adequate sanitary facilities to the construction workers (including those employed under subcontract) at construction sites, office and camp sites. He shall not knowingly allow discharge of any untreated sanitary waste to the ground or surface water. Before mobilization of construction workforce, Contractor shall provide details of sanitary and drainage arrangements to the Engineering Representative (ER) for approval. The detail should include maintenance and operation plans and sufficient other information to allow the ER to assess whether or not the proposed facilities are adequate.
- All vehicles and plant operated by the Contractor (including subcontractor) shall be maintained according to manufacturers' specification and their original manual, particularly regarding control of noise and/or smoke emission. The ER shall reserve the right to ask the Contractor for replacement or rectification of any vehicle or plant within 48 hours that he believes emits excessive noise and/or smoke by serving a notice in writing.
- Contractor shall make every reasonable effort to reduce noise pollution caused by construction activities including relocation of crusher and ancillary plant at new site where the distance between these plants and residential sites is safer for attenuation of noise in the existing residential areas.
- Contractor shall take all reasonable measures to minimize dust-blowing from sites under his control by spraying water on stockpile, bare soil, haul road, un-surfaced traffic route and any other source of dust when conditions require dust suppression. If the ER considers dust suppression measures adopted by Contractor ineffective, Contractor shall in that case take further measure to minimize dust blowing at construction site as per his direction.
- In case any traffic disruption is caused due to construction activities of the Contractor (or subcontractors), Contractor shall in that case be responsible to provide alternative road access to for operational use by vehicles. The facilities provided shall be such that neither of the parties are disturbed by the arrangement.
- In case of any road damage by Contractor (or subcontractor), the Contractor shall notify the ER of it and shall repair the road to its original condition at his own cost.
- In case of any damage caused to agriculture or to the surrounding homesteads outside the RoW either permanently or temporarily by the Contractor or Subcontractor's activities, Contractor shall in such case remain responsible to pay monetary compensation for the damage appropriate to the local market value.

The Contractor on completion of the Contract shall remove the equipment, surplus materials, and rubbish and temporary structures of all types and shall leave sites in clean condition to the satisfaction of local people and the ER.

CHAPTER - 8: INSTITUTIONAL ARRANGEMENT

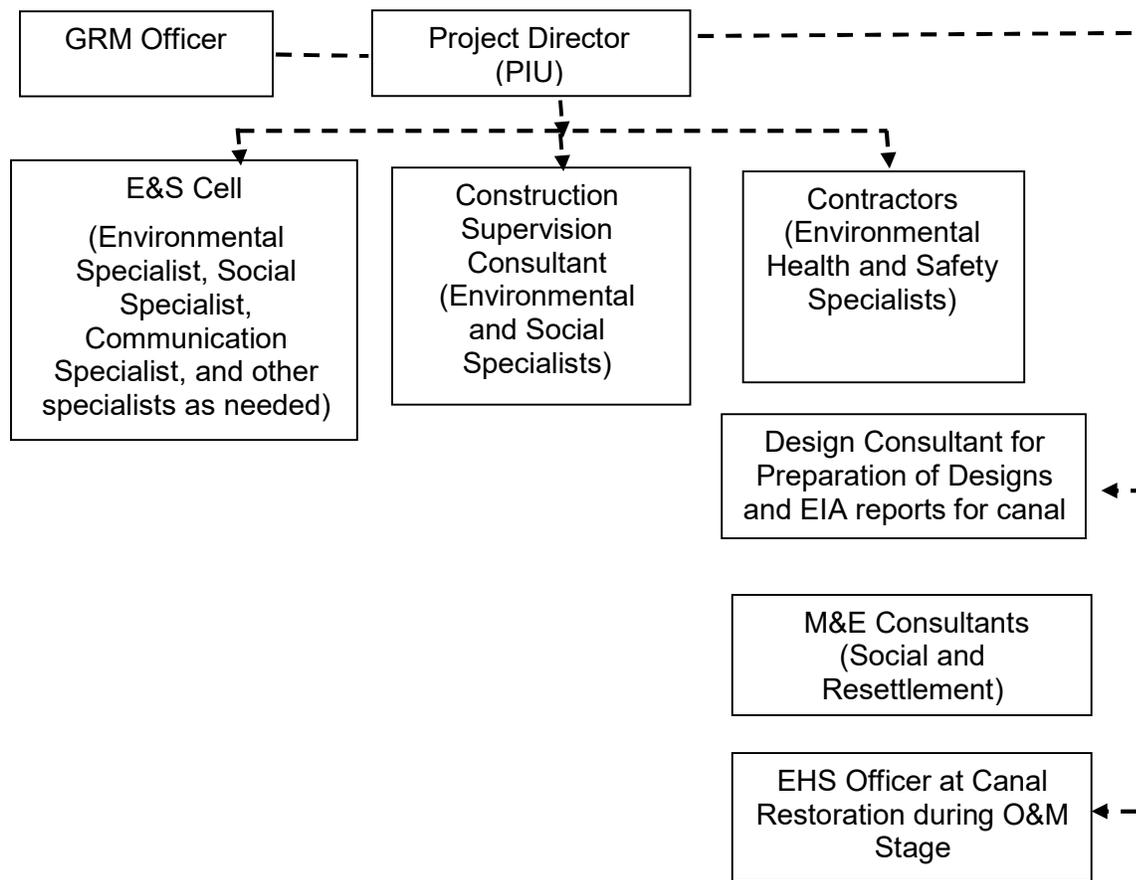
8.1 Institutional Arrangements

The Project implementation will be led by the Project Implementation Unit (PIU) that will be established within NCC. The PIU will be responsible for procurement of consultants for carrying out the EIA and engineering designs for the proposed components. The PIU will be headed by the Project Director (PD). The PIU will consist of an Environment and Social (E&S) monitoring Cell with qualified staff. This E&S Cell will assist the PIU on issues related to environmental and social management and oversee the Construction Supervision Consultant (CSC) and contractors and will compile quarterly monitoring reports on EMP compliance, to be sent to the Project Director and also shared with the World Bank, throughout the construction period. The E&S Cell will also provide trainings to the NCC field personnel responsible for monitoring of environmental compliance during both construction and O&M phases of the project. The organogram PIU is shown in Figure 8.1. In addition; NCC will recruit a permanent Environmental, Health and Safety Specialist in all the proposed NCC project, who will be responsible for overseeing the environmental mitigation measures during operation and maintenance period.

The overall responsibility of environmental performance including EMP implementation of the Project will rest with the PIU. Aside from their in-house environmental and social specialists, the PIU will engage construction supervision consultants (CSC) to supervise the contractors including on their execution of construction-related environmental and social management requirements and measures. The CSC will ensure adherence to the design parameters including quality requirements, as well as all EMP measures related to construction.

The E&S Cell will have adequate numbers of environmental and social scientists/specialists and maintain coordination and liaison with CSC for effective EMP implementation. Similarly, the CSC will also have environmental and social monitors who will supervise and monitor the contractors for effective EMP implementation. The contractors in turn will also have HSE supervisors who will ensure EMP implementation during construction activities and will be tasked to develop necessary detailed HSE plans as per this EMP, and oversee their implementation. Organogram for Environmental and Social Management and monitoring cell of the Project is shown in Figure 8.1

Figure 8. 1: Organogram for Environmental and Social Management of the Project



The PIU will also engage an independent organization to carry out external monitoring and evaluation on implementation of RAP; however, this component will not involve monitoring and evaluation of EMP due to limited nature of impacts. The roles and responsibilities of PIU and its consultants are presented in Table 8.1.

Table 8.1: Roles and Responsibilities for EMF Implementation

Organizations	Responsibilities
PIU/NCC	<ul style="list-style-type: none"> • Ensure that all project activities are well-managed and coordinated. • Recruitment of consultants for EIA and engineering designs; and approval of EIA by the DOE • Procurement of works and goods. • Payment of compensation to the project affectees • Recruitment and supervision of Construction Supervision Consultants (CSC) • Recruitment and supervision of external monitor and independent Panel of Experts • Carry out Environmental Impact Assessment of projects in Component in compliance with the World Bank and Government of Bangladesh requirements
E&S Cell within PIU/ NCC	<ul style="list-style-type: none"> • Responsible for assisting PD with developing TORs and hiring of consultants to carry out any required Environmental Impact Assessment work for subprojects and also for preparatory studies in Component, reviewing consultant deliverables related to Environmental Impact Assessment , reviewing bid documents for inclusion of EMP measures, supervising construction activities, producing periodic monitoring reports, • Ensuring inclusion of EMP in bidding documents • Providing training on EMP principles and requirements to CSC, contractors, NCC field staff, and others as needed to ensure effective implementation of EMP • Supervising CSC for the implementation of EMP • Closely coordinate with other concerned agencies, local governments and communities to support implementation of EMP • Preparation of progress reports on implementation of EMP. • Ensure effective implementation of EMP components not directly tasked to the contractor including components dealing with indirect, induced and cumulative effects, as well as operations and maintenance stage plans and measures. • Commissioning and oversight/review of consultant reports for EIAs/EMPs to be developed for the subcomponents of the Project • Ensure compliance of the studies on Component comply with World

Organizations	Responsibilities
	Bank and Government of Bangladesh requirements. <ul style="list-style-type: none"> • Responsible for developing standard environmental code of practices during operation stage of Canal
EHS Officer at Canal	<ul style="list-style-type: none"> • Responsible for implementing standard environmental code of practices during operation stage of Canal • Implementation of mitigation and monitoring measures during operation stage of the canal (monitoring of dust, traffic, solid waste collection and disposal, OHS issues, etc.)
Design and EIA Consultants	<ul style="list-style-type: none"> • Carrying out EIA studies in compliance with the GoB and World Bank guidelines following the EMF • Preparing EMP for inclusion in the bid documents
CSC	<ul style="list-style-type: none"> • Supervise civil works, ensuring compliance with all design parameters including quality requirements • Supervising contractors for EMP implementation • Prepare monthly reports and submit to PIU • CSC will have dedicated environmental and social staff
Contractor	<ul style="list-style-type: none"> • Responsible for implementation of mitigation and monitoring measures proposed in the EMP • Each contractor will recruit an Environmental, Health, and Safety (EHS) Manager, who will be responsible for implementing the contractors' environmental, health and safety responsibilities, and liaising with government agencies. S/he will have adequate number of staff to support him/her for these tasks.
M&E Consultant	<ul style="list-style-type: none"> • External Monitoring and evaluation of Resettlement Action Plan

8.2 Environmental and Social Management

Details of further tasks to be carried out and various plans to be prepared during the course of implementation and operation of the project are given in the Table 8.2.

Table 8.2: Management Plans/ Additional Tasks for the Project

SI	Plan/Task	Responsibility			Timing
		Plan Preparation	Plan Approval	Review/ Implementation	
1.	Environmental Codes of Practice (ECPs)	ESIA Consultants	NCC /WB	NCC through contractors	Already prepared (Annex 6)
2.	Inclusion of environmental clauses in bid documents for various contracts	ESIA Consultants	NCC /WB	NCC through contractors	2017-2020
Plans to be prepared by contractors					
3.	OHS Plan	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor
4.	Pollution Prevention Plans (related to air, noise, soil, water resources)	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor
5.	Waste Disposal and Effluent Management Plan	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor
6.	Drinking Water Supply and Sanitation Plan	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor
7.	Traffic Management Plan	All Contractors	CSC and PIU	All contractors	Before mobilization of each contractor
8.	Construction Camp Management Plan	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor
9.	Fuels and hazardous substances management plan	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor

SI	Plan/Task	Responsibility			Timing
		Plan Preparation	Plan Approval	Review/ Implementation	
10.	Emergency and contingency Preparedness Plan (for construction phase)	All contractors	CSC and PIU	All contractors	Before mobilization of each contractor
Plans to be prepared for O&M Phase					
11.	O&M Phase Environmental Code of Practices	CSC	NCC /WB	NCC	Prior to completion of construction
12.	Environmental Management System (waste disposal, air and noise quality, etc.)	NCC (through consultants)	-	NCC	Prior to completion of construction
13.	Safety Management Systems (OHS Management)	NCC (through consultants)	-	NCC	Prior to completion of construction
14.	Land use planning around the port facilities	NCC (through consultants)		Local government with the support of NCC	Prior to completion of construction

CHAPTER -9: CONSULTATIONS AND DISCLOSURE

Public Participation & Stakeholder Assessment

9.1 Introduction

Participation is a process, through which stakeholders influence and share control over development initiatives, the decisions and the resources, which affects them. The effectiveness of environment and social management plan is directly related to the degree of continuing involvement of stakeholders in the project development process. Participation of stakeholders in the projects is also a primary requirement in developing an appropriate EMP that addresses project's requirement and suited to the need so the stakeholders. Stakeholder's involvement is also vastly increases the probability of successful implementation of management plan. In order to make consultation and disclosure process effective and fruitful, comprehensive planning is required to assure that local government, host population and project staff interacts regularly and purposefully, throughout all stages of the project and contribute toward a common goal.

9.2 Approach and Methodology for Consultation

The approach undertaken for information disclosure and consultation involved the following key processes.

- Mapping and Identification of key stakeholders such as primary (direct project influence) and secondary (indirect project influence) stakeholders;
- Undertaking expert consultations, interviews and focus group discussions (FGD) with the respective stakeholders;
- Undertaking structured on field consultations, interviews and focus group discussions (FGD) with the respective stakeholders;
- Assessing the influence and impact of the project on these stakeholder groups;
- Summarizing of key findings and observations from the consultations; and
- Preparing a future stakeholder engagement strategy consultation plan for a more detailed assessment at a microscopic level taking into account the various project lifecycle phases and their implications on the stakeholder.

9.3 Stakeholder Assessment

A stakeholder is defined as “a person, group, or organization that has direct or indirect stake in a project/organization because it can affect or be affected by the Project or its Proponent's actions, objectives, and policies”. Stakeholders vary in terms of degree of interest, influence and control they have over the Project or the proponent. In the present study, all the stakeholders have been primarily categorized into two categories that have been identified as:

- Primary Stakeholders: include people, groups, institutions that either have a direct influence on the project or are directly impacted (positively or adversely) by the project and its activities; and

- Secondary stakeholders: are those that have a bearing on the project and its activities by the virtue of their being closely linked or associated with the primary stakeholders and due to the influence they have on the primary stakeholder groups.
- Apart from categorization, the stakeholders have also been classified in accordance with the level of influence they have over the project as well as their priority to the project proponent in terms of importance.
- The influence and priority have both been primarily rates as:
 - ✓ High Influence/Priority: This implies a high degree of influence of the stakeholder on the project in terms of participation and decision making or high priority for project proponent to engage that stakeholder.
 - ✓ Medium Influence/Priority: This implies a moderate level of influence and participation of the stakeholder in the project as well as a priority level for project proponent to engage the stakeholder who are neither highly critical nor are insignificant in terms of influence.
 - ✓ Low Influence/Priority: This implies a low degree of influence of the stakeholder on the project in terms of participation and decision making or low priority for project proponent to engage that stakeholder.

Based on the above attributes, the following **Table 9.1** delineates the detail of stakeholders relevant to Baburail canal identified for the proposed project and their analysis.

Table 9.1: Stakeholder Assessment for the Project

SI.No.	Stakeholders	Category of stakeholder		Brief profile	Overall influence on the project	Basis of Influence Rating
Project Management						
1	Narayanganj City Corporation (NCC)	Primary	<ul style="list-style-type: none"> NCC is the primary project proponent own a controlling stake of 100% in the project 	Highest	<ul style="list-style-type: none"> Are the primary project proponents Responsible for establishment and operation of this project Primary financial beneficiaries Responsible for all the project related risks and impact liabilities 	
Community						
2	Vulnerable Groups (poor, old aged, and destitute)	Primary	<ul style="list-style-type: none"> The marginal groups within the project area primarily comprises of landless households as a result of acquisition, households below poverty threshold, women headed households, old aged & destitute 	Low	<ul style="list-style-type: none"> Employment opportunity during construction. Job prospect for their children Compensation paid to male member of family Little control over compensation amount Employment opportunities 	
3	Local Community	Primary	<ul style="list-style-type: none"> Primarily includes adjacent community to the project site 	Medium	<ul style="list-style-type: none"> Project will bring development to the area Increase in employment opportunities and preference in job Improvement in infrastructure in the area 	
Regulatory/Administrative Authorities & Agencies						
4	Dept. of Environment,	Primary	<ul style="list-style-type: none"> The Department of Environment is the primary 	High	<ul style="list-style-type: none"> Government Regulatory agency to provide Environmental Clearance (EC) to the 	

	Stakeholders	Category of stakeholder	Brief profile	Overall influence on the project	Basis of Influence Rating
	Bangladesh		government regulatory authority for Environmental protection in Bangladesh.		<p>project based on evaluation and approval of Environmental Impact Assessment (EIA) study</p> <ul style="list-style-type: none"> • Responsible for monitoring project's Environmental compliance throughout the project lifecycle
5	Other Regulatory & Permitting Authorities	Primary		High	<ul style="list-style-type: none"> • Agencies required for obtaining permits and licenses for establishment and operation of the project • Primary involvement during pre-construction and operation phases
Political Administration					
6	Ward leaders & local representatives	Secondary	<ul style="list-style-type: none"> • Elected representative at ward level i.e. village level for a fixed tenure 	Medium	<ul style="list-style-type: none"> • Plays important role in providing public opinion and sentiment on the project • Empowered to provide consent and authorization for establishment of project on behalf of the community
Other Institutional Stakeholders Groups					
7	Local NGOs and Community & Social Welfare Groups (CSWG)	Secondary	<ul style="list-style-type: none"> • Microfinance agencies, social welfare groups and charitable organizations working in the area 	Low	<ul style="list-style-type: none"> • No major involvement in the project as per today • Possible inclusion during future stages of the project with respect to project related community welfare activities

9.4 Focus Group Discussion

Field surveys and consultations with different stake holders including affected communities were carried out throughout EIA studies. Consultation meetings were held through focus group discussions, individual meetings and public consultations. A questionnaire survey was performed during individual discussion done.

Discussion was held with the local people at Baburail Canal. Date, location and the number of participants of each discussion is listed in **Table 9.2**. The local people attended the focused group discussion meeting include Shop owners, Businessman, Farmer etc. The summary of focused group meeting (FGD) is shown in **Table 9.3**. Attendances of Focus Group Discussion meeting are provided in **Annex 5**. Photographs of focus group discussion are given in Figure 9.1-9.12.

Table 9.2: Details of FGD Meetings

Sl.	Date	Location of the meeting	Total Participants	Category of participants
1	1.04.17 3.04.17 and 9.04.17	Nimtali Bazar, RK Mitra Road, SK Biswas road, Bangla Bazar, B Das Road,	31	Shop owners and Businessman

Table 9.3: Summary of Focus Group Discussion (FGD) Meeting

Sl. No	Issues discussed	Participant's Opinion, comments and Suggestions	Response to Questions/Action Point
1	General perception about the project and the awareness about the proposed project.	Most of the participants are in favor of the project and have been made aware of the proposed project through the various surveys that have taken place	Acceptance of the project
2	Do you Support for the proposed project?	Everybody said that they will support the project and advise the Consultants to take precautions in the environmental mitigation to avoid the various impacts anticipated during thepreconstruction, construction and operation stages of the project and to ensure protection of the natural water bodies of the	The Consultants informed that during the study, the design and layout of all infrastructures have been considered the anticipated adverse impacts. EMP covers specific measures to follow during the construction process in protecting naturalwater bodies

Sl. No	Issues discussed	Participant's Opinion, comments and Suggestions	Response to Questions/Action Point
3	Does the proposed Project create any problem with ambient air, noise quality or water quality?	Waste water discharge, Noise, vibration and dust will be major issues during construction and operation	Impact of the project upon ambient air, noise quality, water quality has been assessed during EIA study. EMP will be provided instructions limiting environmental qualities to comply with the standards and penalties for violations.
4	Does the proposed project going to provide better traffic system?	All the participants felt that the proposed road construction project will facilitate a better traffic system. Participants mentioned that safety measures are especially important for social institutions like schools, hospitals etc.	Some concerns over safety, supporting design measures such as increased number of sign board, road mark, bump etc.
5	Protected areas (national parks protected forest, religiously sensitive sites, historical or archaeological sites), if any	The proposed Baburail canal restoration construction projects do not pass any protected or ecological critical area.	No concerns over the park, the nearest sites with terms of cultural or religious significance are far from the proposed canal.
6	Employment Status: Percentage of employment/ unemployment/ underemployment	Unemployment is expected in the project area	Job chance and employment will be enhanced and promoted once the construction has been started.
7	Impact of the project on the aquatic environment	The livelihood of the fishermen community should be taken into consideration	As a conclusion of impact prediction, fishery is not affected and aquatic diversity remains same since water quality or hydrological condition is not affected (or worsen) by the project.

Sl. No	Issues discussed	Participant's Opinion, comments and Suggestions	Response to Questions/Action Point
8	If this canal is restore, there may be large groups of workers living temporarily in the area, and construction operations that generate noise and dust. Are there any other issues about construction,	The respondents strongly welcome the link road construction activities. Many observed that the measures are temporary and besides there will be more chances for local communities to be employed during construction, providing both skilled and unskilled labor. Participants did not mention any other problems which might bother them other then following basic safety rules.	Residents understand that construction impacts can be expected and do not have an issue with these, provided safety measures are taken.

Figure 9.1: FGD Meeting with Local People at Deobhog, Banglabazar



Figure 9 2: FGD Meeting with Local People at RK Mitra Road



Figure 9 3: FGD Meeting with Local People at RK Mitra Road



Figure 9 4: FGD Meeting with Local People at RK Mitra Road



Figure 9 5: FGD Meeting with Local People at RK Mitra Road



Figure 9 6: FGD Meeting with Local People at RK Mitra Road



Figure 9 7:FGD Meeting with Local People at RK Mitra Road



Figure 9 8: FGD Meeting with Local People at RK Mitra Road



Figure 9 9: Individual discussion with Local People at RK Mitra Road



Figure 9 10: Individual discussion with Local People at Community Clinic SK Biswas Sarak, Bangla Bazar



Figure 9 11: Individual discussion with Local People at SK Biswas Sarak, Bangla Bazar



Figure 9 12: Individual discussion with Local People at SK Biswas Sarak, Bangla Bazar



9.5 Public Consultations Meeting and Disclosure

Public Consultation meeting was held at NCC Conference room during project preparation and to share the draft EIA and SIA reports. A public consultation meeting was held on 11th April 2017 with the local communities. Notices about the consultation meeting were circulated to the local communities through leaflets one week in advance of the meeting. Posters were also displayed at public places at City Corporation gate, market and bus stand and railway station). Additionally, meetings were also held with NCC officials.

Photographs of public consultation is given in Figure 9.13 and 9.14. During these consultations, leaflets on key environmental and social issues were distributed to the participants (these were prepared in local Bangla language) and posters were also displayed at the venue. Power point presentations were made by the environmental and social experts. Participants were encouraged to ask questions on the environmental and social issues. Detail of consultation meeting and participation were presented in Table 9.4. The Summary of Consultation meeting were presented in Table 9.5. The leaflet of presentation material for public consultation meeting were presented in **Annex-7**.

Table 9.4: Details of Consultation Meetings

Date	Meeting	Male	Female	Total
1 st March 2017	Focus group discussions	31	-	31
3 rd March 2017	Individual Interview	8	1	9
11 th April 2017	NCC auditorium	65	7	72
Total		104	8	112

Table 9.5: Summary of Consultation

S.N.	Comment	Response/Action Plan
1	Can we make an Auto-stand for the Padel Chalito Autos? Nuruddin Ahmed (President, Narayanganj bashi Shonggothon)	To provide a sustainable solution to transport problem we thought about promoting Public Transport like Buses. The road should be widen up to 7m. Then buses will start running on these roads. It will be an environment friendly solution.
2	How to manage the waste materials that accumulate beside the drains? Where to dump these wastes? Advo. AB Siddique (President, BAPA)	After collection of solid waste in bins, the solid waste will be disposed outside the city about 30 km away, this process will be implemented through tender which is now under process. An Environmental Monitoring cell will be formed and local people will also involve to monitor as well as involve in the solid waste management work. There will be fixed dustbins beside Gymkhana Lake.

S.N.	Comment	Response/Action Plan
3	<p>Have the consultants considered the existence of Gas line and WASA line (Utility Lines) during the designing/planning? Will the Utility lines be interrupted/disturbed by the development works? Will there be any walkway/road beside the canal if all the private bridges get demolished? Obaidullah (Ex-Panel Mayor)</p>	<p>Yes, we have. If there appears any kind of obstacle of the utility lines then it will be removed. There will be walkways beside the water bodies. Project's social survey is on-going and the decision for road connectivity will be taken after the findings from the social and traffic surveys are received.</p>
4	<p>When will the project start and what is the total duration of the project? Nazmul Alam (Councilor 16 No. Ward)</p>	<p>The project is already running and total duration of the project is about 2 years. Hopefully within 2019 the whole project will complete.</p>
5	<p>Will the Canal be filled with water ever (as consultant proposed dams/slucice gate)? Abdus Salam (President, Narayanganj Press Club)</p>	<p>Three internal khals are also connected to Baburail Khal and their polluted water should not contaminate Baburail Khal. We are thinking about providing either Rubber Dam or any other kind of Dam whichever seems suitable to save Baburail's water. It is noteworthy that, the underground water level is in good condition and water level will always be 4.5 m from the bed level of the khal.</p>
6	<p>Is there any provision of potable water? Is there provision of maintenance of trees? Is there any provision of Public Toilet?</p>	<p>Thanks for your suggestion. We will try to incorporate it in our plan and designs. There is provision for public toilet in Jimkhana Lake, but due to lack of space there is no provision for public toilet in Baburail Canal. We shall try to incorporate the club house for the provision of Public Toilet.</p>
7	<p>Is there any provision of water treatment plant? After provision of dams will this turn Baburail Canal/Lake into a pond? Will this water body be pollution free? Afzal Hossain (General Secretary, Narayanganj Press Club)</p>	<p>We are not treating the Lake water. We will preserve the rainwater in it which will be clean. We are putting dams so that this clean water does not get mixed with the polluted water that comes from river branches.</p>
8	<p>Will there be any resettlement plan of the settlements along R.K. Mitro road? Abdur Rahman Liton (Secretary, Shop Owners Union) Liton: We have shifted our shops in our own initiatives for the betterment of the project.</p>	<p>Honorable Mayor has got some creative ideas about the resettlement and that will definitely happen.</p>
9	<p>Will there be any development of other Lakes, bridges outside the Narayanganj City Corporation area (From Dhaleshwari to Shitalakkhya River)? Is it</p>	<p>I will try to work for the development works along Shitalakkhya River to Dhaleshwari River. Vitti: Honorable Mayor has taken the ownership of working in the Union Level by developing</p>

S.N.	Comment	Response/Action Plan
	<p>possible to come to NCC office directly from Chasara by rickshaw? Sharifuddin Shobuj (Narayanganj Press Club)</p>	<p>partnership with LGED. In Bangladesh LGED is the only Engineering Department to work with Union Parishad. Some person wanted all of the Survey Data of TIA and SIA. But he was assured that these data are confidential so those won't be provided. But the entire planning of Baburail Khal Project will be available online within very short time.</p>
10	<p>Will there be any katcha bazar (Organic food store) inside the plan? (He was concerned because famous Kacha bazar of Meenabazar/Boubazar was being demolished) Ranjit Kumar Das (SM Malik Road)</p>	<p>Kachha Bazar is unhygienic. So, modern Grocery stores (Departmental store) will come to the area instead. However, if people still want a traditional kacha bazar then I will try to think of it. There is no provision for Katcha bazar along the Canal because of environmental concern.</p>
11	<p>Is there any provision of public toilet in the plan? How many and where? Mizanur Rahman Tulu (Businessman, R K Mitra Road)</p>	<p>We have thought of creating a recreational space surrounding the water bodies. In Gymkhana lake there will be 2 public toilets. However, as per your concern we will try to make arrangements for drinking water beside the water bodies also</p>
12	<p>How long is this project going to take to become a reality? Can we bring Shitalakhya River inside the realm of this project? (He also wants that river to be pollution free) Md. Shofiuddin Prodhan (Ward Councilor of Ward 14)</p>	<p>It's a two years' project. We have already started the work for segment one. One tender is passed. Now it's time for the other segments. Eventually, the project will be done by the end of 2018 or the beginning of 2019. We all want to save Shitalakhya. This is now a national problem. If government wants to do it, then it might be possible to save our rivers. We have to find it out from the Rainfall data. We considered the increase of traffic flow in the project. We have to check it back in our TIA. DAP is on-going. So, plan for a building will not pass if it does not have a road that is 7m wide.</p>
		<p>Concluding Note Mayor: In conclusion note Mayor expressed her gratitude to all for attending in the meeting and making it successful. She informed the audience that a portion (package-1) of the project is already on-going and tender for package-2 will be prepared very soon. Narayanganj is a city of Canal and Rivers and connected by seven rivers directly and indirectly. Government is now taking positive initiatives to save the rivers and agricultural land with proper law and order. Mayor has an agenda to save the playground, doing tree plantation and she has already given directions to new elected councilors to provide her with a list of Khals and water bodies that need to be restored.</p>

Figure 9 13:Public Consultation Meeting with Local People at NCC Auditorium



Figure 9 14:Public Consultation Meeting with Local People at NCC Auditorium



9.6 Access to Information

The EIA, SIA and RAP reports will be disclosed in the NCC website. Consultation workshops were held on 11th April 17 at NCC auditorium to share and disclose the results of the draft EIA report. Invitations were sent to relevant stakeholders including local government officials and local community. The documents will also be sent to the World Bank info shop. The executive summaries of EIA, SIA and RAP documents will also be translated and will be made available to the local communities by placing them at NCC offices.

CHAPTER -10: CONCLUSION AND RECOMMENDATION

10.1 Conclusion

An EIA has been carried out for the proposed Baburail Canal restoration project according to the requirement of DOE for necessary environmental clearances as it is made mandatory in **ECA' 95**, for any new project set up and the subsequent **ECA '97** and also **World Bank** Guideline. An EIA report has been prepared through identifying the potential impacts, assessing them and recommending possible mitigating and enhancing measure for negative and positive impacts, respectively.

An outline of EMP has been given in the present report to mitigate/enhance the impacts, which are expected to occur during construction and operation phase of the project.

The findings of this EIA suggest that the Baburail Canal Restoration project involves potential socio-economic benefit, restore old heritage of Narayanganj, economic development of the area, reduce wastage of valuable time, fuel and air pollution, black smoke, dust emission and cost of travel. Environmental pollution will be reduced. Area will be clean and free from waste dumping. The canal will have clean water and the water flow will upsurge.

The major negative impact may arise from reshaping of canal of filled up earth of the existing Baburail canal and dispose to a safer place in environmentally sustainable way, clear the vegetation, shrub and trees, removal of both legal and illegal structure from the right of way of the Canal. Total 349 temporary structure need to be remove and 258 Nos of small to medium trees need to cut.

Construction 2.8 long canal, 7 km (3.5x2) long both side drain along the canal, 18 bridges, shops, three over pass, sluice gate/ rubber dam at both end of the river side, elevated walkway and canal slope protection need special care during construction. Proper stabilization of soil of the canal slope should be done during preparation of canal.

The negative impacts are temporary mainly during construction of canal and other structure dust, noise, water and solid waste will generate. Pedestrian and vehicle movement will be hampered during construction period. Once the construction work is completed the dust, noise, water and solid waste pollution drastically reduce. Once the project completed it will become a recreation place for the local and tourist people.

NCC will fully implement the EIA's environmental management plan and monitoring plan to comply the monitoring program defined in the EIA.

The limited environmental impacts to which further careful attention should be given using the construction, operation and maintenance of the project in order to minimize and offset the adverse effects. The possible negative impacts are not severe, and the adverse impacts if duly addressed could be minimized without much effort, though they would require attention and positive commitment from the Project Management.

Positive Impacts of the Proposed Project Interventions

1. Positive impacts on terrestrial ecology are expected post project completion due to the increase in vegetation, tree plantation and landscaping. The NCC should coordinate with the local communities to maintain and enhance the trees planted along the roads.
2. The proposed project will conserve and regenerate old lost heritage of the city

3. Transportation facilities will improve which reduces uses of fuel, black smoke, dust emission, time of travel and cost due three over pass will constructed.
4. Increase recreational facilities with environmental aesthetics with scenic beauty change the as clean city.
5. Due to infrastructure and transportation improvement the life style will change of the city dwellers significantly.
6. Economic activity and business will increase and hence employment also increase
7. Improved public safety
8. Improve drainage and solid waste management
9. Improved land use protection
10. Navigation facilities will start when the river water become pollution free. Before that only boat will ply in the closed canal.
11. Create social benefits by providing temporary jobs for unskilled workers/labourers during the construction phase
12. Provide protection of the Baburail Canal slope and protect of canal edge, thus preventing risks of floods in future

The overall finding of the EIA is that the proposed Baburail canal restoration project will not cause any significant adverse environmental impacts during construction period, provided that adequate mitigation measures are implemented. The proposed mitigation measures are prescribed conceptually in the EIA, as an outline EMP. This will be developed by the contractor in the construction phase.

Thus, it can be concluded that the proposed project is environmentally acceptable and will bring economic, social and environmental benefits to the land users and local community in the area.

10.2 Recommendation

The canal water should be free from domestic wastewater, sewage or storm runoff pollution. The storm water and sewage connection to the canal is suggested to be stopped. However, both side open drain has been proposed with sufficient capacity so that these can take care of the storm runoff cum house hold flow generated from the household.

The 4 other existing canals which carries household wastewater and rain water enter directly to the Baburail canal is a major problem and spoil the aim of the project. The following suggestion are made for sole the problem.

It is suggested that in the next 2 years all the other 4 canals should improve and connect with Baburail.

In order to keep the Baburail canal clean a sewage treatment plant (STP) is require to treat the wastewater. So that wastewater will not be contaminated other canals.

One drain should be constructed which carry all the wastewater from the cities and discharge to river.

Before construction of STP to discharge the wastewater into the Baburail canal after simple treatment like, screening for removing leaves, tree buckle, cloth, other rubbish and floating material, sedimentation of grit removal through grit chamber can be perform temporarily. Overflow from the supernatant may be allow to Baburail canal. This will help to maintain the water level of the Baburail canal.

Or divert the wastewater directly to the Shitalakhya and Dhaleshwari River.

The boundary of the reshaping of canal and slope of the canal should be maintained properly to avoid disturbance to the ambient natural system. The reshaping time of canal, should be minimized. The sands/earth used for canal dam should be compacted properly as early as possible. Plantation of trees is a must and at least three new trees would be planted for each cut-down tree.

Satisfactory compensation should be given to the affected people who lost the structures and trees and loss of income. Specially, assets removed from the canal sides should be compensated for at the appropriate level. Minor negative impacts like clearing of vegetation and cutting of trees at the pre-construction and construction phases should be taken care of by taking proper mitigation measures.

Local people should be employed as much as possible during the pre-construction and construction phases. The contractor should be specifically instructed to employ local laborers as much as possible. The health and safety issues of workers should be taken care of under the specific order of the contractor and client. The construction labour camps should be provided with water supply and sanitation facilities. The workers should be apprised of hygienic practices.

The transportation of materials should be done by feasible routes in order to minimize the existing road. The stores and equipment yards should be properly guarded so that all equipment remains safe.

From an overall assessment, it is observed that the proposed project could be implemented in an environment friendly manner, but subject strictly to the implementation of an environmental management plan. So, it is recommended that the project may be cleared to proceed with its work.

NCC concludes that this EIA is complete and addresses all relevant likely impacts and proposes a full set of time-bounded mitigate and monitoring actions, including assignment of responsibility. The application of the detailed EMP will insure that the nature and socio-cultural environmental are not unduly affected by the work or the operation of the canal. Therefore, NCC recommends that an environmental clearance may be granted by DoE, there are no uncertainties in the analysis, and no additional work is required to comply with National Law.

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CHAPTER -12: ANNEXURE