

Initial Environmental Examination

Project No. 52174-001
February 2020

G0582-BAN: Emergency Assistance Project

Construction and operation of mini piped water supply system (10 schemes): Package 3
(EAP/DPHE/W3)

This Initial Environmental Examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

Initial Environmental Examination

February 2019

G0582-BAN: Emergency Assistance Project

Construction and operation of mini piped water supply system
(10 schemes): Package 3 (EAP/DPHE/W3)

Prepared by Department of Public Health Engineering for the Asian Development Bank.

Location of Mini Pipe Water Supply System (10 Schemes) under Package 3

Sl. No	ID	Camp	Block	GPS Coordinates	
				Latitude	Longitude
1	WS01	Camp-2W	D-4	21.207462	92.15576
2	WS02	Camp-2W	D-3	21.209465	92.161095
3	WS03	Camp-2W	B-3	21.209433	92.16265
4	WS04	Camp-13	G	21.18005	92.136903
5	WS05	Camp-5	G-2	21.202286	92.151268
6	WS06	Camp-5	F-3	21.202327	92.152871
7	WS07	Camp-5	E-2	21.197787	92.148387
8	WS08	Camp-2E	D (D-1)	21.206443	92.161972
9	WS09	Camp-2E	D	21.205549	92.164806
10	WS10	Camp-2E	D (E-2)	21.205547	92.163112

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
I. INTRODUCTION.....	3
A. Background	3
B. Need for the Project	3
C. Impact and Outcome	3
D. Outputs	3
E. Subproject	4
F. Objectives and Scope of the Report	4
G. IEE Methodology	4
H. Structure of the Report.....	5
II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK	6
A. Introduction.....	6
B. Environmental Legislation Framework	6
1. Overview of the Project Approval Process.....	6
2. Environmental Approval Framework	6
C. National Policies, Laws, Regulations	8
D. Relevant Occupational Health and Safety Laws and Rules	11
E. Conventions, Treaties and Protocols	12
F. Environmental Categorization and Standards	12
1. Environmental Category: Bangladesh	12
2. ADB Safeguard Policy (ADB Safeguards Policy Statement, 2009)	13
G. Institutional Capacity	14
III. DESCRIPTION OF THE PROJECT.....	15
A. Need for the Subproject	15
B. Subproject Scope	15
C. Location of the Subproject	15
D. Existing Water Supply System	15
E. Description of the Proposed Subproject	17
1. Production Well	17
2. Pumping Facility	18
3. Water Reservoirs	18
4. Pipe Networks for Distribution.....	19
5. Community Tap Stand	20
6. Operation and Maintenance.....	21
7. Implementation Schedule.....	21
IV. DESCRIPTION OF THE ENVIRONMENT	22
A. Physical Environment.....	22
1. Topography and Geomorphology	22
2. Geology and Soil.....	22
3. Climate and Meteorology	23
4. Seismicity	24
5. Natural Disasters.....	24
6. Flooding, Water Logging and Drainage Pattern.....	25
7. Hydrology and Water Resources	25
8. Air Quality and Dust	28
9. Noise Level.....	28
B. Biological Environment.....	28
1. Diversity of Floral and Faunal Species	28
2. Fisheries.....	29
3. Asian Elephants	29

4.	Protected Areas	30
C.	Socio-economic Environment	31
1.	Population	31
2.	Income and Expenditure	31
3.	Land Use Pattern	32
4.	Education	33
5.	Healthcare Facility	33
6.	Sanitation	33
7.	Solid Waste Management	34
8.	Energy	34
9.	Physical and Cultural Heritage	34
V.	ANALYSIS OF ALTERNATIVES	35
A.	Discussion of Alternative Solutions	35
B.	No Project Alternative	35
C.	Conclusion	35
VI.	ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES	36
A.	Impact Assessment	36
1.	Methodology	36
2.	Summary of Impacts	37
3.	Screening out Areas of No Significant Impact	39
4.	Anticipated Impacts and Mitigation Measures during Planning Phase	39
5.	Anticipated Impacts and Mitigation Measures during Construction Phase	39
6.	Anticipated Impacts and mitigation Measures during Operation Phase	42
VII.	ENVIRONMENTAL MANAGEMENT PLAN	43
A.	Objective of the EMP	43
B.	Environmental Monitoring Plan	43
C.	Components to be Monitored	44
D.	Contractor's Environmental Management Plan	45
E.	Institutional Arrangement and Responsibilities	56
1.	Oversight Body	56
2.	Executing and Implementing Agencies	56
3.	Project Management Unit and Project Implementation Unit	56
4.	Design and Supervision Consultants (DSC)	56
5.	Civil Works Contracts and Contractors	56
F.	Capacity Building	56
G.	Environmental Costs	57
H.	Monitoring and Reporting	59
VIII.	GRIEVENCE REDRESS MACHANISM	61
A.	First Level of GRM	61
B.	Second Level of GRM	61
C.	Third Level of GRM	61
IX.	INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION	63
A.	Stakeholder Consultation	63
1.	Stakeholder Consultation Strategy for Emergency Assistance Project	63
B.	Key Target Stakeholders	63
C.	Consultation and Disclosure to Date	63
D.	Findings of the Public Consultation	64
E.	Future Stakeholder Consultation	64
F.	Information Disclosure	64
X.	CONCLUSION AND RECOMMENDATION	66
XI.	REFERENCES	67

ANNEX 1: RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST (WATER SUPPLY AND SANITATION)	68
ANNEX 2: LIST OF ATTENDEES OF THE PUBLIC CONSULTATION.....	72
ANNEX 3: LIST OF WILDLIFE (MAMMALS, BIRDS, REPTILES AND AMPHIBIANS) RECORDED IN THE SUBPROJECT AREA.....	74
ANNEX 4: LIST OF HIGHER PLANTS (MAMMALS, BIRDS, REPTILES AND AMPHIBIANS) RECORDED IN THE SUBPROJECT AREA.....	76
ANNEX 5: IUCN GUIDELINE FOR PLANTATION IN THE CAMP	78
ANNEX 6: TEST RESULTS FOR GROUNDWATER QUALITY.....	80

LIST OF TABLES

Table II.1: Required Permissions for Project under Bangladesh Legislation.....	8
Table II.2: Summary of Environmental Legislations Applicable to the Proposed Project.....	9
Table II.3: occupational and health related rules	11
Table II.4: International Environmental Conventions relevant to the project activities	12
Table II.5: Categorization of Subproject Components	13
Table III.1: Details of existing water supply to the camps.....	16
Table III.2: Implementation sequences	21
Table IV.1: Groundwater Quality within the study area	26
Table IV.2: Rohingya volunteer incentive rates recommended by RRRC.....	32
Table VI.1: Parameters for Determining Magnitude	36
Table VI.2: Criteria for Determining Sensitivity	36
Table VI.3: Significance of Impact Criteria.....	37
Table VI.4: Summary of the potential impacts of the subproject	38
Table VI.5: Fields in which the subproject is not expected to have significant impacts.....	39
Table VI.6: Anticipated Impacts and Mitigation Measures – Construction Phase	40
Table VII.1: Environmental Management and Monitoring Plan – Prior, During, and Post Construction Phase	46
Table VII.2: Site Specific Environmental Management Plan for Mini Pipe Water Supply System (DPHE/W3).....	51
Table VII.3: Indicative Capacity Building and Training Program on EMP.....	57
Table VII.4: Cost Estimates to Implement the EMP.....	58
Table IX.1: Summary of consultation outcomes	64

LIST OF FIGURES

Figure II.1: Environmental approval framework	7
Figure III.1: Location map of the proposed mini pipe water supply system.....	15
Figure III.2: Water distribution zone in the camp	16
Figure III.3: Existing water supply system in the subproject area.....	17
Figure III.4: Design of production well.....	18
Figure III.5: Foundation plan of water reservoir	19
Figure III.6: Layout of distribution and main pipe line	20
Figure III.7: Plumbing details of community tap stand	20
Figure IV.1: Elevation and general soil map of Bangladesh	22
Figure IV.2: Monthly average maximum, minimum and mean temperature.....	23
Figure IV.3: Average monthly rainfall.....	23
Figure IV.4: Monthly average wind speed.....	24
Figure IV.5: Earthquake zone and landslide vulnerability areas around the subproject.....	25

Figure IV.6: Stream network in the sub-project area	26
Figure IV.7: Floral species around the subproject area	29
Figure IV.8: Faunal species around the subproject area	29
Figure IV.9: Elephant watchtower in the camp	30
Figure IV.10: Human-elephant conflict map around the subproject area	30
Figure IV.11: Protected areas of Bangladesh	31
Figure IV.12: Refugee camp sites by population	31
Figure IV.13: Land cover maps for the subproject area.....	33
Figure VIII.1: Grievance redress process	62
Figure IX.1: Public consultation held in the Camp 2E and Camp 5.....	64

ABBREVIATIONS

ADB	Asian Development Bank
BREB	Bangladesh Rural Electrification Board
BMD	Bangladesh Meteorological Department
BoQ	Bill of Quantities
DOE	Department of Environment
DPHE	Department of Public Health Engineering
EAP	Emergency Assistance Project
EARF	Environmental Assessment And Review Framework
ECA	Environmental Conservation Act
ECC	Environmental Clearance Certificate
ECR	Environmental Conservation Rules
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FD	Forest Department
FGD	Focus Group Discussion
GoB	Government of Bangladesh
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature
ISCG	Inter Sector Coordination Group
H&S	Health And Safety
LGED	Local Government Engineering Department
MOEF	Ministry of Environment and Forest
NGO	Non-governmental Organization
NOC	No Objection Certificate
O&M	Operation & Maintenance
PIU	Project Implementing Unit
REA	Rapid Environmental Assessment
RHD	Roads and Highways
RRRC	The Refugee Relief And Repatriation Commission
SCC	Site Clearance Certificate
SPS	Safeguards Policy Statement
ToR	Terms of Reference
UN	United Nations
UNDP	United Nations Development Programme
UNHCR	United Nations High Commissioner for Refugees
WB	World Bank

EXECUTIVE SUMMARY

1 The Emergency Assistance Project is proposed by the Government of Bangladesh from a grant of 100 million USD from Asian Development Bank to provide high-priority basic infrastructure and essential services to help address the humanitarian crisis caused by the arrival of more than 700,000 displaced persons from Myanmar. The project will improve the living conditions and the resilience of displaced persons. The project will directly benefit the lives of people in camps while co-benefitting host communities in some instances.

2 An initial environmental examination (IEE) was carried out for the mini pipe water supply subproject. In accordance with ADB Safeguard Policy Statement (SPS), 2009, an initial screening was conducted using ADB's Rapid Environmental Assessment (REA) checklist for Water Supply. Result of the screening and assessment reveal that the subproject is unlikely to cause significant adverse environmental impact. Thus, the subproject is categorized as category B for environment as per ADB SPS, 2009. In addition, the assessment was also carried out within the policy, legal, and administrative frameworks relevant to water supply projects in Bangladesh.

3 Construction and operation of mini piped water supply system for 10 schemes under Package 3 is designed to provide safe and sustainable water supply to the refugee camps and the adjacent affected villages, which comprises (1) construction of Production well using both truck mounted hydraulic rig and mechanical rig (2) installation of solar pump solution for production well (3) construction of pump houses (4) construction of reservoirs (10000 liter HDPE), (5) construction of HDPE Pipe networks (100mm and 75 mm pipeline) using trench and (6) construction of community tap stand.

4 Subproject component is located in displaced persons' mega camp in Kutupalong and the focus area is situated on a combination of plains and small hills, extending into the Chittagong Hill tracts bordering Myanmar. The subproject area is on the Pleistocene formations and have a Dupi Tila formation and soils of the Dupi Tila formations were formed on unconsolidated and compact rocks, moderately well to excessively drained and probably the oldest of the area. The climate of the subproject area is tropical and characterized by a change of four, pre-monsoon (March to May); monsoon (June to September); post-monsoon (October to November); and the dry season (December to February). The main area of the Rohingya camps is located outside of the flood zone, the camps are vulnerable to extreme weather events such as cyclones and have to withstand major precipitation and strong winds. The steep slopes may become unstable in the monsoon seasons and cause landslides, shelter damage and other destruction. The subproject area has limited sources of surface water where the main water sources such as the Naf River and other big channels are at some distance and are saline and brackish especially in the lower part of the rivers. Himchari national park and Teknaf reserved forest is located about 15 km and 6 km away from the subproject area respectively. None of the subproject components are located in the forest area, and no waste water will enter the forest area from the proposed facilities.

5 Production well at deep aquifer is identified as the most favorable option among all the alternatives as surface water is limited, the shallow water aquifer is drying up and contamination has been identified in the subproject area. Ten production wells of 250m depth and 200 mm dia. will be constructed under this subproject scheme.

6 Total twelve environmental parameters are likely to be affected by the project implementation. Adverse environmental impacts during construction are temporary, less than significant, and can be easily mitigated. There will be no massive construction activities that can damage the environment. No cutting of trees will be done in the subproject area. Water supply pipe-laying is a low impact construction activity since trench excavation is shallow with narrow width. Excavated soil is backfilled to the trench after pipe-laying. Required structures are relatively small in size. Typical construction issues are manageable with the implementation of preventive measures to address: land slide hazard, groundwater quality, dust, noise, biodiversity, worker and public safety. However, the socioeconomic environment is considered to be affected positively as the project activities will create job opportunity for the local people and safe water

supply system to mitigate the water scarcity in the camps. Moreover, environmental problems due to operation and maintenance of the proposed water supply system can be avoided by incorporating the necessary measures in the design and use of appropriate operational procedures.

7 An environmental management plan (EMP) is developed to effectively manage any environmental issues arising from the subproject implementation. The EMP includes: (i) mitigating measures to be implemented, (ii) required monitoring associated with the mitigating measures, and (iii) implementation arrangement. The institutional set-up and arrangement identifies the requirements, responsible stakeholders and responsibilities during pre-construction, construction, and operation phases. The EMP applicable for each phase is presented in detail in tabular form with specific information on: (i) required measures for each environmental impact that requires mitigation, (ii) locations where the measures apply, (iii) associated cost, and (iv) responsibility for implementing the measures and monitoring.

8 The stakeholders were involved in developing the IEE through public consultation, after which views expressed were incorporated into the IEE and in the planning and development of the subproject. The IEE will be made available at public locations in the construction site and will be disclosed to a wider audience via the ADB websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation. A grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly.

9 All potential impacts were identified in relation to design, construction and operation phases. However, most of the individual elements of the subproject are relatively small and involve straightforward construction and operation, thus, the proposed subproject is unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

10 DPHE (Executive Agency) have fully endorsed the EMP and is committed to implement all the mitigation measures. DPHE will also ensure that the work is carried out in an environmentally acceptable manner and the monitoring and reporting are completed in a compliant and timely fashion, acceptable to ADB. Therefore, it is our contention that there will be no negative impacts to deter the development of the subproject if the subproject is developed following the suggestions given in the EMP of this IEE.

11 However, as per Government of Bangladesh ECA, 1995 and ECR, 1997, the sub-project is categorized as “red”; and LCC and ECC must be obtained from DoE. On the other hand, based on this IEE, the determination of environment category as “B” in accordance with ADB’s SPS 2009 is confirmed and does not require further environmental impact assessment.

I. INTRODUCTION

A. Background

1. Bangladesh has received more than 700,000 displaced persons from Myanmar (displaced persons) since August 2017. These displaced persons, which mostly reached Bangladesh by crossing the nearby border on foot, joined about 400,000 other displaced persons who had arrived in waves from Rahkine State earlier. The vast majority of displaced persons who have arrived in Bangladesh are living in 32 camps in Cox's bazar District, with more than 600,000 living in the Kutupalong–Balukhali mega camp. The large influx of displaced persons has caused a huge strain on the local people, infrastructure, and economy. The 2:1 ratio of displaced persons to the local population poses significant challenges to the food supply, shelter, health, sanitation, water, and other essential services. Although UN agencies and other donors are providing humanitarian relief such as food, water, medical aid, and temporary shelter, the existing services are stretched, and large gaps remain.

2. The Government of Bangladesh requested the Asian Development Bank (ADB) on 7 May 2018 for grant support to provide high-priority basic infrastructure and essential services to help address the humanitarian crisis caused by the arrival of the displaced persons. The project meets the requirements for emergency assistance financing.

3. The proposed Emergency Assistance Project will support the Government of Bangladesh in addressing the immediate and urgent needs of the displaced persons in Cox's bazar District, as identified by the United Nations (UN) in its Joint Response Plan (JRP). The project will mainly support the improvement of water supply and sanitation, disaster risk management, sustainable energy supply, and access roads.

B. Need for the Project

4. The Emergency Assistance Project is proposed by the Government of Bangladesh from a grant from Asian Development Bank to provide high-priority basic infrastructure and essential services to help address the humanitarian crisis caused by the arrival of the displaced persons from Myanmar. The Project is aligned to accelerate the social recovery of affected persons in Teknaf and Ukhia sub-districts. The project will improve the living conditions and the resilience of displaced persons. The project will directly benefit the lives of people in camps while co-benefitting host communities in some instances. Under this project a component is designed to provide water supply to the camp and adjacent host community by implementing mini-piped water supply systems with production tube-wells, pipe network, and stand-pipe water distribution points.

C. Impact and Outcome

5. The project is aligned with the following impact: social recovery of displaced persons in Teknaf and Ukhia camps accelerated. The project will have the following outcome: living conditions and the resilience of displaced persons improved. The project will directly benefit the lives of people in camps while indirectly co-benefitting host communities in some instances. ADB is cognizant of sensitivities and potential conflicts among and within affected communities. These will be addressed through a gender- and socially-inclusive approach, among others.

D. Outputs

6. The project has the following four outputs:

7. **Output 1: Water supply and sanitation improved.** This consists of providing the camp areas with (i) mobile water carriers for the distribution of treated water; (ii) community bathing facilities for women; (iii) mini piped water supply systems with a production tube well, distribution pipe network, and standpipe water distribution points; (iv) an integrated waste management facility with collection system; and (v) small surface water treatment plants.

8. **Output 2: Disaster risk management strengthened.** This includes constructing in and around the camp areas (i) multipurpose cyclone shelters with emergency access roads, (ii) food distribution centers, (iii) hill slope protection and/or toe walls to resist landslides, and (iv) storm water drainage networks. The project will also provide lightning arresters and support the preparation of gender-sensitive disaster risk management plans with community-based disaster risk reduction approach.

9. **Output 3: Energy sources provided.** This includes providing the camp areas with (i) retained heat cookers; (ii) stand-alone solar powered street lights with solar photovoltaic panels, battery boxes, and mini grid-connected street lights; and (iii) access to electricity by augmenting substations, distribution lines, and transformers.

10. **Output 4: Access roads improved.** This consists of rehabilitating (i) rural roads to connect to food storage and distribution centers, field hospitals, primary health care centers, and primary education centers; (ii) emergency access roads to the camp areas; and (iii) existing access roads to and within the camps and drainage systems. The project also supports resurfacing the road from Coxsbazar to Teknaf, which is the main supply line.

E. Subproject

11. Construction and operation of mini piped water supply system with Production Tube Well along with Pipe Network, and stand-pipe water distribution points in camps and adjacent affected villages which is located in Kutupalong, Ukhiya, Cox's Bazar displaced persons' mega camp.

F. Objectives and Scope of the Report

12. The project is categorized as category 'B' in accordance with ADB's Safeguard Policy Statement (SPS), 2009 warranting an initial environmental examination (IEE). The IEE has been prepared based on the Environmental Assessment and Review Framework (EARF) developed by Bangladesh Government. The IEE also follows the guidelines of the Department of Environment (DoE) as required by the Environmental Conservation Rule (ECR) 1997 (amended 2002) and in accordance with the Safeguard Policy Statement 2009 (SPS 2009) of ADB and will be disclosed in the websites of the ADB and the implementing agencies. This document shall serve as the base of environmental assessment of the proposed sub-project to be implemented by the executing agency and guideline for environmental management activities on-site.

13. The IEE study has four basic objectives; (i) identify the environmental issues that should be taken into account due to project interventions (ii) determine the magnitude of potential environmental concerns and to ensure that environmental considerations are given adequate weight at planning/design stage (iii) identify need for further environmental studies or Environmental Impact Assessment (EIA) and (iv) suggest enhancement measures, if any.

14. The Scope of works will include:

- Describe the project and its components.
- Determination of the environmental baseline conditions of the project considering the existing and proposed interventions.
- Assessment of the environmental impacts of the proposed interventions.
- Preparation of an EMP integrating the adaptation and mitigation measures, scaling-up measures and an environmental monitoring plan.
- Specify the monitoring and reporting requirements. Moreover, IEE is to ensure, in line with EARF, that the subproject, in the entirety of its project cycle, will not deteriorate or interfere with the environmental sensitivity of the project area, but rather improve environmental quality.

G. IEE Methodology

15. This IEE report has been prepared on the basis of EARF, field investigations and stakeholder consultations to meet the requirements for environmental assessment process and documentation as per ADB's Safeguard Policy Statement (SPS), 2009. IEE commenced with the review of legal requirements for

the project. In next step, technical details were collected compiled by a discussion with the implementing agency to reconfirm the technical details.

16. Scoping of issues to be addressed in the IEE was conducted early in the assessment process (i.e. Field visit) to collect the appropriate baseline information so that collected and the IEE report/study can focused on the relevant issues needed.

H. Structure of the Report

17. The report has been structured in compliance with ADB SPS 2009.

Executive Summary

Chapter 1- Introduction: Presents a brief overview of the assignment along with its background, objectives, scope of work and methodology etc.

Chapter 2- Legislative, Regulatory and Policy Consideration: Outlines the Policy and Legislation on environmental issues.

Chapter 3- Project Description: Describes the proposed interventions including background, project category, need for the project, location, size and magnitude of operation.

Chapter 4- Description of the Environment: Presents a description of the environmental baseline condition (socioeconomic, physical and biological) of the project area.

Chapter 5- Analysis of Alternative: Analyzes the environmental situation “With and Without project”.

Chapter 6- Anticipated Potential Project Impacts: Deals with environmental parameters are identified, predicted the impact and formulate the mitigation measures need to be taken for reducing impact.

Chapter 7- Environmental Management Plan and Environmental Monitoring Plan: Mainly deals with the environmental management plan. However, Deals with the indicator to be monitored during construction and operation as well as frequency of monitoring. Moreover, outlines the environmental monitoring program, institutional responsibilities including the cost of implementing the EMP.

Chapter 8- Grievance Redress Mechanism describes the process of addressing complaints.

Chapter 9- Public Consultation and Information Disclosure: Discusses the issues raised during the consultations, proposed actions to address them, and the information needed to disclose to the public.

Chapter 10- Conclusion and Recommendations: It presents the findings, conclusion and recommendations of the IEE study.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Introduction

18. The Government of Bangladesh (GoB) has developed a complete legal framework, including laws, regulations, decrees, and standards addressing environmental safeguards for promoting ecologically sustainable development through the conservation and ecologically sustainable use of natural resources. It is not limited to the Environmental conservation law. Rather, other laws, regulations and policies have also acknowledged related environmental responsibilities. Of the existing legal framework, those most relevant to this subproject are summarized in this chapter.

B. Environmental Legislation Framework

1. Overview of the Project Approval Process

19. Key legislation governing the environmental approvals process for the proposed Project is the Bangladesh Environmental Conservation Act, 1995 (BECA, 1995) and the Environmental Conservation Rules (ECR, 1997).

20. According to Rule 7 of the ECR, proposed developments within Bangladesh are classified as one of four categories, as follows:

- Green;
- Orange A;
- Orange B; and
- Red

21. These categories define proposed developments according to their potential environmental impact. Section 12 of the ECA states that 'No industrial unit or project shall be established or undertaken without obtaining an Environmental Clearance Certificate from the Director General, in the manner prescribed by the Rules'.

2. Environmental Approval Framework

22. Key milestones in the approvals process are outlined in Figure II.1. These comprise:

- **Project Authorization Letter:** Formal authorization of the Project by the Department of Public Health and Engineering is required in order for the environmental approvals process to formally commence.
- **No Objection Certificate (NOC):** A NOC must be received from the Deputy Commissioner in the sub-project area before the SCC application can be made.
- **Site Clearance Certificate (SCC):** An SCC will be issued by DoE upon approval of the IEE study (note that the IEE submission is to include the Project Authorization Letter, NOC and SCC application form). The SCC will include a ToR for the IEE/EIA study, and typically provides authorization for site establishment works to commence.
- **Environmental Clearance Certificate (ECC):** The ECC will be issued by DoE upon approval of the IEE/EIA study (including associated EMP). The ECC allows project construction to commence, and contains specific approvals requirements for matters such as pollution control and environmental monitoring.

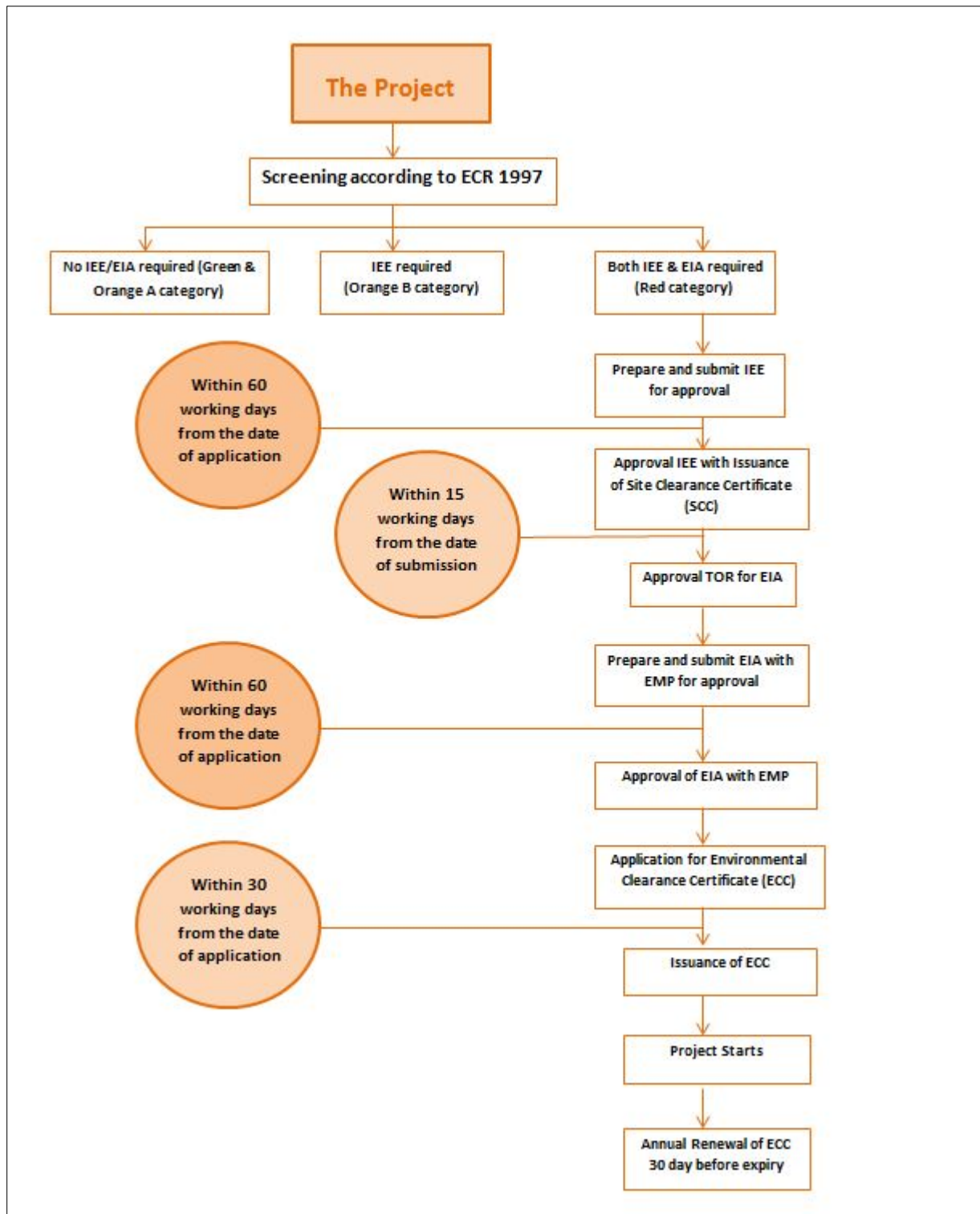


Figure II.1: Environmental approval framework

23. Table II.1 provides an overview of key Bangladesh legislative approvals requirements which are relevant to the Project, and the permissions required under this legislation in order to undertake the subproject works.

Table II.1: Required Permissions for Project under Bangladesh Legislation

Legislation	Permission Required	Purpose	Permission Given By
Environment Conservation Act (1995) Environment Conservation Rules (1997)	SCC and ECC	DoE will issue an SCC to allow for a detailed EIA as per Section 12 (ECA), Rule- 7 and Form -3 of the ECR.	Director General of the Bangladesh DoE
Acquisition and Requisition of Immoveable Property Act (1982)	Application required	To acquire and compensate for any Project land	Ministry of Land and Deputy Commissioner

24. Rule 7 of ECR indicates the procedure and requirements for the issuance of an ECC. The corresponding requirements per category are described below:

- **Green category projects:**

- I. completed application for ECC, and the appropriate fee (shown in Schedule 13);
- II. general information about the project;
- III. exact description of the raw materials to be used, and the product to be manufactured (where relevant); and
- IV. No-objection certificate from the local authority.

- **Orange-A category projects:**

25. Same requirements as green category projects, plus the following:

- I. process flow diagram;
- II. layout plan (showing location of effluent treatment plant or ETP);
- III. effluent discharge arrangement; and
- IV. outlines of the plan for relocation and rehabilitation (if applicable).

- **Orange-B category projects:**

- I. completed Application for ECC, and the appropriate fee;
- II. report on the feasibility of the project;
- III. report on the IEE for the project, plus process flow diagram, and in the case of an industrial project, layout plan (showing ETP) and ETP design;
- IV. report on the environmental management plan (EMP);
- V. no objection certificate from the local authority;
- VI. emergency plan relating to adverse environmental impact and plan for mitigation of the effect of pollution; and
- VII. outline of the relocation and rehabilitation plan (where applicable).

- **Red category projects:**

26. Same requirements as Orange Category B, except that Item 3 (IEE) is amended to read as follows:

- I. report on the IEE for the project, and terms of reference for the EIA; or EIA report prepared based on ToR previously approved by DOE;
- II. in the case of an industrial project, layout plan showing location of ETP, process flow diagram, design, and time schedule of the ETP.

C. National Policies, Laws, Regulations

27. The Government of Bangladesh (GoB) has developed a complete legal framework, including laws, regulations, decrees, and standards addressing environmental and social safeguards for promoting ecologically sustainable development through the conservation and ecologically sustainable use of natural resources. It is not limited to the Environmental conservation law. Rather, other laws, regulations and

policies have also acknowledged related environmental responsibilities. Of the existing legal framework, those most relevant to this subproject are summarized in the Table II.2.

Table II.2: Summary of Environmental Legislations Applicable to the Proposed Project

No.	Environmental Legislation / Act	Objective	Relevance to the Project	Responsible Institution
1	National Environmental Policy, 1992	Ensure that development components do not pollute the environment or degrade resources. It sets out the basic framework for environmental action together with a set of broad sectoral action guidelines.	Restriction on operations which cannot be initiated in ecological critical areas Regulation on vehicles emitting smoke which is harmful to the environment Follow standards on quality of air, water, noise and soil Sets limits for discharging and emitting waste	Ministry of Environment and Forests, and Climate Change
2	National Environmental Management Action Plan (NEMAP), 1995	An action plan to identify key environmental issues affecting Bangladesh, identifies actions for reducing the rate of environmental degradation and improve quality of life.	Sectoral agencies to coordinate with MoEFCC in preparing environmental guidelines.	Ministry of Environment and Forests, and Climate Change
3	Environment Court Act, 2000 and subsequent amendments in 2003	Establishment of Environment Court for trial of an offence or for compensation under environmental law, such as environment pollution.	Option to affected persons for grievances related to environment safeguards.	Ministry of Environment and Forests, and Climate Change
4	The Forest Act (1927) and Forest (Amendment) Act (2000)	An act to control trespassing, illegal resource extraction and provide a framework for the forestry revenue collection system;	Requires clearances for any project within forest areas and clearances for any felling, extraction, and transport of forest produce.	Department of Forests
5	National Forest Policy (1994)	To conserve existing forests and bring about 20% of the country's land area under the Forestation Programme and increase reserved forests by 10% per year until 2015	Incorporate tree planting in the subproject Clearance for any felling, extraction, and transport of forest produce	Department of Forests
6	The Bangladesh Wildlife (Conservation & Security) Act, 2012	To conserve and protect wildlife in Bangladesh including designation of protected areas. Protection of wildlife is provided with lists of species with four schedules: first, second, third and fourth schedule. The fourth schedule species have the highest level of protection.	Consultation and necessary permits required if the project will pass through the wildlife sanctuaries and other protected areas.	Department of Forests
7	National Safe Drinking Water Supply and Sanitation Policy of 1998	Ensures access to safe water and sanitation services at an affordable cost	Pourashavas and water sanitation authorities will take actions to prevent wastage of water. They will take necessary steps to increase public awareness to prevent misuse of water. Pourashavas shall be responsible for solid waste collection, disposal and their management	Ministry of Local Government, Rural Development, and Cooperatives
8	National Water Act 2013	Ensures Bangladesh water sources are free from any type of pollution. Pollution from water in urban outfalls and reservoirs, e.g. lakes, canals, ponds and ditches may result in amenity losses,	Secure clearance certificate on water resource development subprojects	Ministry of Water Resources

No.	Environmental Legislation / Act	Objective	Relevance to the Project	Responsible Institution
		fisheries depletion, health problems and fish and aquatic species contamination.		
9	Wetland Protection Act 2000	Advocates protection against degradation and resuscitation of natural water-bodies such as lakes, ponds, beels ¹ , khals, tanks, etc. affected by man-made interventions or other causes. Prevents the filling of publicly-owned water bodies and depressions in urban areas for preservation of the natural aquifers and environment. Prevents unplanned construction on riverbanks and indiscriminate clearance of vegetation on newly accreted land.	In case of diversion of water from Naf river, detailed assessment will be done	Ministry of Water Resources
10	Bangladesh Labor Law, 2006	It is a comprehensive law covering labour issues such as: conditions of service and employment, youth employment, benefits including maternal benefits, compensation for injuries, trade unions and industrial relations, disputes, participation of workers in company's profits, regulation of safety of dock workers, penalty procedures, administration and inspection. This Act pertains to the occupational rights and safety of factory workers and the provision of a comfortable environment for working. It also includes rules on registration of labourers, misconduct rules, income and benefits, health and fire safety, factory plan	Compliance to provisions on employment standards, occupational health and safety, welfare and social protection, labor relations and social dialogue, and enforcement. Prohibition of employment of children and adolescents.	Ministry of Labor and Employment
11	Bangladesh Labor Rules, 2015	Includes rules on registration of laborers, misconduct rules, income and benefits, health and fire safety, factory plan	Contractors to implement occupational health and safety measures Contractor will be liable for compensation for work-related injuries	Department of Labor
12	The Pourashava Act 2009 / Ordinance issued for the amendment of local government (municipality) ordinance, 2009 and 2010; The Pourashava Ordinance, 1977; Municipal Administration Ordinance, 1960	Provides guidance for subproject integrated community and workers health and hygiene at the construction and operation and maintenance stages of the project	Coordinate with Pourashava committees on disaster management measures, water and sanitation and waste management	Local Authorities

¹ A beel is a billabong or a lake-like wetland with static water (as opposed to moving water in rivers and canals - typically called khaals), in the Ganges - Brahmaputra flood plains of the Eastern Indian states of West Bengal, and Assam and in the country of Bangladesh.

No.	Environmental Legislation / Act	Objective	Relevance to the Project	Responsible Institution
13	Bangladesh Climate Change Strategy and Action Plan of 2009	Enhances the capacity of government ministries, civil society and private sector to meet the challenges of climate change	Integrate adaptation measures for buildings in consideration of extreme climatic events	Ministry of Environment, Forests and Climate Change
14	Building Construction (Amendment) Act and Building Construction Rules, Bangladesh National Building Code	Regulates technical details of building construction and to maintain standards of building construction	Follow specifications to ensure structural integrity of buildings	Ministry of Housing and Public Works
15	Electricity Act, 1910 and Electricity Rules 1937	Requires compensation for any damage, detriment or inconvenience caused by the project; Requires precautionary measures in laying down electricity supply lines near or where any metallic substance or line crosses to avoid electrocution	Secure permission to supply energy and lay down or place electricity supply lines for the conveyance and transmission of electricity from respective authorities prior to any works Give full compensation for any damage, detriment or inconvenience caused by him or by anyone employed by him Take precautions in laying down electricity supply lines near or where any metallic substance or line crosses in order to avoid electrocution	Ministry of Power, Energy and Mineral Resources
16	The National Energy Policy (1996 and Updated 2004)	Ensures environmentally sound sustainable energy development programs causing minimum damage to the environment, to encourage public and private sector participation in the development and management of the energy sector and to bring the entire country under electrification.	Public and private sector participation in the development and management of the energy subprojects. Provides guidelines for renewable energy subprojects	Ministry of Power, Energy and Mineral Resources
17	National Disaster Management Act of 2012	Establishes a framework for managing disasters in a comprehensive way.	Setting-up emergency response procedures	Ministry of Disaster and Relief

D. Relevant Occupational Health and Safety Laws and Rules

28. During construction, the subproject will conform to the occupational and health related rules as outlined in the Table II.3 below.

Table II.3: occupational and health related rules

Title of Laws and Rules	Descriptions
Social Security under the Act, 1923 and an amendment in 1980	According to the Act social impact assessment includes the processes of analyzing, monitoring and managing the intended and unintended social consequences, both positive and negative of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions.
Bangladesh Labor Law of 2006	- Compliance to the provisions on employment standards, occupational safety and health, welfare and social protection, labor relations and social dialogue, and enforcement - Prohibition of employment of children and adolescent

Title of Laws and Rules	Descriptions
The Employer's Liability Act, 1938	The Act declares that the doctrine of common employment and of assumed risk shall not be raised as a defense in suits for damages in respect of employment injuries. Under the Maternity Benefit Act, 1939, the Maternity Benefit Act, 1950, the Mines Maternity Benefit Act, 1941, and finally the rules framed thereunder, female employees are entitled to various benefits for maternity, but in practice they enjoy leave of 6 weeks before and 6 weeks after delivery.
Public Health (Emergency Provisions) Ordinance, 1994	The ordinance calls for special provisions with regard to public health. Whereas an emergency has arisen, it is necessary to make special provision for preventing the spread of human disease, safeguarding public health and providing them adequate medical service and other services essential to the health of respective community and workers in particular during the construction related work.
The Employees State Insurance Act, 1948	It has to be noted that health, injury and sickness benefit should be paid to people, particularly respective workers at work place under the Act.
Bangladesh Factory Act, 1979	The Act requires every workplace including small or large scale construction where women are employed to have an arrangement of childcare services. Based on this Act and Labor Laws - medical facilities, first aid and accident and emergency arrangements are to be provided by the authority to the workers at workplaces.
Water Supply and Sewerage Authority Act, 1996	The Act specify WASA's responsibility to develop and manage water supply and sewerage systems for the public health and environmental conservation.

E. Conventions, Treaties and Protocols

29. Bangladesh has consented to be bound by the terms of some 21 of the 44 principal international conventions, treaties and protocols relating to the environment (Islam, 1996). Those with partial and indirect relevance to industrial projects are the Paris convention of 1972 concerning the protection of the World cultural and natural Heritage, Convention concerning safety in the use of chemicals at work, Geneva 1990, Biodiversity convention, Rio-de-Janeiro, 1992, Convention concerning occupational health services, Geneva 1985 etc.

Table II.4: International Environmental Conventions relevant to the project activities

	Conventions	Signed	Ratified/ Accessed (AC)/ Accepted (AT)	Relevance
1	International Plant Protection Convention (Rome, 1951) & Plant Protection Agreement for SE Asia and Pacific (1999 Revision)		01.09.1978 04.12.1974 (AC)	Ensures that component work or construction materials do not introduce plant pests
2	Convention on Wetlands of International Importance, 1971 (Ramsar Convention)		20.04.1992 (ratified)	Protection of significant wetland and prevention of draining or filling during construction
3	Convention Concerning the Protection of World Cultural and Natural Heritage (Paris, 1972)		03.11.1983 (ratified)	Prevention of damage or destruction of culturally and/or historically significant sites, monuments, etc.
4	Convention on Biological Diversity, 1992 (Rio de Janeiro)	05.06.1992	03.05.1994	Protection of biodiversity during construction and operation.
5	Convention on Persistent Organic Pollutants, 2001	23.05.2001	In process	Restriction of use of pesticides and herbicides
6	United Nations Framework Convention on Climate Change, 1997	11.12.1997	22.10.2001 13.11.2003 (amended)	Reduce greenhouse gas concentrations in the atmosphere to a level that would prevent dangerous anthropogenic interference with the climate system

F. Environmental Categorization and Standards

1. Environmental Category: Bangladesh

30. For the purpose of issuance of Environmental Clearance Certificate, the industrial units and projects shall, in consideration of their site and impact on the environment, be classified into the following four categories: (a) Green; (b) Orange – A; (c) Orange – B; and (d) Red. The Industries and projects included in the various categories are specified in sub-rule (1) have been described in Schedule – 1. The ECR indicates that all industrial units or projects must obtain a Location Clearance Certificate (LCC) and

Environmental Clearance Certificate (ECC) from the Department of Environment (DoE). No industrial unit or project shall be established or undertaken without obtaining environmental clearance from DoE in the manner prescribed by the rules.

31. The environmental category of the sub-project is listed in Schedule – 1 of ECR. As per Schedule 1 of ECR, mini piped water supply subproject is likely to be classified as red category (Table II.5). Thus LCC and ECC is required from the DoE prior to commencement of the subproject.

Table II.5: Categorization of Subproject Components

Subproject	Component	Equivalent in Schedule I of ECR	DoE Classification
Construction and operation of mini piped-water supply system	<ul style="list-style-type: none"> Mini piped-water supply system with production tube-wells. Distribution pipe network and stand pipe water distribution points. 	Water, power, and gas distribution line laying/relaying/extension	Red

2. ADB Safeguard Policy (ADB Safeguards Policy Statement, 2009)

32. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all ADB investments.

33. **Screening and Categorization.** The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts, and are assigned to one of the following four categories:

- **Category A.** Projects could have significant adverse environmental impacts. An EIA is required to address significant impacts.
- **Category B.** Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.
- **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.
- **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all projects will result in insignificant impacts.

34. **Environmental management plan.** An EMP, which addresses the potential impacts and risks identified by the environmental assessment, shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the project's impact and risks.

35. **Public disclosure.** ADB will post the safeguard documents on its website as well as disclose relevant information in accessible manner in local communities:

- for environmental category A projects, draft EIA report at least 120 days before Board consideration;
- final or updated EIA and/or IEE upon receipt; and
- environmental monitoring reports submitted by the PMU during project implementation upon receipt.

36. **Pollution Prevention and Control Technologies.** During the design, construction, and operation of the project the PMU and PIUs will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the

World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of Bangladesh regulations differ from these levels and measures, the PMU and PIUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

G. Institutional Capacity

37. The Refugee Relief and Repatriation Commission (RRRC) is proposed to act as the coordinator on behalf the government to execute all interventions. RRRC and ADB will conduct regular coordination meetings involving all Implementing Agencies (IAs), relevant stakeholders including deputy commissioner (DC), Cox's Bazar, other development partners and agencies. ADB plans to establish extended mission office in Cox's Bazar for close coordination, facilitation of sub-projects development and implementation. A steering committee comprising higher officials from relevant ministries coordinated by ERD will be formed to provide necessary guidance to expedite the sub-project development and implementation. The steering committee will have a safeguards focal person.

38. The Local Government Engineering Department (LGED), the Department of Public Health Engineering (DPHE), the Roads and Highways Department (RHD), and the Bangladesh Rural Electrification Board (BREB) will be the executing agencies and implementing agencies. responsible for project oversight and coordination. There will be a safeguards focal person in the EA/IA. The EA/IA will be assisted by PMCs. The EAs/IAs will form project implementation units (PIU). The PIUs will identify a focal person for environmental safeguards. The focal person will be assisted in the conduct of the environmental assessment, the development and implementation of EMPs, and compliance monitoring by project consultants. All the implementing agencies are currently implementing ADB projects under this institutional arrangement (further defined in Section VI). ADB also conducts safeguards training for project executing and implementing agencies. Thus, the government has sufficient capacity in implementing ADB requirements and strengthening of capacity, other than through the course of the consultant's work with local counterparts, is not required. ADB will continue to conduct capacity building programs during implementation.

III. DESCRIPTION OF THE PROJECT

A. Need for the Subproject

40. The Emergency Assistance Project is proposed by the Government of Bangladesh from a grant from Asian Development Bank to provide high-priority basic infrastructure and essential services to help address the humanitarian crisis caused by the arrival of the displaced persons from Myanmar. The Project is aligned to accelerate the social recovery of affected persons in Teknaf and Ukhia Upazila. The project will improve the living conditions and the resilience of displaced persons. The project will directly benefit the lives of people in camps while co-benefitting host communities in some instances.

B. Subproject Scope

41. The name of the Subproject is “Construction and operation of mini piped water supply system with Production Tube Well along with Pipe Network, and stand-pipe water distribution points in camps and adjacent affected villages”. However, the subproject is designed to provide safe and sustainable water supply to the displaced people from Myanmar and host community in Ukhia through construction, and commissioning of mini piped water supply scheme. Under this scheme, production well, solar pump, pump house pipeline, water reservoir and community tap stand will be constructed.

C. Location of the Subproject

42. The subproject to be implemented is located displaced persons' mega camp in Ukhia Upazila (Figure III.1) which is situated south of Cox's Bazar and borders with the Rakhine state in Myanmar. Cox's Bazar - Teknaf highway is located to the North of the camp and runs south east. Teknaf Game Reserve is west of Kutupalong and encompasses an area of 11,615 hectares.

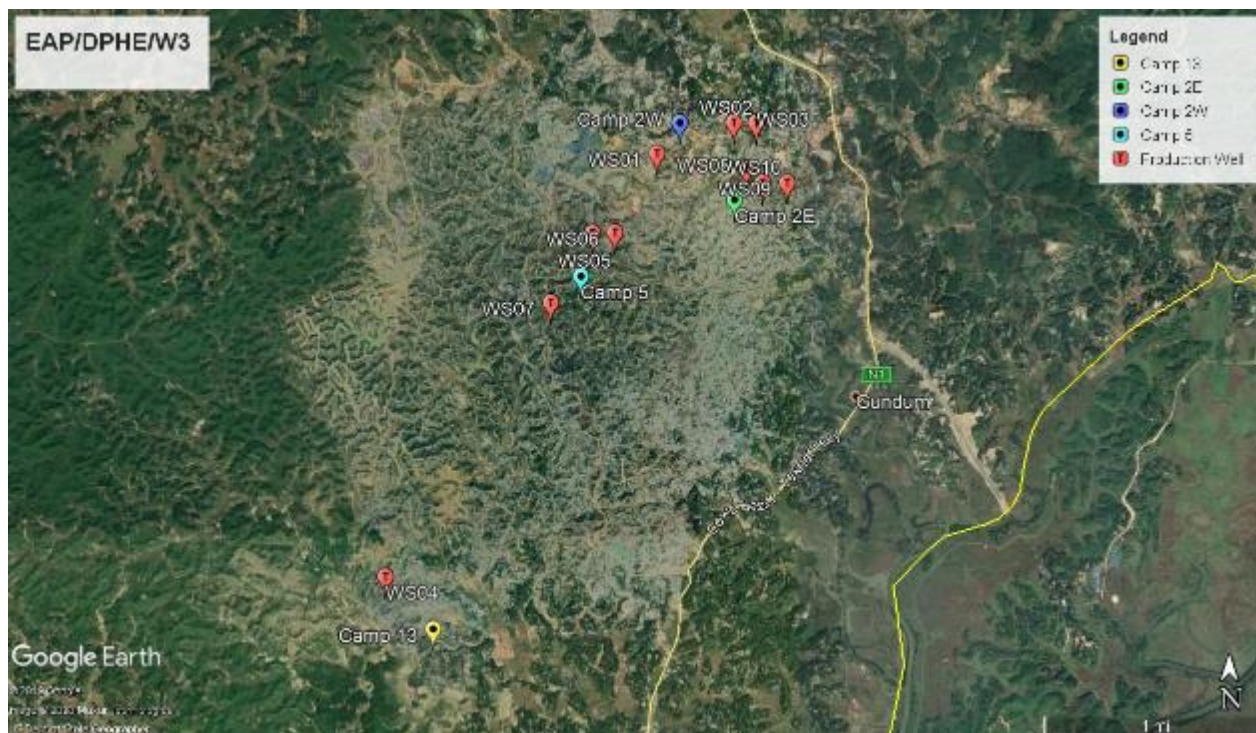


Figure III.1: Location map of the proposed mini pipe water supply system

D. Existing Water Supply System

43. In the proposed subproject area, currently shallow suction hand pumps serve 70% of the population while deep tube wells serve 20%. Based on average discharge each hand-pump can serve up to 250 individuals. Deep hand pumps which can tap water up to depths of 650 to 750 feet (215 – 250m) can serve up to 500 in the dry season.

44. Over 5000 shallow and deep tube-wells (manually) have been drilled in 2017 phase (Figure III.2), most are fitted with hand pumps with 7m max suction head, increasing the risk of many becoming non-functional during the peak of the dry season (Figure III.3).

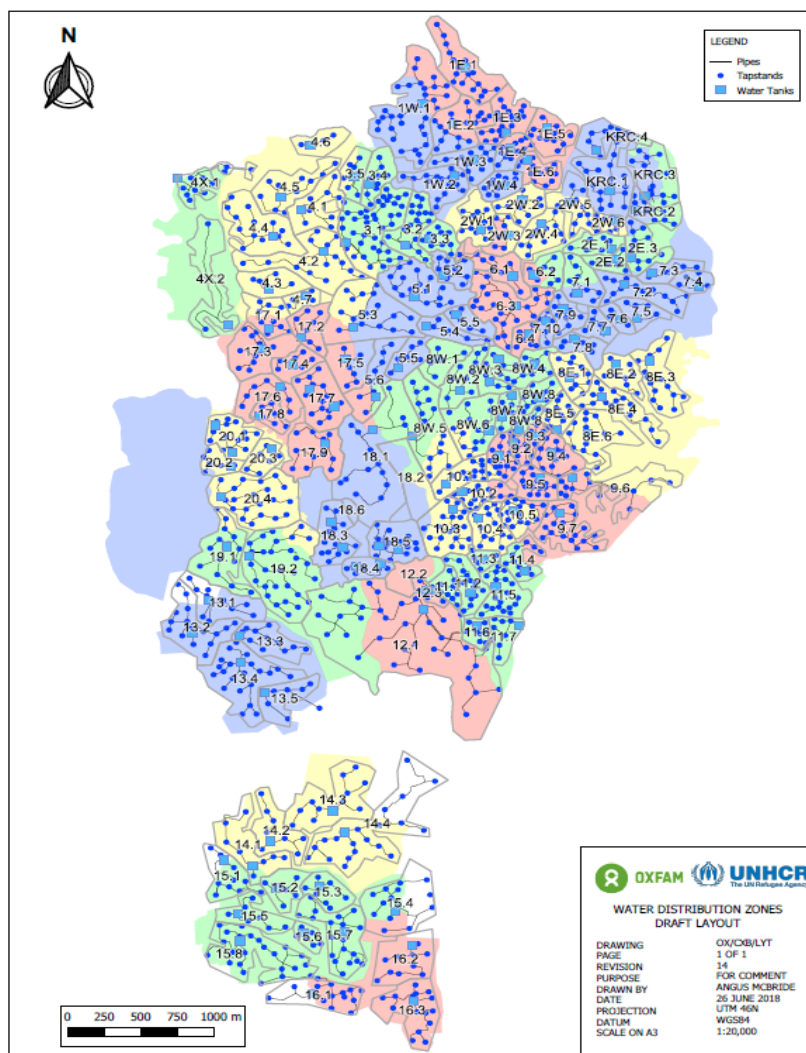


Figure III.2: Water distribution zone in the camp

45. Due to the poor workmanship and indiscriminate siting, sanitary protection is compromised in most sources. Up to 70% of water samples from tube-wells are showing some faecal contamination. There is evidence of wear and tear of spare parts in hand pumps along with the priming of suction pumps increases the risk of contamination and non-functionality.

Table III.1: Details of existing water supply to the camps

	Water trucking	Other Supplies
L/P/D	7.5-10	20
Max queuing	1 hour	30 minutes
Maximum distance to water point	500 meter	200 meter
People / Hand Pump	250 persons/ tap stand	250 persons (STW)/ 500 persons (DTW)

46. In the refugee camps where ground and surface water is not available, water trucking is being implemented especially during dry period and sector partners ensured that such locations receive a minimum of 5-10 litres per person per day. For any type of water trucking, monitoring the source of the water being distributed and chlorination of water before distribution is mandatory. However, DPHE is responsible to conduct water quality surveillance and sanitary survey in the camp.



Figure III.3: Existing water supply system in the subproject area

E. Description of the Proposed Subproject

47. Components of mini piped water supply system that includes the following:

- Construction of Production well: Construction of exploratory drilling (test well),
- Construction of production well using truck mounted hydraulic rig
- Construction of production well using mechanical rig
- Installation of solar pump solution for production well
- Construction of pump houses
- Construction of reservoirs (10000 liter HDPE)
- Construction of HDPE Pipe networks (100mm and 75 mm pipeline) using trench
- Construction of community tap stand

1. Production Well

48. Total ten production wells of 250m depth and 200 mm dia. will be constructed in the camp. Out of 10 production wells, one will be dug using truck mounted hydraulic rig and rest 4 nos. of wells are planning to dig using the mechanical rig. Bentonite clay may be used as drilling mud to ensure stability of the borehole. However, 400 mm dia. casing pipe will be installed around the production well and the annular space around the casing pipe will be filled with local clay etc. Production wells will be developed by over pumping, surging and backwashing in three stages by using suitable capacity air compressor and submersible pump for removing mud-cakes from borehole wall including supply of development material all complete till water is sand and turbidity free. Finally, the well will be disinfected by introducing a solution of sodium or calcium hypochlorite to establish a free chlorine residual of 30 ppm. The solution will be administered into the well by pouring from top of the well. The chlorine solution will remain in the well for 24 hours after which the chlorine solution shall be pumped out of the well. The pumping will continue until the water is free from smell of chlorine.

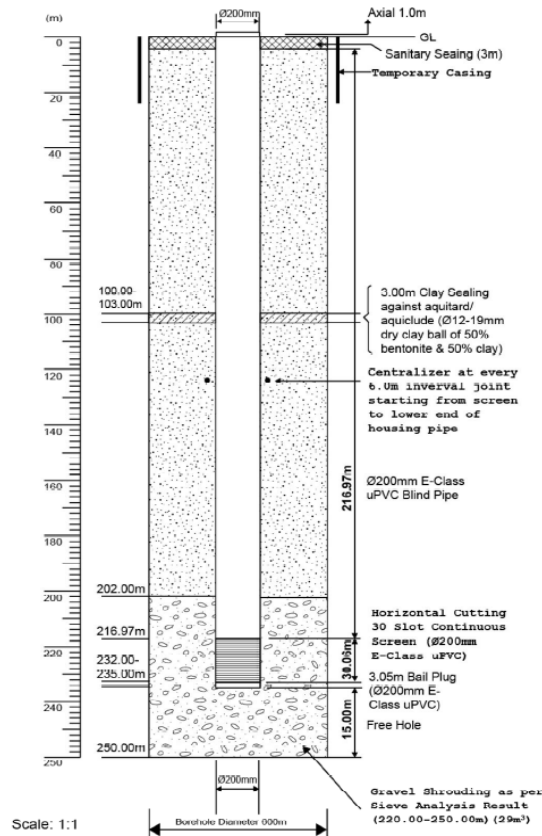


Figure III.4: Design of production well

2. Pumping Facility

49. Ten units of submersible pumps with capacity of 175,000 Liters/day at 50 m TDH with solar system will be set up for lifting water from production well. However, the solar panel for pumping solution will be installed to generate 7.5KW for motor and 10 KW for controller. The specification of the Motor: Highly efficient 3-phase AC motor, Motor Capacity: 11Kw, Frequency: 25...52 Hz, Premium materials, stainless steel: AISI 304, No electronics in the motor. Efficiency max. 80 %, Motor speed 750-1525 rpm, Power factor 0.87. The specification of the Pump: End PE C-SJ 42-6, Non-return valve, Premium materials, stainless steel: AISI 304, Optional: dry running protection, Centrifugal pump Efficiency max. 75%. Moreover, total five nos. of pump houses will be built for 5 schemes in the camp.

3. Water Reservoirs

50. Total 60 nos. of HDPE water tanks with capacity of 10 cum each will be installed on the brick and concrete cement basement at different camp locations. Afterward, disinfection will be carried out by filling the reservoir up to the Top Water Level with water containing appropriate strength of chlorine compound (20mg/l approx.), allowing it to stand for 18 to 24 hours. Chlorine addition shall be done by adding hypochlorite solution and shall be applied with mechanically or electrically powered chemical feed pump designed for feeding chlorine solutions. However, if situation demands less time, then the strength of disinfectant may be increased with corresponding lesser contact time.



52. However, the pipe will rest on a solid and even foundation bedding for the full length of the pipe barrel. The pipe trench will be kept free from water at all times. Where the pipeline passes underneath a trench, ditch or culvert, it should be suitably protected with concrete or other similar material, having a minimum cover of 300mm from the hard cleaned bottom of the ditch or culvert to the top of the pipe. On the other hand, where a pipeline runs parallel to a ditch, the edge of the pipeline trench nearest to the ditch should be kept at a distance from the edge of the ditch at least equal to the depth of the ditch, or the depth of the trench, whichever is the greater. The annular space between the pipe and sleeve shall be cleaned of all loose particles and contamination. If any contamination occurs, shall be removed immediately followed by a thorough washing of the surfaces.

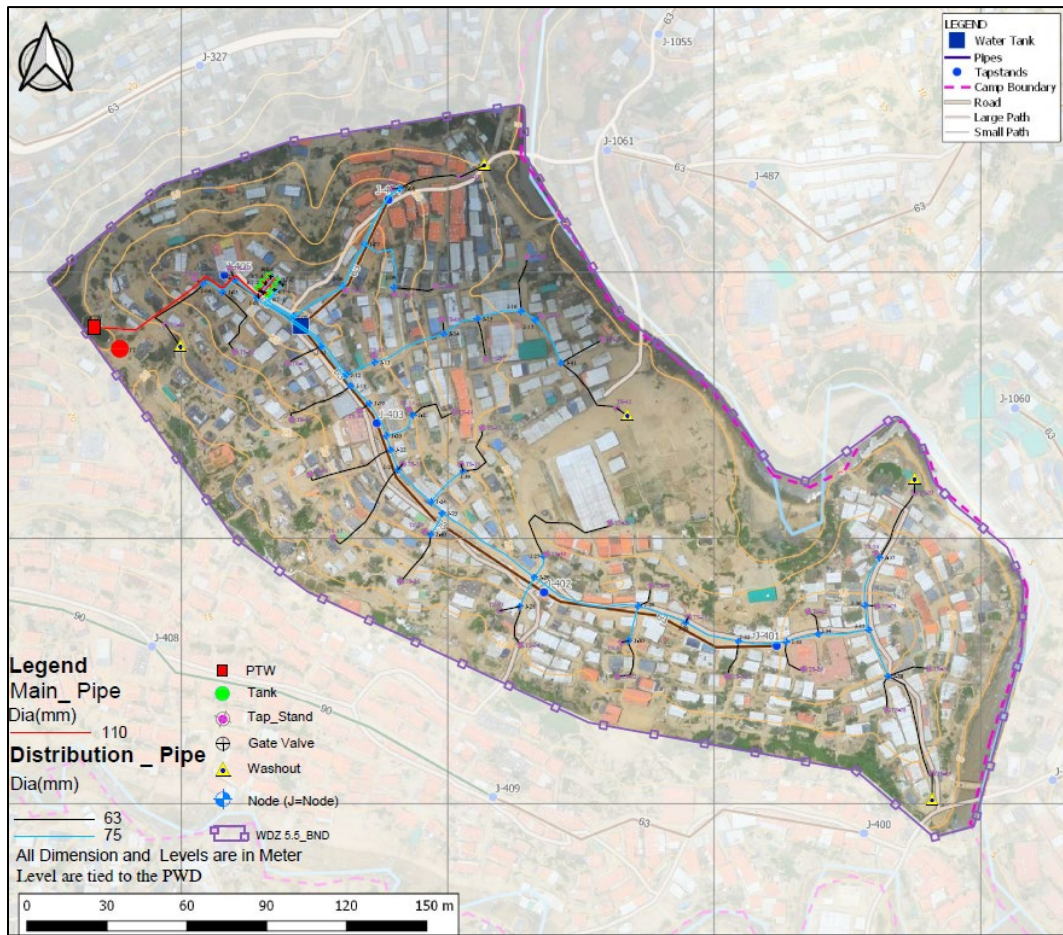


Figure III.6: Layout of distribution and main pipe line

5. Community Tap Stand

53. Six hundred of community tap stands will be constructed (average 60 nos. per scheme) throughout the proposed subproject area.

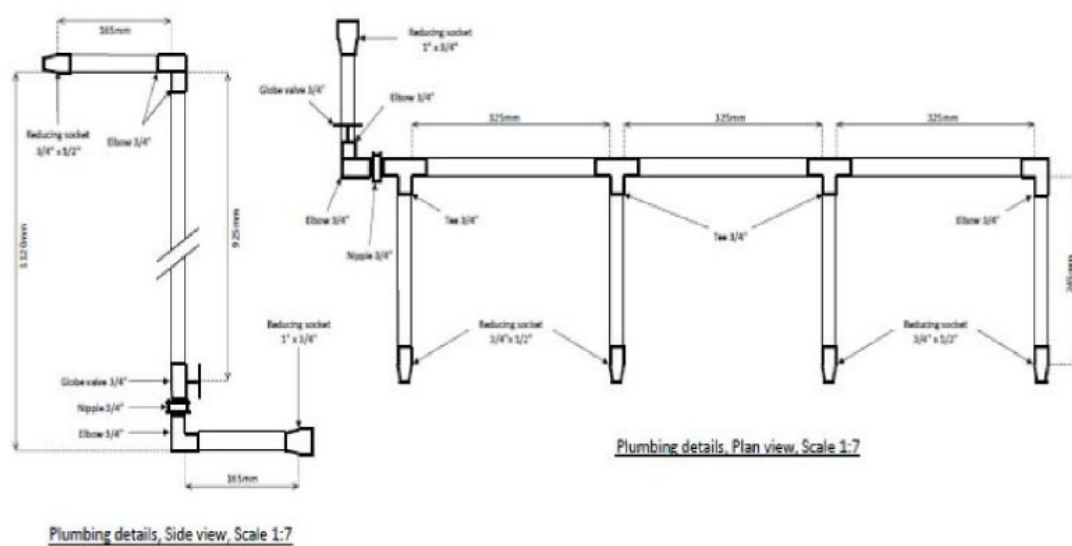


Figure III.7: Plumbing details of community tap stand

6. Operation and Maintenance

54. Operation and maintenance (O&M) will be carried out by the contractor for at least one year after successful commissioning of piped water supply. The content of O&M will be (i) Operator (ii) Chemical (Bleaching powder) and (iii) repair (if requires). This O&M period will be best illustration of the successful commissioning of the scheme and also a good demonstration for the target community about its operation. The contractor will keep all the records of the operation and obtain certificate from the designated authority; also provide the training to the person identified by the DPHE and WASH partner.

7. Implementation Schedule

55. Substantial time is required spanning the continuum of subproject design & estimate, contract award and contract execution. Efforts needs to be made to meticulously follow the schedule should a timely implementation of work is aimed at.

56. Normally the construction work season in Bangladesh runs from October through May (eight months). Construction works are sometimes impeded for the following reasons.

- Early floods in April/May,
- Late floods in September/October,
- Natural calamities (cyclone/tornado, excessive floods) occur in April/May and October/November.
- Normally, the best construction period is only for 6 months a year (October to March). The construction period is sometimes squeezed to 4 months due to natural calamities.

57. However, sometimes, based on time constraint or exigency, construction work may even need to be carried out in the monsoon. Besides, whenever possible, simultaneousness of activities can be ascertained and cashed in on and consequently, quantum of work can be maximized through efficient planning and adoption of best available practice.

58. However, the implementation sequences are given in the following Table III.2.

Table III.2: Implementation sequences

Sequence of Steps	Description of activities
Step 1	Consultation with community, camp authority and WASH partner to finalize the site of borehole, water reservoir, distribution network, community tap stands.
Step 2	Installation of test boring; Topographic survey for layout plan g pipe network.
Step 3	Construction of Production well and development.
Step 4	Construction of pump house and groundwater reservoir, Construction of Pipeline.
Step 5	Construction of community tap stand.
Step 6	Commissioning of piped water scheme.
Step 7	Operation and maintenance of the scheme.

59. Summing up, over a 24-month period, major works are advisable to take place in the first quarter of 2019.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical Environment

1. Topography and Geomorphology

60. Bangladesh is on a relatively young and low-lying area with three main geomorphologic regions: plains, terraces, and hills. It is geo-morphologically young because of the sedimentary deposition that has formed much of the land. The plains compose 80% of the country and are highly susceptible to flooding. Bangladesh's deltaic coastline is wide near sea-level, with numerous rivers carving through the sedimentary silt to reach the ocean. There are regions of tertiary hills in both the north-east and south-east (Imamul Huq and Md. Shoaib J.U, 2013).

61. Kutupalong and the focus area inhabited by refugees are situated on a combination of plains and small hills, extending into the Chittagong Hill tracts bordering Myanmar. Elevation in the focus area are shown in Figure IV.1. Heavy rain on the Chittagong Hill tracts has resulted in numerous landslides. District administration has restricted tree-cutting to limit erosion in the hope of limiting further landslides and related fatalities (Mahmud, 2017).

2. Geology and Soil

62. Kutupalong and the Chittagong district are on Pleistocene formations and have a Dupi Tila formation as shown the in Figure IV.1. The Dupi Tila formation consists of yellow to light brown sandstone that varies from fine to medium grained (Roy, 2012).

63. The soil in the Chittagong region is composed of coarse material and is less mature than the rest of the coastal areas. Similar to the rest of the coastal region of Bangladesh, the area also contains various silts, sands, and some clay (Fisheries and Aquaculture Department, 1985). The soils of the Dupi Tila formations were formed on unconsolidated and compact rocks, moderately well to excessively drained and probably the oldest of the area.

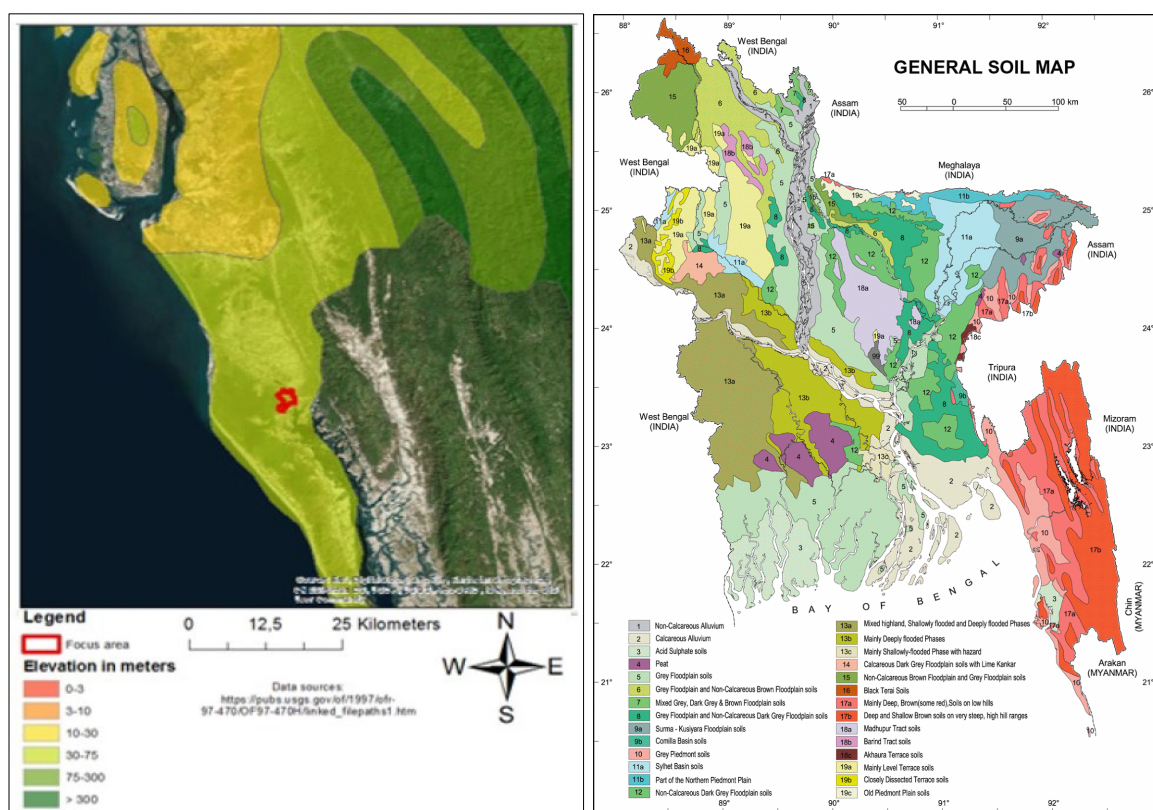


Figure IV.1: Elevation and general soil map of Bangladesh

3. Climate and Meteorology

64. The climate of the subproject area is tropical and characterized by a change of four, monsoon-related seasons: pre-monsoon (March to May); monsoon (June to September); post-monsoon (October to November); and the dry season (December to February). Meteorological data of Cox's Bazar station is considered for the subproject area as it is located in the close proximity to Cox's Bazar station.

65. **Temperature** - The temperature of the country is related to the period of rainfall. In general, cool seasons coincide with the period of lowest rainfall. The monthly average maximum and minimum temperature at the Cox's Bazar station are 29.1°C and 19.9°C respectively. Figure IV.2 show average mean, maximum and minimum temperature for the last five years (2008 to 2012) at Cox's Bazar Meteorological station.

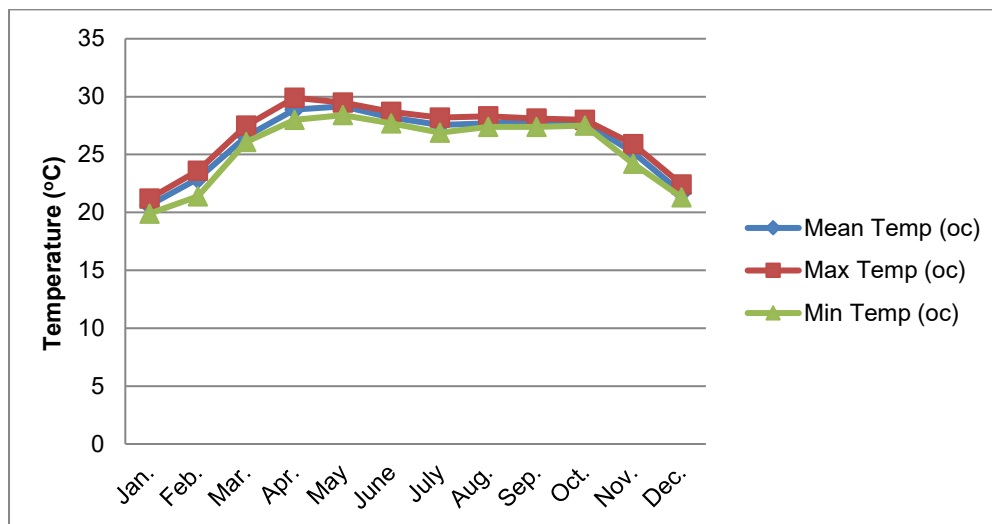


Figure IV.2: Monthly average maximum, minimum and mean temperature

66. **Rainfall** - Rainfall varies considerably from year to year and month to month. The highest rainfall recorded between 2008 and 2012 was in 2012 with peak in June of 1226 mm at Cox's Bazar Station. The average rainfall Cox's Bazar station between 2008 and 2012 was 281.97 mm/month over that five-year period. However, no rainfall was recorded during the month of November, December and January. Figure IV.3 shows the average monthly rainfall over the five-year period along the project corridor, with most of the rainfall between May and August.

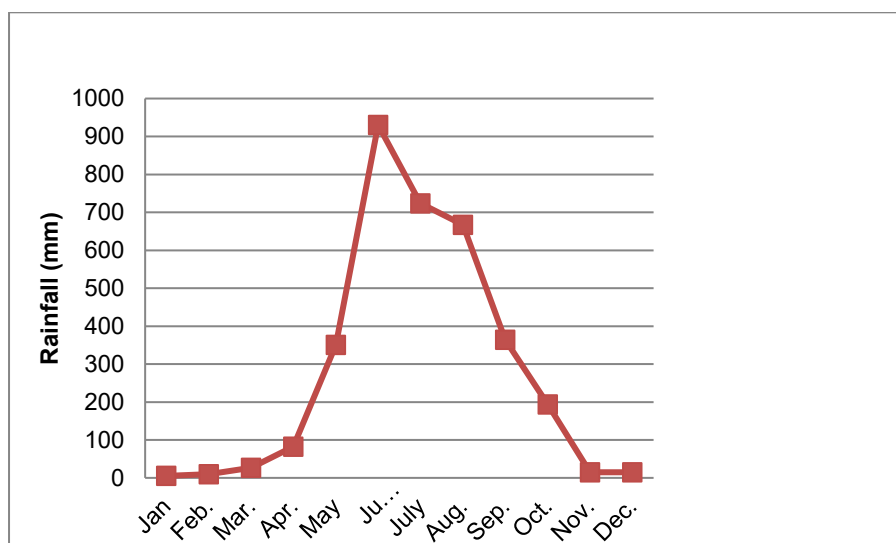


Figure IV.3: Average monthly rainfall

67. **Relative Humidity** - Humidity levels are consistently very high during the monsoon season, and drop significantly for a relatively short period at the end of the dry season. The 5-yearly average maximum relative humidity at Cox's Bazar station was 87% and the average humidity recorded was 77.99%.

68. **Wind Speed and Wind Direction** - Monthly wind data of Cox's Bazar station shows that wind speed is at a maximum in the early part of the monsoon, but drop substantially by the beginning of the dry season. The monthly average wind speed for Cox's Bazar station over the last five years (2008-12) are shown in Figure IV.4, and this pattern is assumed to reflect the conditions of the subproject area.

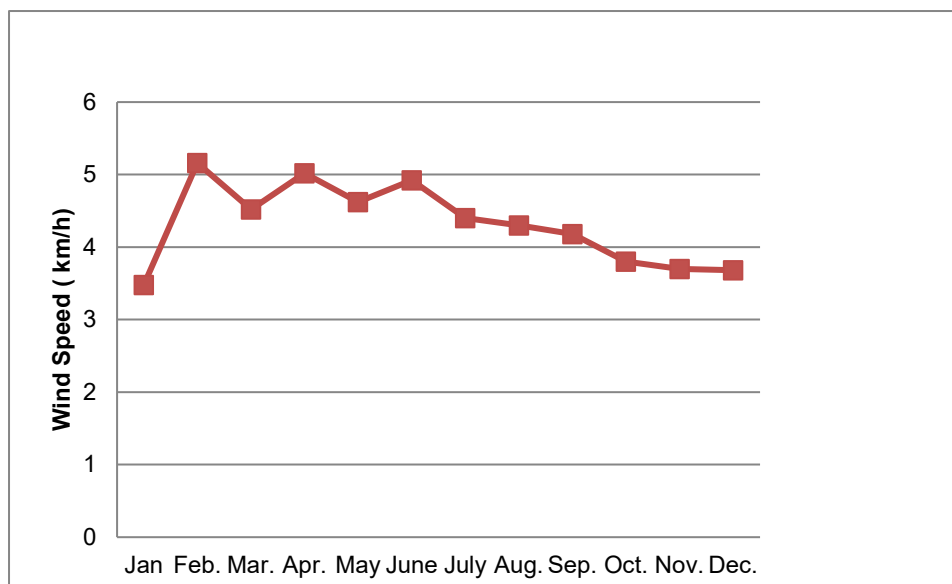


Figure IV.4: Monthly average wind speed

69. Historical wind data (wind speed, wind direction) were collected from Cox's Bazar station which suggested that around 22% of the year, wind blows from East to South with wind speed between 9-12 km/h (13%), 12-15 km/h (7%) and 18-25 km/h (2%). Other 58% of the year, wind blows from south with wind speed between 6-9 km/h (30%), 9-12 km/hr (10%) and 12-15 km/h (2%), wind is highly variable.

4. Seismicity

70. The subproject area is located in a seismic zone II, referred to as the medium risk zone for earthquake in the country (Figure IV.5). Seismic events in Bangladesh are relatively infrequent, but historically, have been severe, such as the earthquakes of 1930, 1950 and 2004. To address any potential impacts due to seismic activities, provisions of the Bangladesh National Building Code (BNBC) 1993 and 2006 shall be strictly followed.

5. Natural Disasters

71. Bangladesh is vulnerable to floods, flash floods, salinity, storm surges, landslides and earthquakes. Flooding, mainly in the period from May to October, occurs almost annually and affects most of the country with the exception of Barind Tract and hilly areas. The western part of the country, including Barind Tract, is a drought prone area which faces severe problems due to a scarcity of water, particularly during the dry season. The southern coastal part of Bangladesh is prone to storm surges and soil salinity while the hilly areas of Bangladesh (Chittagong Hill Tracts, Cox's Bazar and Teknaf) are vulnerable to landslides (UNDP, 2012).

72. The subproject area has a history of occurrence of landslides, earthquakes, flash floods and tidal surges. Although the main area of the Rohingya camps is located outside of the flood zone, the camps are vulnerable to extreme weather events such as cyclones and have to withstand major precipitation and strong winds. The steep slopes may become unstable in the monsoon seasons and cause landslides, shelter damage and other destruction (Figure IV.5). In general, neither the structures in the Rohingya

camps nor those in the makeshift settlements are able to withstand cyclones or floods; nearly 70% of shelters in settlements were damaged by Cyclone Mora in May 2017 (ISCG, 2017).

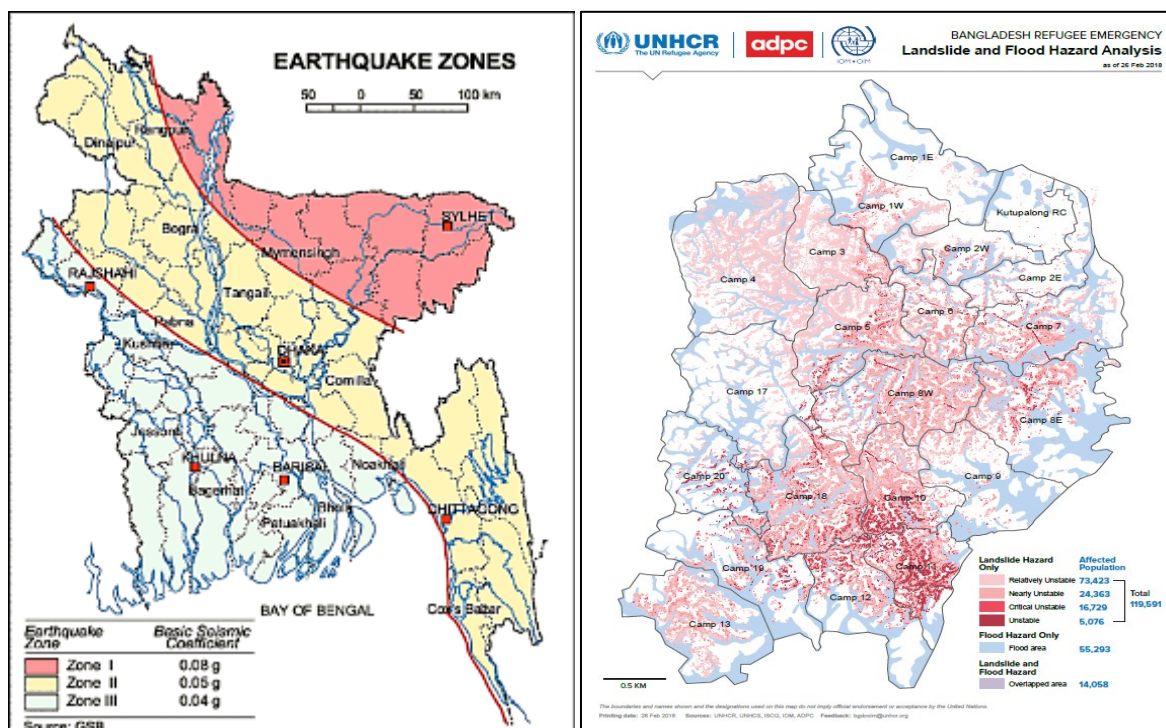


Figure IV.5: Earthquake zone and landslide vulnerability areas around the subproject

6. Flooding, Water Logging and Drainage Pattern

73. Cox's Bazar records heavy rains every year and is one of the most flood prone areas of Bangladesh. Flash floods (rapid flooding from heavy rains) are the most common type of floods in hilly southeastern areas of Bangladesh (Shaw et al. 2013). Ramu, Cox's Bazar Sadar, and Chakaria upazila generally record the highest number of people affected by floods across Cox's Bazar district during the monsoon.

74. Eastern side of Ukhia Upzila comprising high land and gradually down towards the western side. Several natural streams act as the natural drainage system of the region. The mainland surrounding Kutupalong is generally high from the level of tide. The surface hydrology in the camp area is regulated by rainfall and runoff from adjacent uplands and the relief pattern of the plains. The area is interspersed by valleys and gullies and crossed by several streams which at the eastern side flow to the Naf river. As a result, most of the area is free from flood. Waterlogging problem has not been reported. However, there exist erosion and instability problems in the hilly and elevated areas.

7. Hydrology and Water Resources

75. **Surface Water-** There are 405 rivers in Bangladesh and 57 of them are transboundary (2030 WRG, 2015). The Ganges, the Brahmaputra, and the Meghna are the three major rivers in the country that contribute to alluvium deposits. The Kutupalong camp is in the southern part of the Chittagong region where small rivers flow through the makeshift settlement and expansion regions (Figure IV.6). Main water sources such as the Naf River and other big channels are at some distance and are saline and brackish especially in the lower part of the rivers. Fresh water sources are basically pond water and a few small streams originating from the hills. These ponds and streams are not capable of meeting the water needs of the population of the makeshift camps, but can be used for domestic purposes if kept clean from sewage pollution.

76. A study carried out by UNDP Bangladesh and UN Women Bangladesh 2018 on the physical properties of the water with the assistance of the DoE Cox's Bazar office. Under the study samples were

taken from up-stream and down-stream of Gondhom Chara, Balukhali Chara, Talipara Chara, Hakimpur Khal, Palong Khali Khal, Tangkhali Khal and from a number of ponds. Tests were conducted for pH, dissolved oxygen (DO), total dissolved solids (TDS), electro conductivity (EC) and temperature. Test findings reveal that some of the streams are becoming devoid of oxygen downstream from the camps. In some samples, EC was also observed to be high. Uncontrolled open defecation practices along the banks of the ponds and streams and the sedimentation deposits in the streams are most likely the reasons for the deteriorating water quality of the available surface water (UNDP Bangladesh and UN WOMEN Bangladesh, 2018).

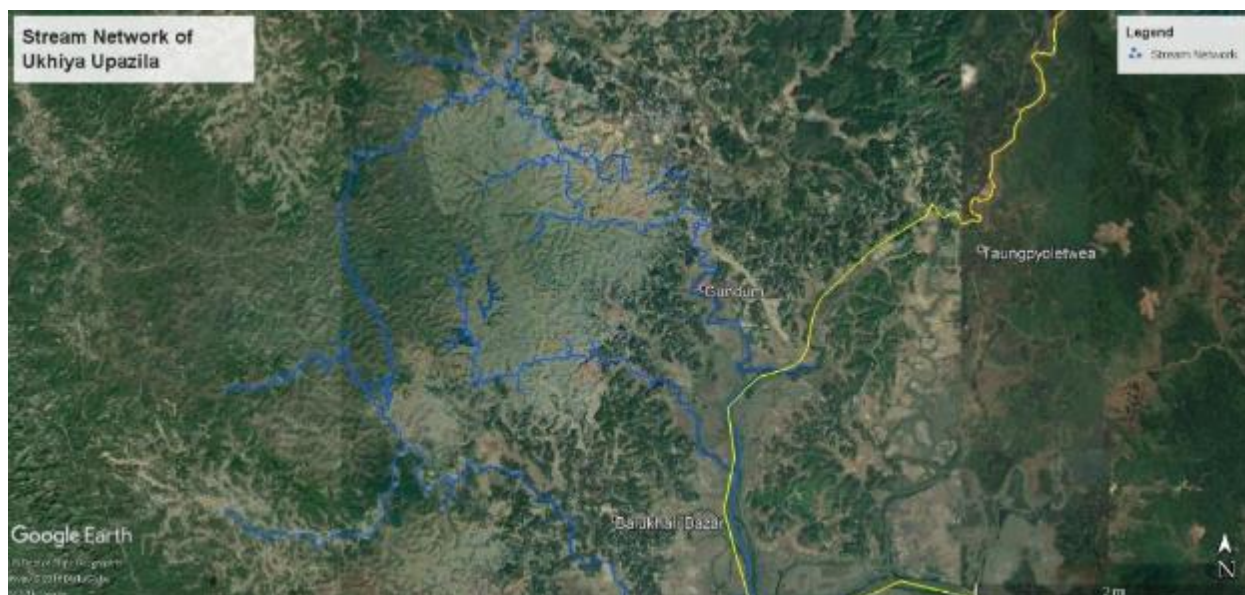


Figure IV.6: Stream network in the sub-project area

77. **Groundwater-** In Bangladesh, surface water and groundwater are used for human resources. The availability and restoration of both water systems vary depending on the season (2030 WRG, 2015). There are shallow and deep aquifers on which 97% of the Bangladeshi population depend (NERC, 2001). Smith et al. (2000) mention that inorganic arsenic occurs naturally in Bangladesh's groundwater and poses many threats to the health of humans (Smith, 2000).

78. (Sikder, 2010) mentions that the Kutupalong camp depends on the groundwater in the region and uses tube wells to access the resource. A study by Grant, 2013 found that 38 sampled wells in the Kutupalong area had a pH from 3.9 – 7.73. Water that has a pH less than 5 raises concern for those areas that contain toxic heavy metals (Grant, 2013). The safety standard for arsenic-contaminated water by WHO is 10µg/L, although the Government of Bangladesh has a regulation of 50µg/L. Flanagan et al. (2012) found that 45%-62% of arsenic-related deaths are from drinking water within the 10µg/L and 50µg/L concentration guidelines.

79. Nine groundwater samples from test tube-well have been collected by the contractor in the presence of DPHE representative from June to July 2019 after disinfecting the well. Every possible precaution has been taken to obtain representative samples, which were collected in a polyethylene bottles (PET bottle). The sampling bottles has been labeled, sealed and transported to the DPHE laboratory.

80. A brief discussion on groundwater test results are given in the Table IV.1 which have been compared with Bangladesh Standard for Drinking Water. The test reports are enclosed in the Annex 6.

Table IV.1: Groundwater Quality within the study area

Water quality parameters	Unit	WS1	WS3	WS4	WS5	WS6	WS7	WS10	Bangladesh Standard
pH	-	7.3	8.1	7.2	7.7	7.4	7.5	7.4	6.5-8.5
EC	µS/cm	340	405	288	285	270	354	394	-

Water quality parameters	Unit	WS1	WS3	WS4	WS5	WS6	WS7	WS10	Bangladesh Standard
TDS	mg/l	168	201	142	140	133	167	191	1000
Alkalinity	mg/l	195	225	145	175	170	195	205	-
Hardness	mg/l	143	120	184	190	202	155	145	200-500
Arsenic	mg/l	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.05
Chloride	mg/l	12	15	10	15	15	15	15	150-600
Iron	mg/l	1.09	0.23	0.52	1.24	0.09	0.31	0.37	0.3-1
Manganese	mg/l	0.05	0.03	0.06	0.06	0.04	0.03	0.04	0.1

81. **pH:** pH is a measure of the hydrogen ion concentration in water and indicates whether the water is acidic or alkaline. The measurement of alkalinity and acidity of pH is required to determine the corrosiveness of the water. From the pH value of the groundwater samples, it is observed that all samples are within the permissible limit of National standard (6.5-8.5).

82. **Electrical Conductivity (EC):** The Electrical Conductivity (EC) indicates the concentration of dissolved electrolytes present in water sample, but do not give any idea about the types of ions being present. The electrical conductivity is the measure of capacity of a substance or a solution to carry an electrical current. The concentrations of EC are ranges from 176 to 405 μ S/cm in the samples collected from the subproject influence area.

83. **Total Dissolve Solid (TDS):** TDS values indicate the general nature of water quality and are usually related to conductivity. However, the values of TDS of all the samples collected throughout the subproject influence area are within the standard limit ranges between 87 and 201mg/L.

84. **Alkalinity:** Alkalinity is a measure of water's ability to neutralize acids. It results primarily from dissolving limestone or dolomite minerals in the aquifer. Water with low levels of alkalinity (less than 150 mg/L) is more likely to be corrosive. High alkalinity water (greater than 150 mg/L) may contribute to scaling. There are no health concerns related to alkalinity. However, the values of alkalinity of all the samples collected throughout the subproject influence area are within the standard limit ranges between 120 and 225mg/L.

85. **Hardness:** Hardness measures the amount of calcium and magnesium in water. Hardness is primarily caused by water slowly dissolving rocks that contain calcium and magnesium. It is the property of water which prevents the lather formation with soap and increases the boiling points of water. Hardness although have no health effects it can make water unsuitable for domestic and industrial use. Total Hardness of tested water samples are ranges from 120 to 215 mg/L which are within the limit of Bangladesh standard for Drinking Water Quality.

86. **Arsenic (As):** Arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land. It is highly toxic in its inorganic form. The greatest threat to public health from arsenic originates from contaminated groundwater. Inorganic arsenic is naturally present at high levels in the groundwater of Bangladesh. However, the values of Arsenic are found within the standard limit of BD Drinking Water Quality.

87. **Chloride (Cl):** Chloride indicates the general nature of water salinity and it breaks up positively or negatively charged ions. A certain amount of chloride is always present in water; however, excessive amount of chloride has health and other secondary impacts. The concentration of chloride in all tested samples are below than the lower limit 150mg/l according to BD Drinking Water Quality Standards.

88. **Iron (Fe):** Aeration of iron-containing layers in the soil can affect the quality of both drinking water and surface water. If the groundwater table is lowered or nitrate leaching takes place, dissolution of iron can occur as a result of oxidation and decrease in pH. The concentration of iron in the tested samples are within limit (0.3mg/L) of Bangladesh standard for Drinking Water Quality which are recorded from 0.09 to 5.09 mg/L.

89. **Manganese (Mn):** Mn values indicate the general nature of water quality. The values of Mn in all tested water samples are within the Bangladesh Standard for Drinking Water Quality (0.1mg/L).

8. Air Quality and Dust

90. Baseline data on air quality is not available. However, the air quality in the camp has slightly deteriorated along the roadside areas because of increased traffic. Brick kilns in Ukhia and Teknaf may also be contributing to the problem. In accordance to the inhabitants, they suffer from the dust generated from the loose soil when strong winds blow; serious dust pollution during stormy winds is an issue. From a health point of view, this should not be a great concern as the size of the dust particles does not allow them to penetrate into the respiratory tract.

91. Indoor air pollution in the camps from cooking is a serious concern especially for women and children, and has been identified as having a severe impact. All cooking is carried out inside the poorly ventilated shelters (the only opening in an 8/8 sq. ft. space is a door at the front) and the firewood which is used as fuel produces large quantities of smoke that stays in the air long after the fire has been extinguished. Burning firewood releases particulate matters, CO, CO₂, and Sulphur oxide which are extremely dangerous.

9. Noise Level

92. Noise level data is not available for the region. The major causes for noise in the subproject area are increased traffic on the Cox's Bazar-Teknaf road (motor cycles, pick-up, mini-trucks, CNG rickshaw and auto-rickshaws). The impact of noise generation on the settlements is not significant as most of the camps are at some distance from the road. Some internal roads have been constructed to facilitate the connectivity between the camps, but traffic on these roads is still very light. Noise is generated at the set times when relief materials are distributed, but measures introduced by the Bangladesh Army in charge of the distribution of relief materials have kept noise levels within reasonable limits.

B. Biological Environment

93. South and Southeast Asian countries are recognized by International Union for Conservation of Nature (IUCN) to be regions of high species diversity. A large number of native plants, including 3,000-4,000 species of woody flora, have been recorded from Bangladesh. The country lies at the meeting point (Eco-tonal region) of several floristic provinces, including the Manipur-Khasia, Bengal and North Burma provinces within the Indo-Malayan realm (IUCN, 2002).

1. Diversity of Floral and Faunal Species

94. **Flora Species-** The forestland in the Ukhia and Teknaf Upazila is covered by tropical evergreen and semi-evergreen forests dominated by Garjan (*Dipterocarpus* spp.) occurring in deep valleys and shaded slopes. Human activities have denuded most parts of the hills which have been re-occupied by sun-grass, herbs and shrubs. Still, the area houses rich biodiversity, especially within the protected areas (PA). There is a small section of mangrove forest on the coast near Kutupalong which encompasses a diverse ecosystem, including medicinal plants (BCAS, 2008).

95. The plant species found in the subproject are listed in the Annex 4 which are: Akashmoni (*Acacia auriculiformis*), raintree (*Albizia saman*), mango (*Mangifera indica*), jackfruit (*Artocarpus heterophyllus*), boroi (*Ziziphus mauritiana*), mahogany (*Swietenia mahogany*), guava (*Psidium guajava*), banana (*Musa* sp.), segun (*Tectona grandis*) Bokul (*Mimusops elengi*) and Bamboo (*Disambiguation*). Sessile joy weed (*Alternanthera sessilis*), thorny amaranth (*Amaranthus spinosus*), bermuda grass (*Cynodon dactylon*), smartweed (*Polygonum* sp), creeping oxalis (*Oxalis corniculata*), etc., are the common weed species (Figure IV.7). Among crop-field vegetation, aman is grown during summer rains and boro (winter rice) cultivated by irrigation in winter.



Figure IV.7: Floral species around the subproject area

96. **Faunal Species-** The Refugee camps have a significant impact on wildlife by shrinking habitats and disruptions in breeding grounds are affecting nocturnal, crepuscular and diurnal wildlife. More than 67% of the mammal wildlife are terrestrial, and of this number, around 63.8% rely on forests as a habitat. Arboreal species are also under severe threat due to the ever-decreasing natural forest area.

97. Apart from the degradation of forest land along the Refugee camps, it still houses rich biodiversity including megafauna like the Asian elephant (*Elephas maximus*) and many different bird species. It has been confirmed that more than 50% of the country's wildlife species are living in the forests of Ukhia, Teknaf, Inani and Himchari under Cox's Bazar South Forest Division.

98. Common bird species noted in the subproject area were Asian crow, myna, cuckoo, kingfisher, pigeon and dove satare, drongo, weaver bird choroi, babui, and dahuk (Figure IV.8). The mammals include fox, monkey, mongoose, Bengal monitor, various rodents etc. There are also several species of frog, lizard and snake (Figure IV.8 and Annex 3).



Figure IV.8: Faunal species around the subproject area

2. Fisheries

99. A survey of the Fisheries fauna of the Naaf river estuary in the 1990s recorded 123 fish species, 20 species of shrimp and prawns, 3 species of crabs and 2 species of lobster (Islam, 1993). The dominant group was represented by a few small sized fishes. Given the close proximity to the sea and the presence of backwaters, the people in the region are habituated in pisciculture and prawn culture.

100. Major fishes are listed in the subproject area are Telapia, rui, catla, mrigal, ghania, kalbaus, kalia, catfish (boal, pangas, silon, ayeir, and bacha) and snake head (shol, gazar, and taki), freshwater shrimp and several other tropical whitefish species (Figure IV.8).

3. Asian Elephants

101. The globally endangered Asian Elephant (*Elephas maximus*) is 'critically endangered' in Bangladesh. Host and Rohingya communities are encroaching on its habitat in the Cox's Bazar Forest Division, and both resident and migratory elephants are facing a continuous shrinkage of their habitat and

food supply. There are likely less than 300 animals remaining in the country with about 200 residents (i.e., not crossing international borders) and 100-150 having a transboundary range with India and Myanmar, and about 40,000 animals in the world, with the greatest populations found in Myanmar and India.

102. There is evidence of presence of elephants in the camp area. This human-elephant conflict has seen 13 refugees killed in elephant attacks since August last year, according to the International Union for Conservation of Nature (IUCN). Figure IV.10 presents a map of recent human-elephant conflicts prepared by the IUCN.

103. The IUCN has conducted a study on such conflict and suggested a few mitigation measures to reduce such conflicts. The IUCN and UNHCR have formed 30 elephant response teams of 10-12 people in the camps. They are also setting up 92 elephant watchtowers, more response teams and training (Figure IV.9).



Figure IV.9: Elephant watchtower in the camp

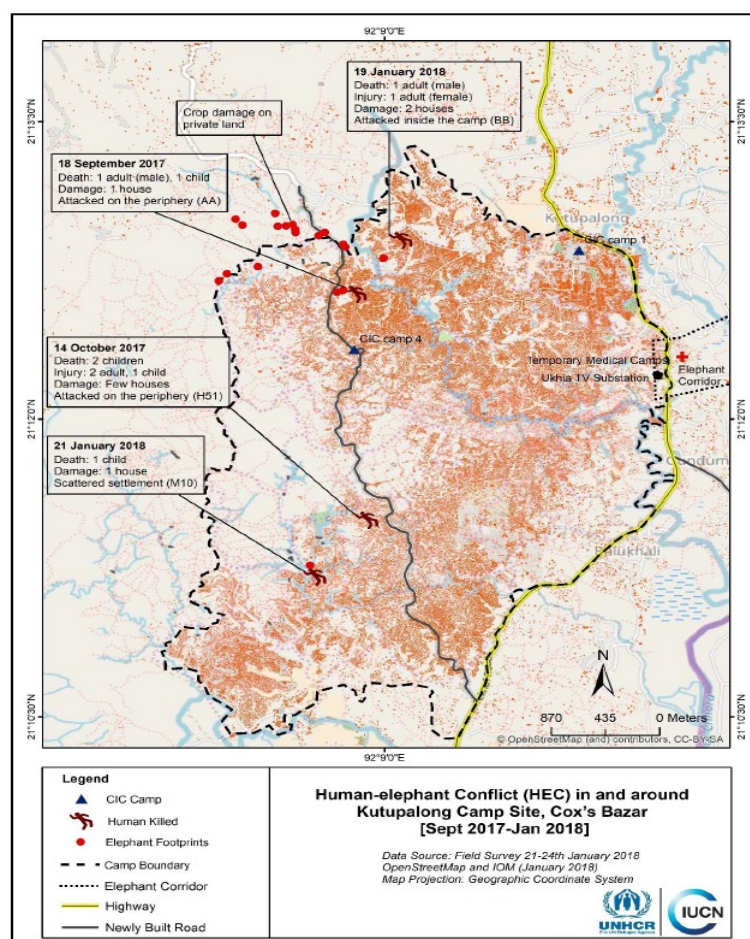


Figure IV.10: Human-elephant conflict map around the subproject area

4. Protected Areas

104. Protected areas (PAs) are “especially dedicated to the protection and maintenance of biological diversity and associated cultural resources, which are managed through legal or other effective means” (IUCN, 1994); “designated or regulated and managed to achieve specific conservation objectives”

(Mulongoy & Chape, 2004). Three types of protected areas were defined under the Bangladesh Wildlife Preservation Act, 1973; i.e. National Park, Wildlife Sanctuary and Game Reserve. Himchari National Park is situated 15 km away from the Refugee camp and Teknaf Game Reserve is located about 6 km away from the subproject area. Figure IV.11 shows the protected areas of Bangladesh.

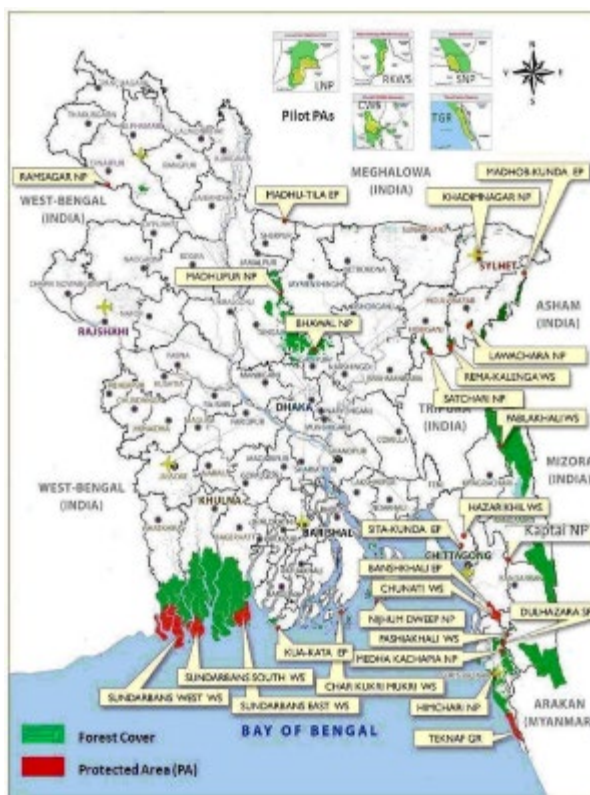


Figure IV.11: Protected areas of Bangladesh

C. Socio-economic Environment

1. Population

105. As of 9 November 2018, the Inter-Sector Coordination Group (ISCG) reported that 620,000 Rohingya refugees have entered Bangladesh since the attacks. According to ISCG's rapid needs assessment, 58 per cent of new arrivals are children and 60 per cent are women including a high number of pregnant (3 per cent) and lactating women (7 per cent). With the new influx, the current total number of Rohingya who have fled from Myanmar into Bangladesh, coupled with the affected population in the communities, has reached a staggering 1.2 million (Figure IV.12). There are 720,000 children among the new arrivals, existing Rohingya populations and vulnerable host communities.

2. Income and Expenditure

106. A guidance recommended by the RRRC is the approach for humanitarian stakeholders working in Rohingya refugee camps and settlements (Table IV.2). This guidance provides a uniform, harmonized approach to definitions of refugee volunteer engagement. There are two main ways in which refugees are engaged in labor the current context: Cash for Work

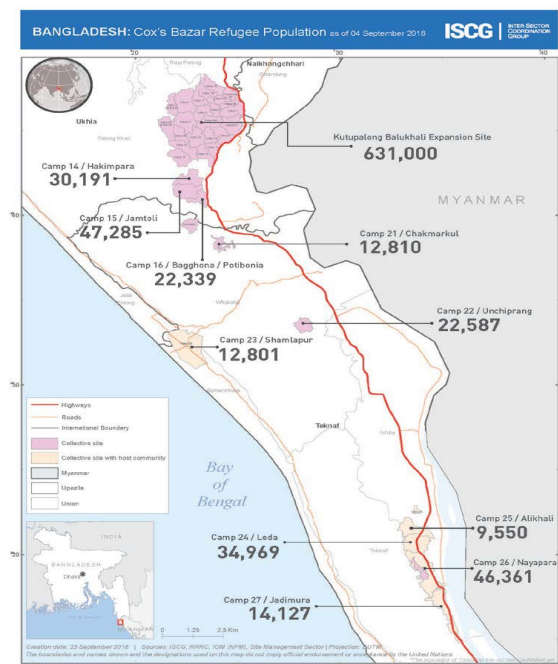


Figure IV.12: Refugee camp sites by population

programming, and engaging refugee volunteer labor to achieve set operational objectives (including unskilled, semi-skilled and skilled volunteers).

Table IV.2: Rohingya volunteer incentive rates recommended by RRRC

Category	Criteria and Competencies	Current Rate
Cash-for-Work	Principles of Cash for Work Programming, including: <ul style="list-style-type: none"> • Beneficiary selection criteria (usually vulnerability) • Days of work predetermined (16 days consecutively, or 32 days scattered over a quarter) • Predetermined daily flat rate 	350 BDT/day (Revised April 2018, yet to be endorsed by the HCTT. This amount represents 75% of the Minimum Expenditure Basket)
Unskilled Volunteer	Unskilled labor engaged to meet operational needs: <ul style="list-style-type: none"> • Porters • Physical/construction laborers • Truck loading/unloading • Gatekeepers • General labor e.g. cleaners 	50 BDT per hour
Semi-skilled Volunteer	Semi-skilled labor engaged to meet operational needs. Requires basic literacy and basic training prior to performing the role. <ul style="list-style-type: none"> • Community mobilizers • Outreach workers (including community health workers, hygiene promoters) • Site management assistants • Enumerators/data collectors (generalists) 	Hourly rate (infrequent engagement) BDT 50 ² – BDT 75 per hour Monthly rate (longer term engagement) BDT 7,200 ³ – BDT 12,600 per month (<i>assumption of 7 hours per day, 24 days a month</i>)

107. The rates will also be applied to the contractors taken on by DPHE as well. The guidance should be incorporated by agencies into contracts at the time they are drawn up.

3. Land Use Pattern

108. In most parts of Ukhia, especially in the areas of Kutupalong and Balukhali, land use has completely changed within a short period of time. Some of the hills have been completely denuded and deforested and the area is now filled with shelters. Other hills will likely face a similar fate. There are over a million Rohingya who have so far been sheltered within a few square kilometers of the influx area combining old and new makeshift camps. However, narrow strip of agricultural land is located in the study area (Figure IV.13).

² It is noted that the starting incentive for semi-skilled is equivalent to that for unskilled. Unskilled labour is often of a hard, physical and sometimes dangerous nature, which requires fair remuneration, and therefore, this is not deemed to be a flaw in the incentive structure. The upper parameter included in the semi-skilled incentive allow for agencies to pay according to their own determination of complexity and responsibilities.

³ It is noted that the lower end of the band for monthly incentives is lower than the hourly incentive, if multiplied across the same time worked. This acknowledges the additional benefits of predictability of income in a longer-term engagement.

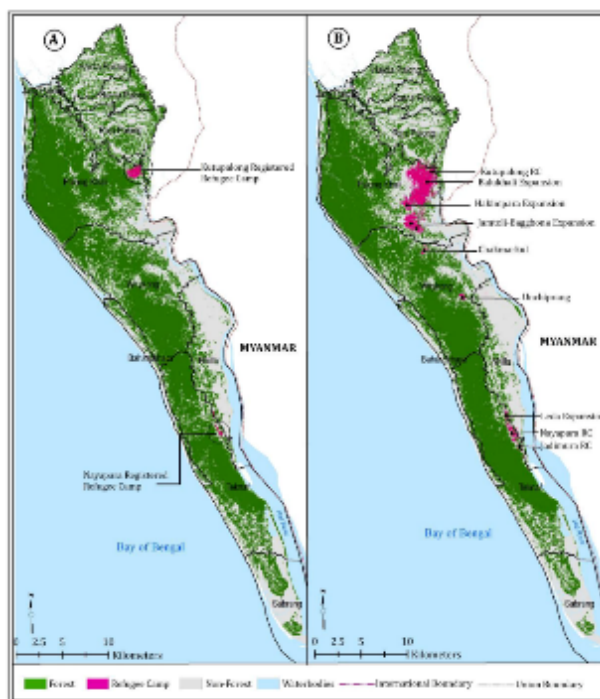


Figure IV.13: Land cover maps for the subproject area

4. Education

109. UNHCR has been supporting primary and junior secondary education for refugee children born Kutupalong camp since the early 1990s. As of September 2018, 36,834 children (31%) out of 120,000 children and youth targeted by UNHCR's programs were provided access to learning. In order to increase the coverage of refugee education, UNHCR and partners has put in place the following: (1) 316 learning spaces including 5 adolescent clubs set up, (2) 682 teachers (including 329 from host communities) recruited, trained and deployed, (3) 812 School Management Committee Members mobilised and engaged to enhance community involvement, (4) 35 Early Childhood Development (ECD) centers set up and 79 facilitators recruited for mobile ECD in 316 locations.

5. Healthcare Facility

110. The health sector maintained the up to date dataset of all health facilities within the camps and the surrounding areas, including facilities implemented by NGOs and Government. Currently, there are 278 functional facilities known to the health sector, with a further 37 planned or under construction. Based on the data available, overall coverage meets the minimum requirements. There are an estimated 170 basic health units (1: 7647 people in need); 33 primary health center facilities (1:39394 people in need) and 10 secondary care facilities (1: 130 000 people in need). Approximately 910 hospital beds are available to the people in need, of which 290 are in Government run facilities. Since the beginning of the crisis on 25 August 2018, a total of 1876908 outpatient consultations were reported.

6. Sanitation

111. Over 48,000 emergency pit latrines were installed to quickly meet the needs of the affected population in the camp, out of which an estimated 17% are non-functional. A minimum depth of five feet for latrine pits has not been met, and they are still often built in close proximity to one another. The number of latrines located within 10 meters of a water source was over 30% in December. In addition, latrines are built too close to shelters, on steep slopes, and close to rivers, which are not usable by women, children, elderly people, or people with disabilities. On the other hand, final disposal and treatment of faecal sludge is become a major issue due to scarcity of land in the congested camps.

7. Solid Waste Management

112. Solid waste management refers to the collection, disposal and recycling of solid waste materials. Waste materials need to be separated before they leave the shelter but currently there are neither primary collection centers nor an organized collection center in the camps. Solid waste management will be an issue for as long as the Rohingya remain in the camps. According to the study done by UNDP in 2018, the impact is identified as moderate to severe. Principal waste materials are the polythene bags in which relief provisions are distributed. Other waste materials include kitchen garbage, food packaging materials, batteries and plastic bottles. Of these, recycling efforts are only beginning to get underway for plastic bottles. Due to the scarcity of firewood, some families use plastic as a cooking fuel, a practice which is extremely harmful.

8. Energy

113. Up to now, the dwindling forests around Kutupalong have provided the only source of fuel to cook with for Rohingya refugees. Currently there is a shortage of natural firewood sources due to the increase in camp population. It is estimated that 900,000 Rohingya refugees in the Cox's Bazar area have needed 700 metric tons of wood every day for cooking alone. In the past, there have been initiatives to create alternate energy sources for the camps, but these have been limited to certain areas and are not sufficient for the current numbers. A solar based mini grid system is in place, providing indoor lighting and street lights in different areas. Other alternative fuels which have been used are biogas, compressed rice husk, and kerosene for lamps (UNHCR, 2017). Moreover, currently more than 200,000 refugee households and some Bangladeshi host families were provided liquefied petroleum gas (LPG).

9. Physical and Cultural Heritage

114. Within the influence area of the subproject no historical sites were identified. Religious center (such as Mosques, temples), educational institutions and local bazar bring cultural values to the community people.

V. ANALYSIS OF ALTERNATIVES

115. An analysis of subproject alternatives is undertaken to determine the best way of achieving the subproject objectives while minimizing environmental and social impacts. The preliminary assessment of the subproject included an analysis of alternatives, addressing the optimal match between required technical specifications and site conditions, as well as addressing any concerns for environmental, social and economic features for each option.

A. Discussion of Alternative Solutions

- **Option 1. Shallow Well:** Shallow layers are better around 100ft (30m) ranges found at the subproject area but most of the shallow tube-wells become non-functional during the peak of the dry season (November to March) as the water table goes down on average 45 - 60 feet (15-20 m). Moreover, there is a possibility of contamination in the shallow aquifers due to leakage from thousands of latrines without proper soak pits installed along the contour lines of the hills close to the shelters and very close to water points.
- **Option 2. Deep Well/ Production Well:** Deep aquifer is found between 650 to 750 feet (215 – 250m) at the subproject area which is protected from fecal contamination due to the impermeable layer. Moreover, based on average discharge, each shallow hand-pump can serve up to 250 individuals while deep pumps can serve up to 500 in the dry season.
- **Option 3. Surface Water:** The subproject area has limited sources of surface water. Main water sources such as the Naf River and other big channels are at some distance and are saline and brackish especially in the lower part of the rivers. Fresh water sources are basically pond water and a few small streams originating from the hills. These ponds and streams are not capable of meeting the water needs of the population of the camps.

B. No Project Alternative

116. Compared to the with-project scenario, the no-project scenario would see continued ineffective water supply system, including; water scarcity as well as water contamination. There would be continued high incidence of intestinal disease outbreaks from contaminated water sources. The existing water supply system would increase the water scarcity in the subproject area and health impacts and impact to the environment would continue.

C. Conclusion

117. Option 2 or Production well is the most favorable option among all the alternatives as surface water is limited, the shallow water aquifer is drying up and contamination has been identified in the subproject area. In regards to the option 2, water source mapping and hydrological surveys should be undertaken to facilitate appropriate siting of wells.

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

119. This section identifies the overall impacts of subproject activities on the physical, biological and socio-economic environment of the subproject area. It also narrates the measures that will mitigate the Project's adverse environmental effects.

A. Impact Assessment

1. Methodology

120. The significance of potential impacts was assessed using the risk assessment methodology that considers impact magnitude and sensitivity of receptors, described below.

121. **Impact Magnitude-** The potential impacts of the subproject have been categorized as major, moderate, minor or nominal based on consideration of the parameters such as: i) duration of the impact; ii) spatial extent of the impact; iii) reversibility; iv) likelihood; and v) legal standards and established professional criteria. These magnitude categories are defined in Table VI: 1.

Table VI.1: Parameters for Determining Magnitude

Parameter	Major	Medium/Moderate	Minor	Negligible
Duration of potential impact	Long term (more than 35 years)	Medium Term Lifespan of the project (5 to 15 years)	Limited to construction period	Temporary with no detectable potential impact
Spatial extent of the potential impact	Widespread far beyond project boundaries	Beyond immediate Project components, site boundaries or local area	Within project boundary	Specific location within project component or site boundaries with no detectable potential impact
Reversibility of potential impacts	Potential impact is effectively permanent, requiring considerable intervention to return to baseline	Baseline requires a year or so with some interventions to return to baseline	Baseline returns naturally or with limited intervention within a few months	Baseline remains constant
Legal standards and established professional criteria	Breaches national standards and or international guidelines/obligations	Complies with limits given in national standards but breaches international lender guidelines in one or more parameters	Meets minimum national standard limits or international guidelines	Not applicable
Likelihood of potential impacts occurring	Occurs under typical operating or construction conditions (Certain)	Occurs under worst case (negative impact) or best case (positive impact) operating conditions (Likely)	Occurs under abnormal, exceptional or emergency conditions (occasional)	Unlikely to occur

122. **Sensitivity of Receptor-** The sensitivity of a receptor has been determined based on review of the population (including proximity/numbers/vulnerability) and presence of features on the site or the surrounding area. Each detailed assessment has defined sensitivity in relation to the topic. Criteria for determining receptor sensitivity of the subproject's potential impacts are outlined in Table VI: 2.

Table VI.2: Criteria for Determining Sensitivity

Sensitivity Determination	Definition
Very Severe	Vulnerable receptor with little or no capacity to absorb proposed changes
Severe	Vulnerable receptor with little or no capacity to absorb proposed changes or limited opportunities for mitigation.
Mild	Vulnerable receptor with some capacity to absorb proposed changes or moderate opportunities for mitigation

Sensitivity Determination	Definition
Low	Vulnerable receptor with good capacity to absorb proposed changes or/and good opportunities for mitigation

123. **Assigning Significance-** Following the determination of impact magnitude and sensitivity of the receiving environment or potential receptors, the significance of each potential impact has been established using the impact significance matrix shown below in Table VI: 3.

Table VI.3: Significance of Impact Criteria

Magnitude of Potential Impact	Sensitivity of Receptors			
	Very Severe	Severe	Mild	Low
Major	Critical	High	Moderate	Negligible
Medium	High	High	Moderate	Negligible
Minor	Moderate	Moderate	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

2. Summary of Impacts

124. The subproject's potential impacts on the key environmental parameters have been assessed and their significance determined using the methodology described above. A summary of the potential impacts of the subproject on the key environmental parameters and significance of these impacts are presented in Table VI: 4.

Table VI.4: Summary of the potential impacts of the subproject

Potential Impacts	Duration of Impact	Spatial Extent	Reversible or not	Likelihood	Magnitude	Sensitivity	Significance Prior to Mitigation	Significance after Mitigation
Environmental Impacts During Pre-Construction Phase								
Existing utilities/services	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
EMP implementation training	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Environmental Impacts During Construction Phase								
Physical and cultural heritage	Short term	Local	Yes	Occasional	Minor	Low	Negligible	Negligible
Site works	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Pipe laying work (Land slide hazard)	Short term	Local	Yes	Certain	Major	Severe	High	Negligible
Surface water quality	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Groundwater quality	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Air quality	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Noise level	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Biodiversity	Short term	Local	Yes	Likely	Minor	Mild	Low	Negligible
Provision of worker facilities	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Workers health and safety	Long Term	Local	Yes	Certain	Major	Severe	High	Negligible
Community health and safety	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Site Reinstatement	Long term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Environmental Impacts During O&M Phase								
Water quality	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible

3. Screening out Areas of No Significant Impact

125. From the preliminary design and results of the rapid environmental assessment, it is clear that implementation of mini pipe water supply subproject will not have major negative impacts because activities will be localized/site-specific and short in duration. Moreover, subproject construction will be conducted within a relatively small area. Because of these, some aspects of the environment that are not expected to be significantly affected by the construction process have been screened out and will not be mentioned further in assessing the impacts of the construction process (Table VI.5).

Table VI.5: Fields in which the subproject is not expected to have significant impacts

Field	Rationale
Topography, landforms, geology and soils	Required amount of materials will not cause alteration of topography, landforms, geology and soils. Excavation will not be large enough to affect these features.
Climatic condition	Short-term production of dust is the only effect on atmosphere. However, impact is short-term, site-specific and within a relatively small area.
Land use	There are no major changes in any areas to be affected by the subproject
Tourism	Tourists mostly drive by the villages located as these are located on the highway
Community	Construction will not affect population numbers, location or composition

4. Anticipated Impacts and Mitigation Measures during Planning Phase

126. **Existing Utilities/Services:** Existing facilities such as drains, toilets or any other infrastructure can be disrupted due to laying of pipeline of mini pipe water supply subproject, hence the disturbance will be temporary and minimal. However, locations of existing drains, toilets and any other infrastructure on the way of pipe layout needs to be identified and redesign pipe layout to avoid any damage on such small infrastructure of the camps.

127. **EMP Implementation Training:** Often lack of proper training to implement the Environmental Management Plan (EMP) stipulated in the Bid document leads to mismanaged environmental safeguards. Therefore, EMP training for the contractors, workers and implementing agency is necessary before construction goes on-board. A training needs to be arranged before construction starts with all involved parties: contractor, workers and representatives from Implementing Agency to implement the EMP and therefore is necessary.

5. Anticipated Impacts and Mitigation Measures during Construction Phase

128. In the case of this subproject (i) most of the individual elements are relatively small and involve straightforward construction, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements. There are no impacts that are significant or complex in nature, or that need an in-depth study to assess the impact. Thus, mini pipe water supply system subproject is unlikely to cause significant adverse impacts. The potential adverse impacts that are associated with construction activities can be mitigated to acceptable levels with the following mitigation measures (Table VI.6).

Table VI.6: Anticipated Impacts and Mitigation Measures – Construction Phase

Field	Impacts	Mitigation Measures
A. Physical Characteristics		
Physical and Cultural Heritage	Construction works will be on existing Rohingya camp, thus risk for chance finds is low.	Stop work immediately to allow further investigation; Prevent workers or any other persons from removing and damaging of archaeological remains.
Site Works	<ul style="list-style-type: none"> • Accidents, injury; • Sediment runoff; • Air pollution and noise. <p>The impacts are negative but short-term, site-specific within a relatively small area.</p>	<ul style="list-style-type: none"> • Take necessary safety and security to transport material inside the camp area, safety in transporting drilling rig and other heavy equipment; • Workplace should be kept orderly to reduce accidents; • Surface soils should be graded-to-drain and protected to reduce erosion and sediment runoff; • Restrict use of heavy equipment and material receipts to daylight hours. Apply water to suppress dust where needed.
Pipe Laying Work	<ul style="list-style-type: none"> • Potential erosion/land slide may occur when moderately to highly sloping terrains are disturbed for the construction of production wells, installation of distribution pipes; • Blockage of access; • Dust hazard; • Construction and domestic waste disposal. <p>The impacts are negative but short-term, site-specific within a relatively small area.</p>	<ul style="list-style-type: none"> • Prioritize re-use of excess spoils and materials in construction activities. If spoils need to be disposed, consult with PMU and Consultant for disposing at designated disposal areas. • All earthworks must to be conducted during dry season to maximum extent possible to avoid the difficult working conditions that prevail during monsoon season such as problems from runoff. • Location for stockyards for construction materials shall be away from watercourses. Place storage areas for fuels and lubricants away from any drainage leading to water bodies. • Take all precautions to minimize the wastage of water in the construction activities. • Take all precautions to prevent entering of wastewater into streams, watercourses • Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in low lying areas. • While working across or close to any water body, the flow of water must not be obstructed. Ensure no construction materials like earth, stone, or appendage are disposed of in a manner that may block the flow of water of any watercourse and drainage channels. • Monitor water quality according to the environmental management plan.
Surface water quality	Trenching and excavation, run-off from stockpiled materials, and chemical contamination from fuels and lubricants may result to silt-laden runoff during rainfall which may cause siltation and reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	<ul style="list-style-type: none"> • Prioritize re-use of excess spoils and materials in construction activities. If spoils need to be disposed, consult with PMU and Consultant for disposing at designated disposal areas; • All earthworks must to be conducted during dry season to maximum extent possible to avoid the difficult working conditions that prevail during monsoon season such as problems from runoff; • Location for stockyards for construction materials shall be away from watercourses. Place storage areas for fuels and lubricants away from any drainage leading to water bodies; • Take all precautions to minimize the wastage of water in the construction activities. • Take all precautions to prevent entering of wastewater into streams, watercourses; • Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in low lying areas;

Field	Impacts	Mitigation Measures
		<ul style="list-style-type: none"> While working across or close to any water body, the flow of water must not be obstructed. Ensure no construction materials like earth, stone, or appendage are disposed of in a manner that may block the flow of water of any watercourse and drainage channels; Monitor water quality according to the environmental management plan.
Groundwater quality	Impacts on the Quality of Groundwater Resource caused by the use of dirty or contaminated drilling equipment. The impacts are negative but short-term, site-specific within a relatively small area.	<ul style="list-style-type: none"> Ensure drilling equipment is cleaned well and will be free of contaminants such as grease, sewage and chemicals, prior to drilling; and Dispose of spoils and wastes at the end of each day's work.
Air quality	Air pollution due to construction activities. The impacts are negative but short-term, site-specific within a relatively small area.	Water spraying for dust control; construction materials with potential for significant dust generation shall be covered; no smoke belchers equipment; and limiting speed of construction vehicles in access roads and work sites to maximum of 30 kph.
Noise	Nuisance from noise of construction equipment. The impacts are negative but short-term, site-specific within a relatively small area.	Consultation with affected areas; not to operate noisy equipment during night time (22:00 – 06:00); sound suppression for equipment; Ear plugs for workers.
Biodiversity	Haphazard site clearing, parking and movement of construction vehicles and equipment, stockpiling, and Illegal unnecessary loss of vegetation beyond Subproject footprints. There are no protected areas in or around subproject sites, and no known areas of ecological interest.	<ul style="list-style-type: none"> Check if tree-cutting will be required during detailed design stage. No trees, shrubs, or groundcover may be removed or vegetation stripped without the prior permission of the environmental specialist; If any tree cut is required, compensatory plantation for trees lost at a rate of 2 trees for every tree cut; Re-vegetating disturbed slopes and grounds, as applicable.
Provision of Worker Facilities	Inconvenience to the communities due to presence of workers; Solid waste and sanitary discharges from worker camps. The impacts are negative but short-term, site-specific within a relatively small area.	Provide suitable housing, adequate supplies of potable water, and toilet and bathing facilities within the housing area. Onsite facilities for preparing food need to be provided, or food service contracted; Provide means for disposing of wastewater from toilets, baths and food preparation areas either through a septic tank and soak away, or holding tank with removal by vacuum truck. Solid waste should be collected at waste bins and disposed of properly offsite.
Workers health and safety	Unsafe working conditions and injury. Potential impacts are negative and long-term but reversible by mitigation measures.	Basic safety and health plan in place for workers; personal protective gear; suitable training or experience in the work; emergency care available on call; contractor to maintain a record of accidents.
Community Health and Safety	Accident or injury to public. The impacts are negative but short-term, site-specific within a relatively small area.	The public should be barred from the site and children of workers should not be allowed within the work area.
Site Reinstatement	Damage due to debris, spoils, excess construction materials. Potential impacts are negative and long-term but reversible by mitigation measures.	<ul style="list-style-type: none"> Remove all spoils wreckage, rubbish, or temporary structures; All affected structures rehabilitated/compensated; The area that previously housed the construction worker shed is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up.

6. Anticipated Impacts and mitigation Measures during Operation Phase

129. Regular operation of mini pipe water supply system involves groundwater abstraction, disinfection with chlorine, pumping to reservoirs and distribution from reservoirs to the community tap stand. Operation also involve laboratory analysis of water supplies. Water supply infrastructure will require repair and maintenance activities like detection and repair of leaks. As these repairs and maintenance work will be infrequent, and will affect individual small locations for short periods only, the impacts should be much less significant thus be negligible. The potential impact that is associated with O&M activities can be mitigated to acceptable levels with the following mitigation measure.

130. **Water Quality:** Oil/fuel spill from stored oil/fuel for generator, disposal of bleaching powder or improper chlorination, may cause reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures which are:

- Take all precautions to store the oil/fuel properly so that no chance of spill.
- Proper disposal of excess bleaching powder and care should be taken to follow the appropriate procedure for chlorination.
- Necessary training is needed for chlorination to those persons who will be in charge of operation and maintenance.

VII. ENVIRONMENTAL MANAGEMENT PLAN

131. Environmental management is a sustainable way of planning, arranging, supervising, organizing, and developing the environment so that the preservation of natural resources can be maintained and impact can be prevented or mitigated. An EMP, also referred to as an impact management plan, is usually prepared as part of EIA or IEE reporting. It translates recommended mitigation and monitoring measures into specific actions that will be carried out by the project proponent. Depending upon particular requirements, the plan may be included in, or appended to, the EIA report or may be a separate document. The EMP will need to be adjusted to the terms and conditions specified in during project approval stage. It will then form the basis for impact management during project construction and operation.

132. On the basis of identification of the environmental impacts and recommended mitigation measures linked with the construction activities of the mini pipe water supply system with production tube well along with pipe network, an EMP has been prepared which will be followed at the pre-construction, construction and operation stages (Table VII.1). A mitigation measure will be considered as successful when it complies with the Environmental Quality Standards (EQS), policies, legal requirements set by ADB SPS, 2009 and DoE environmental guidelines and other relevant GoB legal requirements. In absence of DoE's own EQS, other relevant international or other recognized organization's quality standard will be applied.

A. Objective of the EMP

133. The main objectives of the EMP for the construction and operation of the mini pipe water supply system are:

- i. Identification of the environmental impacts and recommended mitigation and enhancement measures;
- ii. Define the responsibilities of the project proponents in accordance with the three project phases (design, construction and operation);
- iii. Facilitate the implementation of the mitigation measures by providing the technical details of each project impact;
- iv. Define a monitoring mechanism and identify monitoring parameters to ensure that all proposed mitigation measures are completely and effectively implemented;
- v. Identify training requirements at various levels and provide a plan for the implementation of training sessions;
- vi. Providing a cost estimate for all proposed EMP actions.

B. Environmental Monitoring Plan

134. The environmental monitoring is important for assessing the baseline environmental quality and during the construction and operation of the project. The monitoring plays vital role to assess the deterioration of environmental quality and extent of implementation of the mitigation measure. It plays a judgmental role about the efficacy of the implementation.

135. The main objectives of the pre-construction, construction and operation phase monitoring plans will be to:

- i. Monitor the actual impact of the works on physical, biological and socioeconomic receptors within the subproject site;
- ii. Recommend mitigation measures for any unexpected impact or where the impact level exceeds;
- iii. Ensure compliance with legal and community obligations including safety on construction sites;
- iv. Monitor the rehabilitation and the restoration of construction campsites as described in the EMP;
- v. Evaluate the effectiveness of the mitigation measures proposed in the EMP and recommend improvements, if and when, necessary.

136. The compliance monitoring will be conducted in accordance with the environmental mitigation measures and monitoring plan provided with this report (Table VII.1). Aspects to be monitored are as follows:

137. **Pre-construction phase:** Compliance monitoring during the pre-construction comprises:

- Checking that the project's design incorporates appropriate measures to avoid or minimize negative impacts.
- Incorporation of appropriate protective clauses in the contract documents that will be obliged by contractors.

138. **Construction phase:** To ensure environmental safety the following parameters should be observed to ensure the efficiency of mitigation measures:

- Contractor's compliance to the environmental issues in their day-to-day activities.
- Air quality will be monitored once by direct measurement of sensitive air pollution parameters like particulate matters (PM10, PM2.5), CO, NOx and SO₂.
- Noise will be monitored during regular construction procedures. Hearing protection means will be provided to personnel when noise cannot be avoided or controlled.
- Chemical and microbiological tests will be carried out on water samples to determine the requirement.
- Awareness training for the workers regarding the importance of flora and fauna will be ensured.
- Collection, transportation and disposal of solid waste of construction site and camp will be monitored.
- Inexperience coupled with unawareness of mechanical and electrical equipment to be used during the construction phase can cause injuries to the workers.
- Health and safety training program will be developed for the awareness of workers for handling of emergency situations.
- Provision of first aid facilities and use of personal protection devices like helmets, ear plugs and safety boots will be ensured. Entry of persons not wearing the protection devices within the construction site will not be allowed.

139. **Operation phase:** The contractor for 1st one-year of O&M will compile and maintain the environmental data and records gathered during the construction phase for reference during the operation phase. The contractor will coordinate with DPHE, for monitoring with respect to water quality.

- The contractor in collaboration with the concerned department will organize monitoring of water quality and necessary measures will be taken to keep them within the limits set by government.
- The contractor in collaboration with the concerned department will ensure proper security measures including serious security surveillance along the pump house site.
- The contractor will monitor any activity of the nearby residents (such as disposal of waste etc.), which affects the pipe line, will be brought to the knowledge of the competent authority for necessary action.

C. Components to be Monitored

140. Monitoring has two components:

- i. Compliance monitoring, which checks whether prescribed actions have been carried out, usually by visual observation and by the use of checklists.
- ii. Effects monitoring which records the beneficial and adverse consequences of activities on the biophysical and social environment. This is often by repeat measurements of a set of objectively verifiable indicators.

141. Monitoring for this project will concentrate on compliance monitoring to ensure that measures are being implemented on time and according to sound environmental principles.

D. Contractor's Environmental Management Plan

142. During construction, contractor will be guided by its detailed CEMP. This shall be based on the subproject's EMP with details on staff, resources, implementation schedules, and monitoring procedures. The agreed CEMP will be the basis for monitoring by PMU and supervision consultant. Inclusion in construction contract documents the provisions requiring the contractor to submit a CEMP is important since the contractor will be legally required to allocate a budget for mitigation measures implementation. The CEMP will allow PMU construction supervision engineer to focus on what are specific items expected from the contractor regarding environmental safeguards on a day-to-day basis. With the CEMP, PMU can easily verify the associated environmental requirements each time the contractor will request approval for work schedules.

Table VII.1: Environmental Management and Monitoring Plan – Prior, During, and Post Construction Phase

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds	Responsibility	
						Implementation	Supervision
1. Pre-Construction Phase							
Existing Utilities/Services	Disruption of services.	Identify and include locations of existing drains, toilets and any other infrastructure on the way of pipe layout and redesign pipe layout to avoid any damage on such small infrastructure of the camps.	List of affected utilities and small infrastructures;	Before start of construction	No cost required.	Consultant	PMU
Preparation of Final IEE/EMP	Site-specific impacts not identified, mitigation measures not appropriate and sufficient to address impacts.	Revise/update IEE/EMP based on detailed design.	Final IEE and EMP reviewed, approved and disclosed	Upon completion of layout plan by contractor	No additional cost required	Contractor, Consultant	PMU
EMP Implementation Training	Irreversible impact to the environment, workers, and community	Project manager and all key workers of contractors will be required to undergo EMP implementation including spoils management, Standard operating procedures (SOP) for construction works; health and safety (H&S), core labor laws, applicable environmental laws, etc.	(i) Proof of completion (Safeguards Compliance Orientation) (ii) Posting of EMP at worksites	Before start of construction	Cost of EMP Implementation on Orientation Training to contractor is responsibility of PMU and Consultant.	Consultant	PMU
2. Construction Phase							
Physical and Cultural Heritage	Construction works will be on existing Rohingya camp, thus risk for chance finds is low.	Stop work immediately to allow further investigation; Prevent workers or any other persons from removing and damaging of archaeological remains.	Records of chance finds	Visual inspection by PMU and supervision consultants on monthly basis	Included in civil works contract	Contractor	Consultant, PMU
Site Works	Accidents, injury; Sediment runoff; Air pollution and noise. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	Take necessary safety and security to transport material inside the camp area, safety in transporting drilling rig and other heavy equipment; Workplace should be kept orderly to reduce accidents; Surface soils should be graded-to-drain and protected to reduce erosion and sediment runoff; Restrict use of heavy equipment and material receipts to daylight hours.	Contractor's safety and security program; Location of stockpiles; Number of complaints from stakeholders; Air Quality: PM10 test.	Once prior of construction; Inspection by PMU and supervision consultants on monthly basis; Air Quality: PM10 test once in construction period.	Included in civil works contract	Contractor	Consultant, PMU

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds	Responsibility	
						Implementation	Supervision
		Apply water to suppress dust where needed.					
Pipe Laying Work	Potential erosion/land slide may occur when moderately to highly sloping terrains are disturbed for the construction of production wells, installation of distribution pipes; Blockage of access; Dust hazard; Construction and domestic waste disposal. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	Should avoid moderately to highly sloping terrains for excavation; prepare proper protection before such excavation; Exercise caution to prevent erosion losses, close excavations rapidly and stabilize soils once the pipeline is in place; Provide access by bridging trenches; Store bedding materials outside trafficked areas. Cover materials and/or suppress dust with water; Contractor will prepare and implement a Waste Management Plan approved by PMU.	Status of debris and quarries, no of trenches, date of trenching and backfilling; Number of complaints from stakeholders regarding access; Record of watering schedule; Proper implementation of Contractor's "Waste Management Plan".	Once prior to trenching and once after backfilling; Once in a week during construction; At the beginning of the subproject, then weekly during construction activities.	Included in Civil works contract	Contractor	Consultant, PMU
Surface water quality	Trenching and excavation, run-off from stockpiled materials, and chemical contamination from fuels and lubricants may result to silt-laden runoff during rainfall which may cause siltation and reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	Prioritize re-use of excess spoils and materials in construction activities. If spoils need to be disposed, consult with PMU and Consultant for disposing at designated disposal areas; All earthworks must to be conducted during dry season to maximum extent possible to avoid the difficult working conditions that prevail during monsoon season such as problems from runoff; Location for stockyards for construction materials shall be away from watercourses. Place storage areas for fuels and lubricants away from any drainage leading to water bodies; Take all precautions to minimize the wastage of water in the construction activities.	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) Records of surface water quality inspection; Water Quality Test (National Drinking Water Quality Standard Parameters); (iii) No visible degradation to nearby drainages, <i>khal</i> s or water bodies due to construction activities	Water quality test once in construction period	Included in Civil works contract	Contractor through a nationally recognized laboratory	Consultant, PMU

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds	Responsibility	
						Implementation	Supervision
		Take all precautions to prevent entering of wastewater into streams, watercourses; Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in low lying areas; While working across or close to any water body, the flow of water must not be obstructed. Ensure no construction materials like earth, stone, or appendage are disposed of in a manner that may block the flow of water of any watercourse and drainage channels; Monitor water quality according to the environmental management plan.					
Groundwater Quality	Impacts on the Quality of Groundwater Resource caused by the use of dirty or contaminated drilling equipment. The impacts are negative but short-term, site-specific within a relatively small area.	(i) ensure drilling equipment is cleaned well and will be free of contaminants such as grease, sewage and chemicals, prior to drilling; and (ii) dispose of spoils and wastes at the end of each day's work.	Cases of mixing of contaminated water/ public reporting; Water quality test	Water quality test once in construction period	Included in civil works contract	Contractor through a nationally recognized laboratory	Consultant, PMU
Air Quality	Air pollution due to construction activities. The impacts are negative but short-term, site-specific within a relatively small area.	Water spraying for dust control; construction materials with potential for significant dust generation shall be covered; no smoke belchers equipment; and limiting speed of construction vehicles in access roads and work sites to maximum of 30 kph.	Location of stockpiles; Number of complaints from stakeholders; Air Quality: PM10 test	Air Quality: PM10 PM2.5, SPM test once in construction period.	Included in civil works contract	Contractor through a nationally recognized laboratory	Consultant, PMU
Noise Level	Nuisance from noise of construction equipment. The impacts are negative but short-term, site-specific within a relatively small area.	Consultation with affected areas; not to operate noisy equipment during night time (22:00 – 06:00); sound suppression for equipment; ear plugs for workers.	Number of complaints from stakeholders; Use of silencers in noise-producing equipment and sound barriers; Noise Quality, Equivalent Sound Pressure Level	Inspection by PMU and supervision consultants on monthly basis;	Included in civil works contract	Contractor through a nationally recognized laboratory	Consultant, PMU

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds	Responsibility	
						Implementation	Supervision
Biodiversity	Haphazard site clearing, parking and movement of construction vehicles and equipment, stockpiling, and illegal unnecessary loss of vegetation beyond Subproject footprints. There are no protected areas in or around subproject sites, and no known areas of ecological interest.	Check if tree-cutting will be required during detailed design stage. No trees, shrubs, or groundcover may be removed or vegetation stripped without the prior permission of the environmental specialist; If any tree cut is required, compensatory plantation for trees lost at a rate of 2 trees for every tree cut; Re-vegetating disturbed slopes and grounds, as applicable.	PMU to report in writing the number of trees cut and planted if tree-cutting will be required; Number of complaints from stakeholders on disturbance of vegetation, poaching, fishing, etc.	Visual inspection by PMU and supervision consultants on monthly basis	Included in civil works contract	Contractor	Consultant, PMU
Provision of Worker Facilities	Inconvenience to the communities due to presence of workers; Solid waste and sanitary discharges from worker camps. The impacts are negative but short-term, site-specific within a relatively small area.	Provide suitable housing, adequate supplies of potable water, and toilet and bathing facilities within the housing area. Onsite facilities for preparing food need to be provided, or food service contracted; Provide means for disposing of wastewater from toilets, baths and food preparation areas either through a septic tank and soak away, or holding tank with removal by vacuum truck. Solid waste should be collected at waste bins and disposed of properly offsite.	Site-specific H&S Plan; Records of supply of uncontaminated water; Record of H&S orientation trainings; Condition of sanitation facilities for workers	Visual inspection by PMU and supervision consultants on monthly basis	Included in civil works contract	Contractor	Consultant, PMU
Worker Health and Safety	Unsafe working conditions and injury. Potential impacts are negative and long-term but reversible by mitigation measures.	Basic safety and health plan in place for workers; personal protective gear; suitable training or experience in the work; emergency care available on call; contractor to maintain a record of accidents.	Site-specific H&S Plan; Records of supply of uncontaminated water; Record of H&S orientation trainings; Condition of sanitation facilities for workers	Visual inspection by PMU and supervision consultants on monthly basis	Included in civil works contract	Contractor	Consultant, PMU
Community Health and Safety	Accident or injury to public. The impacts are negative but short-term, site-specific within a relatively small area.	The public should be barred from the site and children of workers should not be allowed within the work area.	Number of permanent signage, barricades and flagmen on worksite as per Traffic Management Plan; Complaints record.	Visual inspection by PMU and supervision consultants on monthly basis	Included in civil works contract	Contractor	Consultant, PMU

Project Activity/ Field	Impacts	Mitigation Measures	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds	Responsibility	
						Implementation	Supervision
Submission of EMP Implementation Report	Unsatisfactory compliance to EMP	Appointment of contractor's supervisor to ensure EMP implementation; Timely submission of monitoring reports including pictures	Availability and competency of appointed supervisor by contractor; Monthly report by contractor and consultant.	Monthly monitoring report to be submitted by contractor to consultant and consultant to PMU; PMU to submit semi-annual monitoring report to ADB.	Included in civil works contract	Contractor	Consultant, PMU
Site Reinstatement	Damage due to debris, spoils, excess construction materials. Potential impacts are negative and long-term but reversible by mitigation measures.	Remove all spoils wreckage, rubbish, or temporary structures; All affected structures rehabilitated/compensated; The area that previously housed the construction worker shed is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up.	PMU report in writing that (i) worksite is restored to original conditions; (ii) worker shed has been vacated and restored to pre-project conditions; (iii) all construction related structures not relevant to O&M are removed; and (iv) worksite clean-up is satisfactory.	Prior to turn-over of completed works	Included in civil works contract	Contractor	Consultant, PMU
3. Operation and Maintenance (O&M) Phase							
Water Quality	Oil/fuel spill from stored oil/fuel for generator, disposal of bleaching powder or improper chlorination, may cause reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area.	Take all precautions to store the oil/fuel properly so that no chance of spill; Proper disposal of excess bleaching powder and care should be taken to follow the appropriate procedure for chlorination; Necessary training is needed for chlorination to those persons who will be in charge of operation and maintenance.	Visible degradation to nearby drainages, <i>khals</i> or water bodies; Records of surface and groundwater quality inspection (nearby O&M); Water Quality Test (National Drinking Water Quality Standard Parameters)	Water quality test once in every year.	Included in O&M cost	Contractor through a nationally recognized laboratory	DPHE

Table VII.2: Site Specific Environmental Management Plan for Mini Pipe Water Supply System (DPHE/W3)

Site	Issue	Impacts	Mitigation Measures
WS-01, WS-02 and WS-03 in Camp 2W	Site clearances	Two sites (WS02 and WS03) are situated in the kitchen garden farmed by the camp dwellers which will be damaged due to construction activities.	<ul style="list-style-type: none"> • DPHE will negotiate with the affected gardeners for compensation for the damaged vegetables. • Appoint the affected person in the construction activity in line with their skill following the guidance recommended by the RRRC.
	Construction activities near educational institutions, religious structures etc.	The selected site for production well in WS-03 and one water reservoir of WS-02 is located adjacent to the school and mosque respectively which will be directly and indirectly affected from the construction activities.	<ul style="list-style-type: none"> • Provision should be made for the barriers between the construction site and the sensitive structures. • Community consultation should be carried out frequently so that compliant regarding project activities can mediate immediately. • Grievance redress mechanism should be formed and contact information will be disseminated at the sensitive locations. • Construction site should be confined to ensure community safety.
	Drainage congestion	The proposed site for WS-01 is situated at the outlet of the drainage channel in a low-lying area which might impede due to construction activity.	<ul style="list-style-type: none"> • The flow of the water must not be obstructed and ensure no construction materials like earth, stone, or appendage are disposed of in a manner that may block the flow of water of the watercourse and drainage channel. • Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in the low-lying area. • Take all precautions to prevent entering of wastewater into the watercourse. • Monitor water quality according to the environmental management plan.
	Soil and water pollution	Since the selected sites in camp 2W are located along the low-lying area, thus, soil and water pollution may be resulted due to discharge of fuel, lubricants and construction wastes in the watercourse and siltation of water bodies due to spillage of construction wastes.	<ul style="list-style-type: none"> • The fuel storage area will be stationed such that runoff from the site does not drain into water bodies/ponds abutting the construction sites. • Oil interceptors will be provided at construction areas and workshops ensuring that all wastewater flows into the interceptor prior to its discharge. • Silt fencing will be provided at all water bodies near construction sites to prevent sediments from construction sites entering adjoining water bodies. • Discharge standards for waste from industrial units or projects waste will be strictly adhered to. • The work site will be cleaned and restored to pre-project conditions.
	Disposal of excavated earth, construction materials	Excavation for distribution network and borehole need for disposal of earth material which may result in damage of existing infrastructure, including access roads, tube wells, kitchen gardens etc.	<ul style="list-style-type: none"> • The contractor shall provide sediment and erosion control measures in accordance with local environmental legislation. • Excavation material shall be removed from the trench as the work progresses which can be used as filling material. • The contractor shall supply portable mud tanks or construct temporary mud pits to contain excess drill fluids during construction. Spent drilling fluids and cuttings shall be confined to the entrance and exit pits. • The contractor shall take all necessary precautions to minimize the damage to the adjacent properties. Any drilling fluid that enters the pipe shall be removed by flushing or other suitable methods. • The contractor shall be responsible for cleanup and restoration.

Site	Issue	Impacts	Mitigation Measures
	Community health and safety	The production well, reservoir tanks and solar panel are located in the densely populated area in camp 2W which might be affected by high level of noise due to continuous construction activity and dropping of small children in open trench excavated for pipe line and foundation pit of solar panel.	<ul style="list-style-type: none"> • Pits excavated to permit connection of bored pipe shall be backfilled, and disturbed areas shall be restored to their original state or better. • Place safety signage in the active working site. • Keep distances from the sensitive receptor; • Confined the noise source with efficient mufflers; • Use well-maintained equipment that emit least noise; • Minimizing drop heights when loading and unloading coarse aggregates. • Community consultation should be carried out frequently so that compliant regarding project activities can mediate immediately.
WS-04 in Camp 13	Drainage congestion	The proposed site for WS-04 is situated along the drainage channel in a low-lying area in camp 13 which might impede due to construction activity.	<ul style="list-style-type: none"> • The flow of the water must not be obstructed and ensure no construction materials like earth, stone, or appendage are disposed of in a manner that may block the flow of water of the watercourse and drainage channel. • Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in the low-lying area. • Take all precautions to prevent entering of wastewater into the watercourse. • Monitor water quality according to the environmental management plan.
	Disturbance to the nearby community	The site is placed on the internal access road which might impede the accesses to the houses, shops and work site.	<ul style="list-style-type: none"> • Community consultation should be carried out frequently so that compliant regarding project activities can mediate immediately. • Keep distances from the sensitive receptor; • Providing safe access to affected properties; • Manage stockpiling properly; • Leading pumped water from excavations to drains or storing in drums for use in watering dry surfaces.
	Soil and water pollution	The selected site in camp 13 is located along the drainage channel, thus, soil and water pollution may be resulted due to discharge of fuel, lubricants and construction wastes in the watercourse and siltation of water bodies due to spillage of construction wastes.	<ul style="list-style-type: none"> • The fuel storage area will be stationed such that runoff from the site does not drain into water bodies/ponds abutting the construction sites. • Oil interceptors will be provided at construction areas and workshops ensuring that all wastewater flows into the interceptor prior to its discharge. • Silt fencing will be provided at all water bodies near construction sites to prevent sediments from construction sites entering adjoining water bodies. • Discharge standards for waste from industrial units or projects waste will be strictly adhered to. • The work site will be cleaned and restored to pre-project conditions.
	Pipe laying work	Internal road excavation is required for all the sites due to pipe laying work which may result: <ul style="list-style-type: none"> • Blockage of access; • Dust hazard; • Drainage congestion; 	<ul style="list-style-type: none"> • Provide access by bridging trenches; • Store bedding materials outside of trafficked areas. • Cover materials and/or suppress dust with water; • Contractor will prepare and implement a Waste Management • Plan approved by PMU.

Site	Issue	Impacts	Mitigation Measures
		<ul style="list-style-type: none"> • Accident/ dropping small children on open trench. 	
WS-05, WS-06 and WS-07 in Camp 5	Site clearances	Proposed sites for WS06 and WS07 in camp 5 are situated in the vegetable plots farmed by the camp dwellers which will be damaged due to construction activities.	<ul style="list-style-type: none"> • DPHE will negotiate with the affected gardeners for compensation for the damaged vegetables. • Appoint the affected person in the construction activity in line with their skill following the guidance recommended by the RRRRC.
	Land slide hazard	The proposed sites for WS05 and WS07 are located along the steep slope where potential erosion/land slide may occur when the terrain is disturbed for the construction of boreholes/ production wells, installation of distribution pipes and solar panel.	<ul style="list-style-type: none"> • Fencing is required at the edge of the work site where steep slopes start and put proper signboards around the fencing. • Construct guide walls for stabilizing the downhill slope. Use of steel nets on the steeper slopes will prevent local soil erosion. • Plant native deep rooted plants on the slopes where possible. Choose less stepper slopes for plantation. • Aware the plantation worker on steeper slopes. Provide necessary safety equipment such as ropes, safety guards, boots etc.
	Drainage congestion	WS-05 is situated in the low-lying area along the drainage channel where seasonal waterlogging reported, might impede due to construction activity.	<ul style="list-style-type: none"> • The flow of the water must not be obstructed and ensure no construction materials like earth, stone, or appendage are disposed of in a manner that may block the flow of water of the watercourse and drainage channel. • Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in the low-lying area. • Take all precautions to prevent entering of wastewater into the watercourse. • Monitor water quality according to the environmental management plan.
	Soil and water pollution	Soil and water pollution may be resulted due to discharge of fuel, lubricants and construction wastes in the watercourse and siltation of water bodies due to spillage of construction wastes in the drainage channel placed in the close proximity of WS05.	<ul style="list-style-type: none"> • The fuel storage area will be stationed such that runoff from the site does not drain into water bodies/ponds abutting the construction sites. • Oil interceptors will be provided at construction areas and workshops ensuring that all wastewater flows into the interceptor prior to its discharge. • Silt fencing will be provided at all water bodies near construction sites to prevent sediments from construction sites entering adjoining water bodies. • Discharge standards for waste from industrial units or projects waste will be strictly adhered to. • The work site will be cleaned and restored to pre-project conditions.
	Community health and safety	The production well, reservoir tanks and solar panel are located in the densely populated area in camp 5 which might be affected by high level of noise due to continuous construction activity and dropping of small children in open trench excavated for pipe line and foundation pit of solar panel.	<ul style="list-style-type: none"> • Place safety signage in the active working site. • Keep distances from the sensitive receptor; • Confined the noise source with efficient mufflers; • Use well-maintained equipment that emit least noise; • Minimizing drop heights when loading and unloading coarse aggregates. • Community consultation should be carried out frequently so that compliant regarding project activities can mediate immediately.

Site	Issue	Impacts	Mitigation Measures
WS-08, WS-09 and WS-10 in Camp 2E	Drainage congestion	All the selected sites in camp 2E are located at low-lying area along the drainage channel which might impede due to construction activity.	<ul style="list-style-type: none"> The flow of the water must not be obstructed and ensure no construction materials like earth, stone, or appendage are disposed of in a manner that may block the flow of water of the watercourse and drainage channel. Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in the low-lying area. Take all precautions to prevent entering of wastewater into the watercourse. Monitor water quality according to the environmental management plan.
	Construction activities near educational institutions, religious structures etc.	The selected site for production well in WS-08 is located adjacent to the school which will be directly and indirectly affected from the construction activities.	<ul style="list-style-type: none"> Provision should be made for the barriers between the construction site and the sensitive structures. Community consultation should be carried out frequently so that compliant regarding project activities can mediate immediately. Grievance redress mechanism should be formed and contact information will be disseminated at the sensitive locations. Construction site should be confined to ensure community safety.
	Disposal of excavated earth, construction materials	Excavation for distribution network and borehole need for disposal of earth material which may result in damage of existing infrastructure, including access roads, tube wells, kitchen gardens etc.	<ul style="list-style-type: none"> The contractor shall provide sediment and erosion control measures in accordance with local environmental legislation. Excavation material shall be removed from the trench as the work progresses which can be used as filling material. The contractor shall supply portable mud tanks or construct temporary mud pits to contain excess drill fluids during construction. Spent drilling fluids and cuttings shall be confined to the entrance and exit pits. The contractor shall take all necessary precautions to minimize the damage to the adjacent properties. Any drilling fluid that enters the pipe shall be removed by flushing or other suitable methods. The contractor shall be responsible for cleanup and restoration. Pits excavated to permit connection of bored pipe shall be backfilled, and disturbed areas shall be restored to their original state or better.
	Land slide hazard	The proposed sites for WS09 and WS10 are located along the steep slope where potential erosion/land slide may occur when the terrain is disturbed for the construction of boreholes/ production wells, installation of distribution pipes and solar panel.	<ul style="list-style-type: none"> Fencing is required at the edge of the work site where steep slopes start and put proper signboards around the fencing. Construct guide walls for stabilizing the downhill slope. Use of steel nets on the steeper slopes will prevent local soil erosion. Plant native deep rooted plants on the slopes where possible. Choose less stepper slopes for plantation. Aware the plantation worker on steeper slopes. Provide necessary safety equipment such as ropes, safety guards, boots etc.
	Disturbance to the nearby community	The production well, reservoir tanks and solar panel are located in the densely populated area which might be affected by high level of noise due to continuous construction activity and dropping of small	<ul style="list-style-type: none"> Place safety signage in the active working site. Keep distances from the sensitive receptor; Provide access by bridging trenches; Confined the noise source with efficient mufflers; Use well-maintained equipment that emit least noise;

Site	Issue	Impacts	Mitigation Measures
		children in open trench excavated for pipe line and foundation pit of solar panel.	<ul style="list-style-type: none"> • Minimizing drop heights when loading and unloading coarse aggregates. • Community consultation should be carried out frequently so that compliant regarding project activities can mediate immediately.

E. Institutional Arrangement and Responsibilities

1. Oversight Body

143. The RRRC is proposed to act as the coordinator on behalf the government to execute all interventions. RRRC and ADB will conduct regular coordination meetings involving all executing and implementing agencies, relevant stakeholders including deputy commissioner of Cox's bazar, other development partners and agencies. ADB established an extended mission office in Cox's bazar for close coordination, facilitation of sub-projects development and implementation.

144. A steering committee comprising higher officials from relevant ministries coordinated by ERD will be formed to provide necessary guidance to expedite the sub-project development and implementation.

2. Executing and Implementing Agencies

145. The Department of Public Health Engineering (DPHE), under the Local Government Division (LGD) of the Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C), having extensive experience in managing urban and water supply projects financed by ADB, will be the both executing and implementing agency of Emergency Assistance Project. Ministry of Finance, Economic Relations Division has signed the grant agreement with ADB for funding of the implementation of project. Ministry of Disaster Management and Relief will facilitate establishing a project coordination committee and provide guidance and supervision of project activities.

3. Project Management Unit and Project Implementation Unit

146. A PMU will be established at Dhaka for the overall management of the project. The PMU will be headed by Project Director (PD) supported by officials. A Project Implementation Unit (PIU) will be established at Cox's Bazar under DPHE. A team of Individual Consultant lead by Project Management Specialist/TL and a consulting firm lead by Team Leader/Sr Water Supply and Sanitation Engineer will be recruited to support PMU and PIU in implementing the project activities at Cox's Bazar, Ukhiya and Teknaf.

4. Design and Supervision Consultants (DSC)

147. The DSCs together with the PIU, will assist in developing and updating IEEs through the conduct of the DMS in a participatory and transparent way and consistent with the ADB's environment principles and the environmental assessment and review framework. Once approved by the PMU and reviewed and concurred by ADB, the DSC will provide technical advice in the implementation of the approved IEE and EMP. The DSC will likewise provide capacity-building orientation and skills training, as needed, to concerned personnel of the PMU and PIU.

148. Together with the EA/IA and PIU, the DSC will supervise civil works activities to ensure that the contractors adhere with the terms of their contract relative to avoiding and/or minimizing environmental impacts, in addition to ensuring that contractors provide the necessary compensation and/or assistance to the affected households prior to and/or during construction activities. The DSC will assist the PIU in regular monitoring of EMP implementation.

5. Civil Works Contracts and Contractors

149. EMPs are to be included in bidding and contract documents and verified by the PMU. The contractor will be required to designate an environmental supervisor to (i) coordinate with Consultant on updating the IEE/EMP if necessary, and (ii) ensure implementation of EMP during civil works. Contractors are to carry out all environmental mitigation and monitoring measures outlined in their contract.

F. Capacity Building

150. A training program on environmental assessment, implementation and reporting will be developed to build the capability of PMU. This will be conducted by the Consultants. The PMU, consultants and

contractors of on-going contracts will attend a one-day ADB SPS induction workshop provided by ADB safeguard specialist at BRM. Salient features of ADB SPS, policy triggers, safeguard requirements on environment, resettlement and indigenous peoples, and construction best practices.

151. PMU will organize an induction course for the training of contractors, preparing them on: (i) EMP implementation, including environmental monitoring requirements related to mitigation measures; and (ii) taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation. The contractor will be required to conduct environmental awareness and orientation of workers prior to deployment to work sites. The suggested outline of the training program is presented in Table VII.3.

Table VII.3: Indicative Capacity Building and Training Program on EMP

Description	Contents	Schedule	Participants
Program 1 Orientation workshop	Module 1 – Orientation ADB Safeguards Policy Statement Bangladeshi Environmental Laws and Regulations Module 2 – Environmental Assessment Process ADB environmental process, identification of impacts and mitigation measures, formulation of an environmental management plan (EMP), implementation, and monitoring requirements Review of environmental assessment report to comply with ADB requirements Incorporation of EMP into the project design and contracts	1 day	DPHE officials involved in the project implementation PMU
Program 2 Orientation program/workshop for contractors and supervisory staff	Environmental issues during construction Implementation of EMP Monitoring of EMP implementation Reporting requirements	1 day	PMU contractors
Program 3 Experiences and best practices sharing	Experiences on EMP implementation – issues and challenges - Water use efficiency Best practices followed	1 day on a regular period to be determined by PMU and Consultant	PMU Consultant Contractors Local community representative

G. Environmental Costs

152. The contractor's cost for site establishment, preliminary activities, construction, defect liability activities, and environmental mitigation measures related to EMP implementation before construction and construction are to be incorporated into the contractual agreements and engineer's costs, which will be binding on him for implementation. The survey will be conducted by the contractor.

153. The operation phase mitigation measures are again of good operating practices, which will be the responsibility of the implementing agency (DPHE). 1st one-year O & M will be done by contractor and rest period will be done by local personnel involve in O & M and/or camp in charge (such as UNHCR/IMO or other organization responsible for O & M) or any other mechanism identified by ADB.

154. The activities identified in the EMP mainly include site inspections and informal discussions with workers and local community, and this will be the responsibility of PMU with the assistance of Consultant, costs of which are part of project management. Table VII.4 presents the estimated cost to implement the EMP.

Table VII.4: Cost Estimates to Implement the EMP

SL.	Particulars	Phase	Unit	Total number	Rate (BDT)	Cost (BDT)	Costs covered by
A. Capacity building							
1	Program 1 Orientation Workshop Program 2 Orientation program/workshop for contractors and supervisory staff Program 3 Experiences and best practices sharing	Pre-construction	Three modules, 1 day per module	Covered under consultancy			
2	Training for contractor's staff and labour on Health, safety and environment and construction practice	During construction	Two modules, 1 day per module	2	25,000.0	50,000.0	Civil Works Contract
Sub Total (A. Capacity building)						50,000.0	
B. Mitigation measures							
1.	Compensatory plantation measures (payment is to be made only when trees are fully grown)	Construction	Per tree	100	200.0	20,000.0	Civil works contract
2.	Site safety and security	Construction	Per site	10	10,000.0	100,000.0	Civil works contract should be included under site preparation
3.	Dust suppression measures at work sites twice per day over construction period, and noise & water pollution control measure	Construction	Per site	10	10,000.0	100,000.0	Civil works contract
4.	Worker health and safety (safety gears and first aid facility at work site, water quality at labour camp, solid waste management at labour camp etc.)	Construction	Per site	10	10,000.0	100,000.0	Civil works contract
Sub Total (B. Mitigation measures)						320,000.0	
C. Monitoring parameter for establishing baseline during detailed design/before construction							
1.	Ambient air quality monitoring at work site and nearby sensitive receptor; (PM10, PM2.5, SOx, NOx, COx)	Before construction	Per contract package	2	20,000	40,000.0	Civil works contractor
2.	Noise level (LAeq in dB during day and night period at work site and nearby sensitive receptor)	Before construction	Per contract package	10	2,000	20,000.0	Civil works contractor

SL.	Particulars	Phase	Unit	Total number	Rate (BDT)	Cost (BDT)	Costs covered by
3.	Surface water quality monitoring at nearby water body; (pH, EC, Turbidity, TSS, DO, BOD, COD, Cl, Ammonia)	Before construction	Per contract package	1	20,000	20,000.0	Civil works contractor
4.	Groundwater quality monitoring at nearby Tube-well; (pH, EC, TDS, Cl, Mn, Fe, As, TC, FC)	Before construction	Per contract package	1	20,000	20,000.0	Civil works contractor
Sub Total (C. Monitoring parameter during pre-construction)						100,000.00	
D. Monitoring parameter during construction							
1.	Ambient air quality monitoring at work site and nearby sensitive receptor; (PM10, PM2.5, SOx, NOx, COx)	Construction	Per contract package	4	20,000	80,000.0	Civil works Contract
2.	Noise level (LAeq in dB during day and night period at work site and nearby sensitive receptor)	Construction	Per contract package	10	2,000	20,000.0	Civil work contractor
3.	Surface water quality monitoring at nearby water body; (pH, EC, Turbidity, TSS, DO, BOD, COD, Cl, Ammonia)	Construction	Per contract package	2	20,000	40,000.0	Civil work Contractor
4.	Groundwater quality monitoring at nearby Tube-well; (pH, EC, TDS, Cl, Mn, Fe, As, TC, FC)	Construction	Per contract package	2	20,000	40,000.0	Civil work Contractor
Sub Total (D. Monitoring parameter during construction)						180,000.00	
E. Monitoring Parameter during operation							
1.	Surface water quality monitoring at nearby water body; (pH, EC, Turbidity, TSS, DO, BOD, COD, Cl, Ammonia)	Once in 1 st year during operation	Per package	2	20,000	40,000.0	Civil work Contractor for 1 st year; DPHE as per ADB identified mechanism for operation for rest period
2.	Groundwater quality monitoring at nearby Tube-well; (pH, EC, TDS, Cl, Mn, Fe, As, TC, FC)		Per package	2	20,000	40,000.0	
Sub Total (E. Monitoring parameter during operation)						80,000.00	
Grand Total for EMP Monitoring (A+B+C+D+E)						730,000.00	

155. The EMP implementation cost stands at BDT 730,000.00

H. Monitoring and Reporting

156. PMU will monitor and measure the progress of EMP implementation. The monitoring activities will correspond with the project's risks and impacts, and will be identified in the IEEs for the projects. In addition to recording information on the work and deviation of work components from original scope PMU, and Consultant will undertake site inspections and document review to verify compliance with the EMP and progress toward the final outcome.

157. Contractor will submit report to Consultant and Consultant will submit monthly monitoring and implementation reports to PMU, who will take follow-up actions, if necessary. PMU will submit semi-annual monitoring reports to ADB. Subproject budgets will reflect the costs of monitoring and reporting requirements.

158. ADB will review project performance against the MLGRDC's commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system. ADB will monitor projects on an ongoing basis until a project completion report is issued. ADB will carry out the following monitoring actions to supervise project implementation:

- (i) conduct periodic site visits for projects with adverse environmental or social impacts;
- (ii) conduct supervision missions with detailed review by ADB's safeguard specialists/officers or consultants for projects with significant adverse social or environmental impacts;
- (iii) review the periodic monitoring reports submitted by EAs to ensure that adverse impacts and risks are mitigated, as planned and as agreed with ADB;
- (iv) work with EAs to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate; and
- (v) prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

VIII. GRIEVANCE REDRESS MACHANISM

159. The objective the grievance redress mechanism (GRM) is to resolve complaints as quickly as possible and at the local level through a process of conciliation; and, if that is not possible, to provide clear and transparent procedures for appeal. A well-defined grievance redress and resolution mechanism will be established to resolve grievances and complaints in a timely and satisfactory manner. All affected persons will be made fully aware of their rights, and the detailed grievance redress procedures will be publicized through an effective public information campaign. The grievance redress process includes three levels:

A. First Level of GRM

160. The first level and most accessible and immediate contact for the fastest resolve of grievances are the contractors, with assistance from DSC on site. Prior to construction of any works, the PIU will ensure local community meetings are held to notify residents and businesses of any temporary disturbances, and to inform them of the Project and the GRM. If any complaints arise, the contractors, with assistance from DSC can immediately resolve the complaint on site. The contractor's and DSC's office phone number will be posted in public areas within the subproject areas and construction sites. Any person with a grievance related to the project works can contact the project to file a complaint. The contractor may seek the assistance of the DSC safeguards specialists (the environmental specialist or social safeguards specialist) to resolve the issue. The DSC safeguards (environment and resettlement) focal person will immediately address and resolve the issue with the contractor within 1-2 days, if the complaint remains unresolved at the field level. The DIU safeguards focal person will fully document the following information: (i) name of the person; (ii) date complaint was received; (iii) nature of complaint; (iv) location, and (v) how the complaint was resolved.

B. Second Level of GRM

161. Should the grievance remain unresolved; the contractor with assistance from DSC will forward the complaint to the PIU safeguards focal person. The person filing the grievance will be notified by DSC safeguards focal person that the grievance was forwarded to the PIU safeguards focal person. The PIU will address the grievance. Grievances will be resolved through continuous interactions with affected persons, and the PIU will answer queries and resolve grievances regarding various issues including environmental or social impacts. Corrective measures will be undertaken at the field level by the PIU safeguards focal person within 7 days. He/she will fully document the following information: (i) name of the person; (ii) date complaint was received; (iii) nature of complaint; (iv) location and (v) how the complaint was resolved.

C. Third Level of GRM

162. Should the grievance remain unresolved, the PIU's project director will activate the third level of the GRM by referring the issue (with written documentation) to a Grievance Redress Committee (GRC), which will, based on review of the grievances, address them in consultation with the PIU, contractor, DSC, and affected persons. The GRC will consist of Refugee Relief and Repatriation Commission (RRRC), as chairperson, EA/IA representative, camp-in-charge, and other relevant stakeholders. A meeting will be called with the GRC, if necessary, where the affected person can present his/her concern and issues. The process will promote conflict resolution through mediation. The GRC will meet as necessary when there are grievances to be addressed. The GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within 15 days. The functions of the GRC are as follows: (i) to provide support to affected persons on problems arising from environmental or social disruption, asset acquisition (where required), and eligibility for entitlements, compensation, and assistance; (ii) to record grievances of affected persons, categorize and prioritize them, and provide solutions within 15 days; and (iii) to report to the aggrieved parties' developments regarding their grievances and decisions of the GRC. The EA/IA safeguards focal person will be responsible for processing and placing all papers before the

GRC, recording decisions, issuing minutes of the meetings, and taking follow-up action to see that formal orders are issued, and the decisions carried out.

163. Safeguard monitoring reports will include the following aspects pertaining to progress on grievances: (i) number of cases registered with the GRC, level of jurisdiction (first, second, and third levels), number of hearings held, decisions made, and the status of pending cases; and (ii) lists of cases in process and already decided upon may be prepared with details such as affected person, date of notice, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e. open, closed, pending).

164. All costs involved in resolving the complaints (meetings, consultations, communication and reporting / information dissemination) will be borne by the EA/IA.

165. Where an affected person is not satisfied with the outcomes of the 3 levels of the Project GRM, the affected person should make good faith efforts to resolve issues working with the South Asia Regional Department through ADB's Bangladesh Resident Mission. As a last resort, the affected person can access ADB's Accountability Mechanism (ADB's Office of Special Project Facility or Office of Compliance Review). ADB's Accountability Mechanism, including information on how to file a complaint, will also be explained to affected households.

166. The grievance redress mechanism and procedure are depicted in Figure VIII.1.

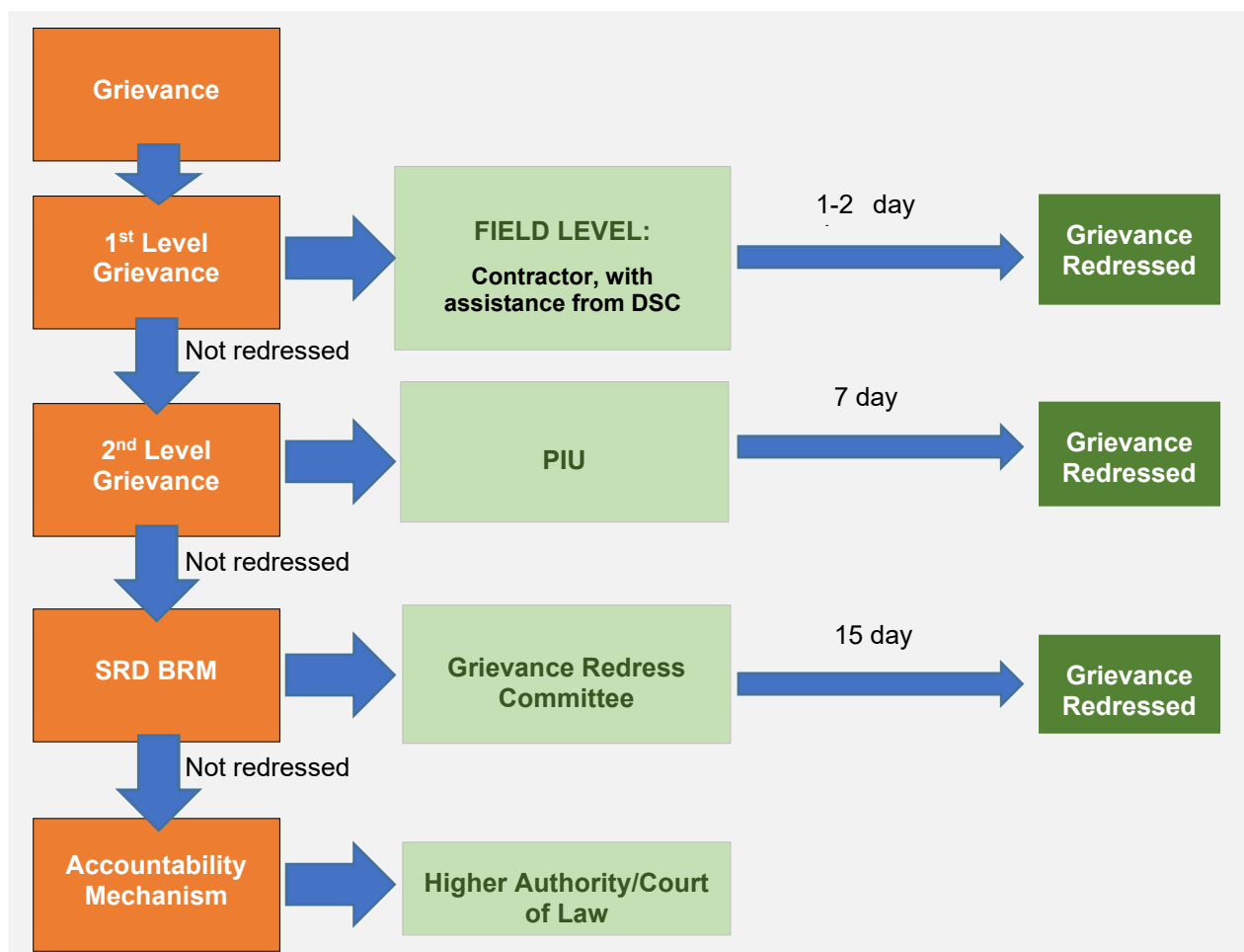


Figure VIII.1: Grievance redress process

IX. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Stakeholder Consultation

168. Meaningful stakeholder consultation and participation is part of the project preparation and implementation strategy. Consultation, participation and will ensure information is provided and feedback is obtained and considered on the implementation of subprojects. Affected persons will be consulted at various stages of subproject preparation to ensure: (i) incorporation of views/concerns of affected persons, particularly the vulnerable, on environmental impacts and mitigation measures; (ii) identification of any help required by affected persons during rehabilitation; and (iv) avoidance of potential conflicts for smooth project implementation.

169. It will also provide adequate opportunities for consultation/participation of all stakeholders and inclusion of the vulnerable in subproject process. Relevant information on any major changes to the Project or subproject scope will be shared with beneficiaries, affected persons, vulnerable groups, and other stakeholders.

1. Stakeholder Consultation Strategy for Emergency Assistance Project

170. At minimum, stakeholders will be consulted regarding the scope of an impact assessment before work is commenced and they will be informed of the likely impacts of the subproject and proposed mitigation once the draft IEE and EMP documents are prepared. The safeguards documents will record views of stakeholders and indicate how these have been taken into account in subproject development. Consultations will be held with a special focus on vulnerable groups.

B. Key Target Stakeholders

171. The key stakeholders to be consulted during subproject preparation, EMP implementation and subproject implementation include:

- Beneficiaries;
- Elected representatives, community leaders, religious leaders and representatives of community based organizations;
- Local non-government organizations (NGOs);
- Local government and relevant government agency representatives, including local authorities responsible for land acquisition, protection and conservation of forests and environment, archaeological sites, religious sites, and other relevant government departments;
- Residents, shopkeepers, business persons, and farmers who live and work alongside transport and education/district infrastructure which will be rehabilitated;
- Executing agency, implementing agency, PIU, staff and consultants; and
- ADB and Government.

C. Consultation and Disclosure to Date

172. Public consultation was held during field visit on 26 November 2018 and 8 January 2019 in the Camp 2E and Camp 5 where the attendees were 13 and 12 respectively (Figure IX.1). The attendee's list is attached in Annex 2. Some informal discussion was held with the local people during site visit. Main topics of discussions were:

- Awareness and extent of the subproject components
- Benefits of the subproject for the betterment of camp dwellers
- Labour availability in the subproject area
- Local disturbances due to subproject construction work
- Water logging and drainage problem
- Air and noise pollution due to subproject construction work
- Movement of construction vehicle within the camp



Figure IX.1: Public consultation held in the Camp 2E and Camp 5

D. Findings of the Public Consultation

173. Camp dwellers are very much interested on the subproject and they will help the authorities in all aspects. However, mitigation measures will be required at construction sites to minimize the impact on environment. The major outcomes from the public consultation were related to drainage congestion, traffic interference during construction and the possible dust and noise problems during constructional phase. Moreover, people were interested to know the possibility of employment in the construction activity. Summary of the consultation outcomes is presented in Table IX.1.

Table IX.1: Summary of consultation outcomes

SI	Issues	Response
01	Does the local person support the proposed subproject?	<ul style="list-style-type: none"> All participants pledged to give their full support for the said subproject for everybody's welfare.
02	Any critical issue or concern by the local people regarding the subproject?	<ul style="list-style-type: none"> No issues or concerns.
03	Will the subproject require any land for implementation?	<ul style="list-style-type: none"> No land acquisition is required. Moreover, the contractor will survey the location prior to the construction activity so that the existing facility will not be affected.
04	Will the subproject construction activity adversely affect drainage management?	<ul style="list-style-type: none"> Necessary provisions will be provided to avoid the drainage congestion during the construction.
05	Will the subproject construction activity adversely affect the air and noise level?	<ul style="list-style-type: none"> Sprinkling of water at frequent intervals will avoid and curtail the dust emission. Good constructional practices and proper work timings shall avoid noise disturbances to the neighborhood.
06	During labour recruitment, should the camp dwellers including women be given priority during construction?	<ul style="list-style-type: none"> This largely depends on the types of job and will be assessed on a case-to-case basis by the contractor according to needs.

E. Future Stakeholder Consultation

174. The contractor will consult with the targeted stakeholders prior to the implementation of work, during implementation and prior to operation and maintenance. Contractor will also consult with the camp authority and working WASH partner. The consultation is very important to finalise the site of all components. The contractor will coordinate with WASH working group through DPHE. Under the guidance of WASH working group, different NGOs are working for the task of community consultation and motivation. The WASH working group will define the concern NGOs and the contractor will finance the NGO from the contract provision for carrying out the project specific task, in consultation with DPHE.

F. Information Disclosure

175. Information is disclosed through public consultation and making available relevant documents in public locations. The following documents will be submitted to ADB for disclosure on its website:

- IEEs (including subproject EMP);
- Updated IEEs (including EMP) and corrective action plan prepared during project implementation, if any; and
- Environmental monitoring reports.

176. The EAs/IAs will send a written endorsement to ADB for disclosing these documents on the ADB website. The PIUs will provide relevant safeguards information in a timely manner, in an accessible place and in a form and language understandable to affected people and other stakeholders. For illiterate people, other suitable communication methods will be used. Disclosure will follow ADB's Public Communication Policy, 2011.

X. CONCLUSION AND RECOMMENDATION

178. The process described in this document has assessed the environmental impacts of all elements of Mini piped water supply package 3. All potential impacts were identified in relation to design and location, construction, and operation phases.

179. Planning principles and design considerations are reviewed and incorporated into the site planning process whenever possible; thus, environmental impacts as being due to the project design or location are not significant.

180. Most of the individual elements of the subproject are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant. Most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving trenching and other excavation. However, the routine nature of the impacts means that most can be easily mitigated. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. Mitigation will be assured by a program of environmental monitoring to ensure that all measures are implemented, and will determine whether the environment is protected as intended. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries. Any requirements for corrective action will be reported to the ADB.

181. The stakeholders are involved in developing the IEE through discussions on-site and public consultation, after which views expressed are incorporated into the IEE and in the planning and development of the subproject. The IEE will be made available at public locations in the city and will be disclosed to a wider audience via the ADB and DPHE project websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation. A grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly.

182. A copy of the EMP shall be kept on-site during the construction period at all times. The EMP shall be made binding on all contractors operating on the site, and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance.

183. DPHE (Executive Agency) have fully endorsed the EMP and is committed to implement all the mitigation measures. DPHE will also ensure that the work is carried out in an environmentally acceptable manner and the monitoring and reporting are completed in a compliant and timely fashion, acceptable to ADB. If the subproject is developed following the suggestions given in the EMP of this IEE, it is our contention that there will be no negative impacts to deter the development of the subproject.

184. Therefore, as per Government of Bangladesh ECA, 1995 and ECR, 1997, the sub-project is categorized as “red”; and LCC and ECC must be obtained from DoE. On the other hand, based on this IEE, the determination of environment category as “B” in accordance with ADB’s SPS 2009 is confirmed and does not require further environmental impact assessment.

XI. REFERENCES

- 2030 WRG. (2015). *Consolidation and analysis of information on water resources management in Bangladesh*. Dhaka: 2030 WRG.
- Akhter, S. &. (2017). Gender-based Violence among Documented Rohingya Refugees in Bangladesh. *Indian Journal of Gender Studies*.
- DoE. (1997). *Environmental Conservation Rules*. Department of Environment, Ministry of Environment and Forestry, GoB.
- Fisheries and Aquaculture Department. (1985). *Chapter II: Hydrology. In Report on tidal area study*. . FAO.
- Grant, K. (2013). *Effect on nitrogen on lead release in an iron and manganese rich aquifer in Kutupalong refugee camp, Bangladesh. (Master's Thesis)*. Bangladesh.
- Imamul Huq and Md. Shoaib J.U. (2013). *Geology and Geomorphology*. Springer.
- ISCG. (2017). *Situation Report: Cyclone Mora*. Cox's Bazar: Inter Sector Coordination Group.
- Islam, M. S. (1993). Fisheries fauna of the Naf river estuary . *Bangladesh journal of fish, Mymensingh, Bangladesh*.
- IUCN . (2002). *Bio-ecological Zones of Bangladesh* . Dhaka : IUCN-The World Conservation Union .
- IUCN. (1994). *Guidelines for Protected Area Management Categories*. . Cambridge, UK.: World Conservation Union.
- Mahmud, T. (2017). Rohingya influx: 15-year-old forestation project destroyed in 57 days. Dhaka: Dhaka Tribune.
- Mulongoy, K., & Chape, S. (. (2004). *Protected Areas and Biodiversity: An Overview of Key Issues*. Cambridge, UK.: CBD Secretariat, Montreal and UNEP-WCMC.
- NERC. (2001). *Groundwater quality: Bangladesh*. . British Geological Survey.
- Roy, M. A. (2012). Paleoenvironment of deposition of the Dupi Tila Formation, Lalmai Hills, Comilla, Bangladesh. *Journal Geological Society of India* , 80: 409-419.
- Sikder, A. (2010). Access to water and sanitation in refugee settings: Success and setbacks in Bangladesh. . *In Proc. of International Conference on Environmental Aspects of Bangladesh (ICEAB10)*, (pp. pp. 149-151). Japan.
- Smith, A. L. (2000). Contamination of drinking-water by arsenic in Bangladesh: a public health emergency. *Bulletin of the World Health Organization*, 78(9): 1093-1103.
- UNDP. (2012). *Comprehensive Disaster Management* . Dhaka: UNDP.
- UNDP Bangladesh and UN WOMEN Bangladesh. (2018). *Report on Environmental Impact of Rohingya Influx*. Dhaka: UNDP Bangladesh.

ANNEX 1: RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST (WATER SUPPLY AND SANITATION)

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (SDES) for endorsement by the Director, SDES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and on tribes, minor races, ethnic sects and communities;⁴ (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: G0582-BAN: Emergency Assistance Project

Sector Division: Urban Infrastructure

Subproject Name – Construction and operation of mini piped water supply system (10 schemes): Package 3 (EAP/DPHE/W3)

Screening Questions	Yes	No	Remarks
A. PROJECT SITING IS THE PROJECT AREA...			
▪ DENSELY POPULATED?	✓		The population distribution shows that the project area is densely populated as high as 125000 per sq km.
▪ HEAVY WITH DEVELOPMENT ACTIVITIES?		✓	
▪ ADJACENT TO OR WITHIN ANY ENVIRONMENTALLY SENSITIVE AREAS?		✓	There are no sensitive ecological and cultural sites in the project area.
• CULTURAL HERITAGE SITE		✓	
• PROTECTED AREA		✓	
• WETLAND		✓	
• MANGROVE		✓	
• ESTUARINE		✓	
• BUFFER ZONE OF PROTECTED AREA		✓	
• SPECIAL AREA FOR PROTECTING BIODIVERSITY		✓	
• BAY		✓	
B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE...			

⁴ Groups or population identified as Indigenous Peoples within the context of ADB's Safeguard Policy Statement will be referred to in this document as *tribes, minor races, ethnic sects and communities* (following the request of the Government of Bangladesh).

Screening Questions	Yes	No	Remarks
• pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		✓	Source of water supply is groundwater. No industrial establishment in the Camp.
• impairment of historical/cultural monuments/areas and loss/damage to these sites?		✓	There are no cultural heritage sites/monuments of prominence.
• hazard of land subsidence caused by excessive ground water pumping?		✓	
• social conflicts arising from displacement of communities?		✓	
• conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		✓	
• unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		✓	All water supply to comply with the National Drinking Water Quality Standard.
• delivery of unsafe water to distribution system?		✓	
• inadequate protection of intake works or wells, leading to pollution of water supply?		✓	
• over pumping of ground water, leading to salinization and ground subsidence?		✓	
• excessive algal growth in storage reservoir?		✓	
• increase in production of sewage beyond capabilities of community facilities?		✓	
• inadequate disposal of sludge from water treatment plants?		✓	
• inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		✓	
• impairments associated with transmission lines and access roads?		✓	
• health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		✓	
• health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?		✓	Personal protective equipment will be provided to the workers.
• dislocation or involuntary resettlement of people?		✓	No displacement of communities.
• disproportionate impacts on the poor, women and children, tribes, minor races, ethnic sects and communities or other vulnerable groups?		✓	
• noise and dust from construction activities?	✓		Anticipated during construction activities. However, impacts are temporary and short in duration. The EMP includes measures to mitigate the impacts.
• increased road traffic due to interference of construction activities?	✓		Anticipated during construction activities. However, impacts are temporary and short in duration. The EMP ensures measures are included to mitigate the impacts.
• continuing soil erosion/silt runoff from construction operations?		✓	
• delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		✓	
• delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		✓	Not anticipated. Water quality will be regularly monitored.
• accidental leakage of chlorine gas?		✓	Not anticipated.

Screening Questions	Yes	No	Remarks
• excessive abstraction of water affecting downstream water users?		✓	Not anticipated.
• competing uses of water?		✓	Not anticipated.
• increased sewage flow due to increased water supply		✓	
• increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant		✓	
• large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	Not anticipated.
• social conflicts if workers from other regions or countries are hired?	✓		Priority in employment will be given to local residents.
• risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		✓	Not applicable. Trenching will be done manually. Construction will not involve use of explosives.
• community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		✓	Operational area will be clearly demarcated and access will be controlled.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: G0582-BAN: Emergency Assistance Project

Sector: Urban Infrastructure

Subsector: Water supply and sanitation

Division/Department: DPHE

Screening Questions		Score	Remarks
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	1	Little chance to be affected by storms and landslide as reservoir will be located at the hill top, however, proper protection will be taken.
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc.)?	0	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Medium



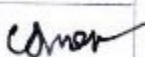








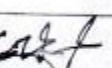
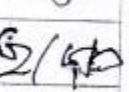
ANNEX 2: LIST OF ATTENDEES OF THE PUBLIC CONSULTATION**Public Consultation Meeting**

Emergency Assistance Project (Mini pipe Water Supply- EAP/DPE/WZ)

Venue: Camp 2

Date: / Time: 26 NOV. 2018 (12:15 PM)

Attendance Sheet

Sl. No.	Name	Occupation	Address	Phone No	Signature
1.	Bulu (Mazhi)	Mazhi	Camp 2E	01874831884	
2.	Md. Salam	Micro Driver	Camp 2E	01834960930	
3.	Aman Ullah	Day labourer	Camp 2E	01845378716 01849551996	
4.	Md. Omar	DRC (Volunte)	Camp 2E	01876824668	
5.	Md. Amin	DRC Self (Unit Volun)	Camp 2E	01857726524	
6.	Lamal Hossain	DRC (Volunteers)	Camp 2E	01879671820	
7.	Md. Yunus	labours	Camp 2E	01864883890	
8.	Md. Ehsan	labour	Camp 2E	01823073800	
9.	Md. Yusuf	labour	Camp 2E	0186867467	
10.	Md Ayez	labour	Camp 2W	01856961339	
11.	Rubel	labour	Camp 2W	01868732125	
12.	Md. Selim	labour	Camp- 2E	01863449365	
13.	Sadek	Amir Sahels	Camp- 2W	01851125584	


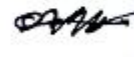


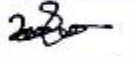
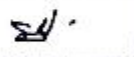
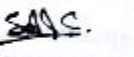
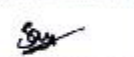

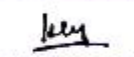
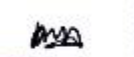
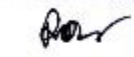
Public Consultation Meeting

Emergency Assistance Project (Mini pipe Water Supply System)

Venue: Camp 5

Date: / Time: 08/01/2019

Attendance Sheet

Sl. No.	Name	Occupation	Address	Phone No	Signature
1	Md. Aziz	Labor	Camp 5	01828930997	
2	Sonchu Alam	Labor	"	0177470693	
3	Md. Jamatullah	Labor	Camp 5	01840680149	
4	Hafez Ahmad	Labor	"	-	
5	Zakaria	Labor	"	0190871524	
6	Md. Jafar	Labor	"	-	
7	Md. Ali	Labor	"	-	
8	Sayed Salim	Shopkeeper	Camp 5	-	
9	Hasham Khan	Labor	"	-	
10	Ilias Ali	Labor	Camp 5	-	
11	Md. Alam	Labor	Camp 5	-	
12	Rahim Mullah	Labor	"	-	
13					

ANNEX 3: LIST OF WILDLIFE (MAMMALS, BIRDS, REPTILES AND AMPHIBIANS) RECORDED IN THE SUBPROJECT AREA

MAMMALS:

SL	Scientific Name	English Name	Family
01	<i>Bandicota bengalensis</i>	Lesser Bandicoot Rat	Muridae
02	<i>Mus musculus</i>	Eastern House Mouse	Muridae
03	<i>Rattus rattus</i>	House Rat	Muridae
04	<i>Vandeleuria oleracea</i>	Asiatic Long-tailed Climbing Mouse	Muridae
05	<i>Paradoxurus hermaphroditus</i>	Common Palm Civet	Viverridae
06	<i>Viverra zibetha</i>	Large Indian Civet	Viverridae
07	<i>Felis chaus</i>	Jungle Cat	Felidae
08	<i>Herpestes auropunctatus</i>	Small Indian Mongoose	Herpestidae
09	<i>Canis aureus</i>	Golden Jackal	Canidae
10	<i>Suncus murinus</i>	Asian House Shrew	Soricidae
11	<i>Cynopterus sphinx</i>	Greater Short-nosed Fruit Bat	Pteropodidae
12	<i>Pteropus giganteus</i>	Indian Flying Fox	Pteropodidae
13	<i>Megaderma lyra</i>	Greater False Vampire Bat	Megadermatidae
14	<i>Pipistrellus tenuis</i>	Least Pipistrelle	Vespertilionidae
15	<i>Scotophilus heathi</i>	Greater Asiatic Yellow Bat	Vespertilionidae
16	<i>Scotophilus kuhlii</i>	Lesser Asiatic Yellow Bat	Vespertilionidae

BIRDS:

SL	Scientific Name	English Name	Family
01	<i>Columba livia</i>	Rock Pigeon	Columbidae
02	<i>Spilopelia suratensis</i>	Western Spotted Dove	Columbidae
03	<i>Streptopelia decaocto</i>	Eurasian Collared-dove	Columbidae
04	<i>Streptopelia tranquebarica</i>	Red Turtle-dove	Columbidae
05	<i>Treron phoenicopterus</i>	Yellow-footed Green pigeon	Columbidae
06	<i>Caprimulgus macrurus</i>	Large-tailed Nightjar	Caprimulgidae
07	<i>Cypsiurus balasiensis</i>	Asian Palm-swift	Apodidae
08	<i>Cacomantis merulinus</i>	Plaintive Cuckoo	Cuculidae
09	<i>Clamator jacobinus</i>	Jacobin Cuckoo	Cuculidae
10	<i>Cuculus micropterus</i>	Indian Cuckoo	Cuculidae
11	<i>Eudynamys scolopaceus</i>	Western Koel	Cuculidae
12	<i>Hierococcyx varius</i>	Common Hawk-cuckoo	Cuculidae
13	<i>Ardeola grayii</i>	Indian Pond-heron	Ardeidae
14	<i>Bubulcus ibis</i>	Cattle Egret	Ardeidae
15	<i>Egretta garzetta</i>	Little Egret	Ardeidae
16	<i>Tyto alba</i> Common	Barn-owl	Tytonidae
17	<i>Merops orientalis</i>	Asian Green Bee-eater	Meropidae
18	<i>Dendrocopos macei</i>	Fulvous-breasted Woodpecker	Picidae
19	<i>Dicrurus leucophaeus</i>	Ashy Drongo	Dicruridae
20	<i>Dicrurus macrocercus</i>	Black Drongo	Dicruridae
21	<i>Corvus macrorhynchos</i>	Large-billed Crow	Corvidae
22	<i>Corvus splendens</i>	House Crow	Corvidae

SL	Scientific Name	English Name	Family
23	<i>Acrocephalus dumetorum</i>	Blyth's Reed-warbler	Acrocephalidae
24	<i>Hirundo rustica</i>	Barn Swallow	Hirundinidae
25	<i>Pycnonotus cafer</i>	Red-vented Bulbul	Pycnonotidae
26	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	Pycnonotidae
27	<i>Acridotheres fuscus</i>	Jungle Myna	Sturnidae
28	<i>Acridotheres tristis</i>	Common Myna	Sturnidae
29	<i>Copsychus saularis</i>	Oriental Magpie-robin	Muscicapidae
30	<i>Motacilla alba</i>	White Wagtail	Motacillidae

REPTILES:

SL	Scientific Name	English Name	Family
01	<i>Calotes emma</i>	Forest Crested Lizard	Agamidae
02	<i>Calotes versicolor</i>	Common Garden Lizard	Agamidae
03	<i>Gekko gekko</i>	Tokay Gecko	Gekkonidae
04	<i>Hemidactylus frenatus</i>	Common House Gecko	Gekkonidae
05	<i>Eutropis carinata</i>	Keeled Grass Skink	Scincidae
06	<i>Eutropis macularia</i>	Bronze Grass Skink	Scincidae
07	<i>Sphenomorphus maculatus</i>	Spotted Litter Skink	Scincidae
08	<i>Varanus bengalensis</i>	Bengal Monitor	Varanidae
09	<i>Amphotyphlops braminus</i>	Common Blind Snake	Typhlopidae
10	<i>Lycodon aulicus</i>	Common Wolf Snake	Colubridae
11	<i>Xenochrophis piscator</i>	Checkered Keelback	Colubridae
12	<i>Naja naja</i>	Spectacled Cobra	Elapidae
13	<i>Duttaphrynus melanostictus</i>	Common Toad	Bufonidae
14	<i>Microhyla berdmorei</i>	Berdmore's Microhylid Frog	Microhylidae
15	<i>Euphlyctis cyanophlyctis</i>	Common Skipper Frog	Dicroglossidae
16	<i>Hoplobatrachus tigerinus</i>	Indian Bull Frog	Dicroglossidae
17	<i>Polypedates leucomystax</i>	Common Tree Frog	Rhacophoridae

ANNEX 4: LIST OF HIGHER PLANTS (MAMMALS, BIRDS, REPTILES AND AMPHIBIANS) RECORDED IN THE SUBPROJECT AREA

SL	Scientific Name	English Name	Family
01	<i>Pteris vittata</i>	Fern	Pteridaceae
02	<i>Microlepia speluncae</i>	Lacy Fern	Dennstaedtiaceae
03	<i>Thunbergia grandiflora</i>	Black Clock Vine	Acanthaceae
04	<i>Achyranthes aspera</i>	Prickly Chaff-flower	Amaranthaceae
05	<i>Alternanthera philoxeroides</i>	Alligator Weed	Amaranthaceae
06	<i>Amaranthus spinosus</i>	Spiny Amaranth	Amaranthaceae
07	<i>Centella asiatica</i>	Indian Pennywort	Apiaceae
08	<i>Calotropis gigantea</i>	Crown Flower	Asclepiadaceae
09	<i>Ageratum conyzoides</i>	Billy Goat Weed	Asteraceae
10	<i>Chromolaena odorata</i>	Triffid Weed	Asteraceae
11	<i>Crassocephalum crepidioides</i>	Redflower Rag leaf	Asteraceae
12	<i>Eclipta alba</i>	False Daisy	Asteraceae
13	<i>Sphaeranthus indicus</i>	East Indian Globe-thistle	Asteraceae
14	<i>Tridax procumbens</i>	Coat Button	Asteraceae
15	<i>Vernonia cinerea</i>	Little Ironweed	Asteraceae
16	<i>Bombax ceiba</i>	Red Silk Cotton Tree	Bombacaceae
17	<i>Heliotropium indicum</i>	Indian Heliotrop	Boraginaceae
18	<i>Senna occidentalis</i>	Coffee Senna	Caesalpiniaceae
19	<i>Tamarindus indica</i>	Tamarind	Caesalpiniaceae
20	<i>Carica papaya</i>	Papaya	Caricaceae
21	<i>Terminalia catappa</i>	Indian Almond	Combretaceae
22	<i>Ipomoea aquatica</i>	Swamp Cabbage	Convolvulaceae
23	<i>Coccinia grandis</i>	Ivy Gourd	Cucurbitaceae
24	<i>Thladiantha cordifolia</i>	Golden Creeper	Cucurbitaceae
25	<i>Dipterocarpus turbinatus</i>	Garjan-oil Tree	Dipterocarpaceae
26	<i>Croton bonplandianus</i>	Bonplant's Croton	Euphorbiaceae
27	<i>Euphorbia hirta</i>	Snake Weed	Euphorbiaceae
28	<i>Phyllanthus reticulatus</i>	Reticulated Leaf-flaver	Euphorbiaceae
29	<i>Desmodium triflorum</i>	-	Fabaceae
30	<i>Leucas aspera</i>	-	Lamiaceae
31	<i>Abutilon Indicum</i>	Indian Mallow	Malvaceae
32	<i>Hibiscus rosa-sinensis</i>	China Rose	Malvaceae
33	<i>Malvastrum coromandelianum</i>	Coromandel Malva	Malvaceae
34	<i>Acacia auriculiformes</i>	Ear-pod Wattle	Mimosaceae
35	<i>Albizia lebbek</i>	Siris Tree	Mimosaceae
36	<i>Mimosa pudica</i>	Sensitive Plant	Mimosaceae
37	<i>Artocarpus heterophyllus</i>	Jackfruit	Moraceae
38	<i>Ficus benghalensis</i>	Banyan Tree	Moraceae
39	<i>Psidium guajava</i>	Guava	Myrtaceae
40	<i>Syzygium cumini</i>	Black Berry	Myrtaceae
41	<i>Oxalis corniculata</i>	Indian Sorrel	Oxalidaceae
42	<i>Piper betle</i>	Betel	Piperaceae
43	<i>Persicaria lapathifolia</i>	Green Smartweed	Polygonaceae

SL	Scientific Name	English Name	Family
44	<i>Citrus aurantifolia</i>	Common Lime	Rutaceae
45	<i>Citrus maxima</i>	Pummelo	Rutaceae
46	<i>Laportea interrupta</i>	-	Urticaceae
47	<i>Phyla nodiflora</i>	Cape-weed	Verbenaceae
48	<i>Areca catechu</i>	Betel-nut Palm	Araceae
49	<i>Cocos nucifera</i>	Coconut Palm	Araceae
50	<i>Commelina benghalensis</i>	Blue Commelina	Commelinaceae
51	<i>Cyperus compressus</i>	Poorland Flat-sedge	Cyperaceae
52	<i>Cyperus difformis</i>	Small Flower Umbrella Plant	Cyperaceae
53	<i>Lemna perpusilla</i>	Minute Duckweed	Lemnaceae
54	<i>Bambusa balcooa</i>	Bhalku Bamboo	Poaceae
55	<i>Bambusa tulda</i>	Tulda Bamboo	Poaceae
56	<i>Chrysopogon aciculatus</i>	Love Grass	Poaceae
57	<i>Cynodon dactylon</i>	Bahama Grass	Poaceae

ANNEX 5: IUCN GUIDELINE FOR PLANTATION IN THE CAMP

This guideline has been prepared by the International Union of Nature Conservation (IUCN) in collaboration with UNHCR. IUCN carried out a study in August 2018 in Camp 4 of Kutupalong Extension Camp to identify suitable places for plantation, to select suitable species for plantation, and to outline management options for this plantation. Although the plantation guideline is intended for Camp 04, the generalized plantation process can be applied to other camp areas.

The following sections of this study draws the generalized plantation recommendation from the IUCN study. The original study should be cited as:

UNHCR & IUCN. 2018. Plantation and Management Plan for Camp 4, Cox's Bazar. UNHCR, IUCN (International Union for Conservation of Nature), Dhaka, Bangladesh.

The report is available at: https://www.iucn.org/sites/dev/files/content/documents/plantation_and_management_plan_for_camp_4_iucn-unhcr.pdf (Accessed: November 26, 2018).

A. Site preparation

Since the best time to plant is in August, the site should be well-prepared immediately for the plantations.

- The fallow forest sites with bushes of coppice shoots and weeds/grasses, shall be lightly slush, but the coppice shoots of native tree species, for example Puti jam, Kharullah, Suregada, Chatian, and Dumur should be left alone.
- Predetermine the planting position with appropriate spacing and stacking with bamboo sticks.
- On hills/hillocks, make stacking across the slopes for minimizing soil erosion.
- After stacking, make planting pit/hole of 30 cm x 30 cm x 30 cm dimension. Care should be taken to make pits in steep slopes for avoiding soil erosion and land slide. Augur may be use in those areas for making the pits.
- Put handful of decomposed cow dung and 20 g of TSP in each pit, mix well with top soil before planting the seedlings.
- For soil conservation and stabilization, only line planting of Vetiver/ Phuljaru/ Arahar should be done for minimal soil disturbance.

B. Planting Techniques

B 1 Spacing

- Long-, medium- and short-rotation forest trees: 2 m x 2 m
- Shed trees: 4 m x 4 m or depending on suitable lands around homesteads
- Plants for soil stabilization with Vetiver, Phuljaru, Arahar: 40 cm x 40 cm
- Bamboo offset/seedlings/cuttings along creeks/chhara: 5 m x 5 m in alternate position

B 2 Plantation of seedlings

- Distribute the seedlings according to the design of the plantations (short-, medium and long-rotation).
- Short-rotation, fast-growing species shall be planted in mix on the hill-tops.
- Slow-growing, long-rotation species shall be planted at the hill bottom and mid slope.
- Cut polybag with a sharp knife and remove it carefully so that the ball of earth does not break.
- Place the seedling with the ball of earth in the pit/ hole. Take proper care so that roots do not curl or bend in the holes.

- Make sure that root-collar region of the seedling is just below the soil surface. Tighten the soil by tramping with feet/hand around the seedlings, so that there does not remain any air-space inside the planting hole.
- In the low-lying areas, ensure that no water can stand at the root-collar zone. This may be achieved by slightly raising the soil surface in the seedling region.

C. Post-plantation management and maintenance

C1 Weeding

Weeding schedule is given below:

- 3 weeding in 1st year (August, October & April-May of next year).
- 2 weeding in 2nd year (July-August and May-June).
- 1 weeding in 3rd year (May-June depending on rainfall & severity of weed growth).

Note: Weeding pattern shall be circular (50 cm around the seedling/sapling) or line (50 cm all along). Complete weeding is not recommended for halting the soil erosion.

C2 Vacancy filling

- If any vacancy occurs, have to fill it up at the end of the plantation programme (if rain exists).
- Priority shall be given for the same species for vacancy filling.

C3 Fertilizations

- If the soil of the plantation area is fertile, generally fertilization is not essential.
- Since the camp plantation site is degraded, it needs adequate fertilizer application: Urea 30 g, TSP 20 g with a basal dose of 20 kg/ha of MP.
- Thoroughly mix full dose of TSP and half of urea with the soil of planting hole/pit.
- Apply the rest half of urea after 30-40 days of planting the seedlings (if drought starts, be careful about the application of urea).

C4 Watering/ Irrigation

- If watering/ irrigation is possible, seedlings must be benefited and growth will be enhanced.

C5 Mulching



Mulching is useful to conserve soil moisture for the seedlings during the dry period and release nutrients after gradual decomposition.

- Mulching helps to conserve 20–25% soil moisture, thus helps the seedling further growth during dry period.
- Kitchen waste (biodegradable) and leaf-litter/grass may be used for mulching in the camp site.
- About 2" thick mulching may be given from 1-2" distance from the seedling.

D. Records, Monitoring, and Evaluation

- Make a register/plantation Journal for each site, indicating the details of plantation activities.
- Make a detailed map of the plantation indicating the ordinates, plantation type and species with topography of the site.
- Keep record of all activities, e.g. nursery raising, purchase of seedlings (species, prices and average height), field preparation and out-planting etc.
- Record the silvicultural treatments, e.g. weeding, cleaning, vacancy filling, mulching, irrigation and any damages, if happened, etc.
- Take photographs of the activities (before, during and after planting activities).
- Record the survival, height growth and diameter of the seedlings planted at each site.

ANNEX 6: TEST RESULTS FOR GROUNDWATER QUALITY

	Government of the People's Republic of Bangladesh Office of the Chief Chemist Department of Public Health Engineering Central Lab, 38-39, Mohakhali C/A, Dhaka-1212 Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com	
---	--	---

Lab Memo: 1792/ CC, DPHE, CL, Dhaka.

Date: 27-06-2019

Physical /Chemical/ Bacteriological Analysis of Water Sample

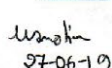
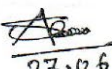
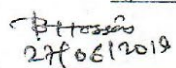
Sample ID: CEN2019060127	Sample Receiving date: 19-06-2019
Ref. Memo No: 48.03.2294.301.16.015.18-180 & Dated: 17-06-2019	Sample Source: Test Tube Well
Sent by: Md. Ibrahim Khalil, Sub-assst. Engineer, DPHE, Ukhia Upazila, Cox's Bazar.	Dist: Cox's Bazar, Upazila: Ukhia
Care Taker: DPHE, Ukhia Upazila, Cox's Bazar (TTW-01) 27.6.19	Union, Vill.:
Sample Collection date:	Date of Testing: 19/06/2019-26/06/2019



LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Alkalinity	-	195	mg/L	Titrimetric	-
2	Arsenic (As)	0.05	0.001	mg/L	AAS	0.001
3	Chloride	150-600	12	mg/L	Titrimetric	-
4	EC	-	340	µS/cm	Multimeter	-
5	Hardness	200-500	143	mg/L	Titrimetric	-
6	Iron (Fe)	0.3-1	1.09	mg/L	AAS	0.05
7	Manganese (Mn)	0.1	0.05	mg/L	AAS	0.03
8	pH	6.5-8.5	7.3	-	pH Meter	-
9	Total Dissolved Solid (TDS)	1000	168	mg/L	Multimeter	-

Comments: Sample was collected & Supplied by client.

N.B: AAS - Atomic Absorption Spectrophotometer, LOQ - Limit of Quantitation.

Test Performed by: 1.) Name: Mahabuba Sabina Motin Designation: Sample Analyzer Signature:  27-06-19 2.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature:  27-06-19	Countersigned/Approved by: 1.) Name: Md. Biplab Hossain Designation: Chief Chemist Signature:  27-06-2019 2.) Name: _____ Designation: _____
--	--

	Government of the People's Republic of Bangladesh Office of the Chief Chemist Department of Public Health Engineering Central Lab, 38-39, Mohakhali C/A, Dhaka-1212 Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com	
---	--	---

Lab Memo: 1772/ CC, DPHE, CL, Dhaka.

Date: 24-06-2019

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2019060090	Sample Receiving date: 16-06-2019
Ref. Memo No: 46.03.2294.301.16.015.18-173 & Dated: 29-05-2019	Sample Source: Test Tube Well
Sent by: Md. Ibrahim Khalil, Sub-asst. Engineer, DPHE, Ukhia Upazila, Cox's Bazar.	Dist: Cox's Bazar, Upa: Ukhia Upazila
Care Taker: DPHE, Ukhia Upazila, Cox's Bazar. <i>(TTW 3) 24.6</i>	Union: Vill.: Rohingya Camp
Sample Collection date:	Date of Testing: 16/06/2019-24/06/2019

LABORATORY TEST RESULTS:



Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Alkalinity	-	225	mg/L	Titrimetic	-
2	Arsenic (As)	0.05	0.001	mg/L	AAS	0.001
3	Chloride	150-600	15	mg/L	Titrimetic	-
4	EC	-	405	μS/cm	Multimeter	-
5	Hardness	200-500	120	mg/L	Titrimetic	-
6	Iron (Fe)	0.3-1	0.23	mg/L	AAS	0.05
7	Manganese (Mn)	0.1	0.03	mg/L	AAS	0.03
8	pH	6.5-8.5	8.1	-	pH Meter	-
9	Total Dissolved Solid (TDS)	1000	201	mg/L	Multimeter	-



Comments: Sample was collected & Supplied by client.

N.B: AAS - Atomic Absorption Spectrophotometer, LOQ - Limit of Quantitation.

Test Performed by:		Countersigned/Approved by:	
1.) Name: Mahabuba Sabina Motin	Signature <i>Mahabuba</i> 24-06-19	1.) Name: Mita Sarker	Signature <i>Mita Sarker</i> 24/06/19
Designation: Sample Analyzer		Designation: Senior Chemist	
2.) Name: Md. Saiful Alam Khosru	Signature <i>Saiful Alam</i> 24.06.19	2.) Name: Md. Biplab Hossain	Signature <i>Biplab Hossain</i> 24/06/19
Designation: Sample Analyzer		Designation: Chief Chemist	

Md. Biplab Hossain
 Chief Chemist
 Department of Public Health Engineering
 Central Laboratory, Mohakhali, Dhaka.

	Government of the People's Republic of Bangladesh Office of the Chief Chemist Department of Public Health Engineering Central Lab, 38-39, Mohakhali C/A, Dhaka-1212 Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com					
Lab Memo: 1792/CC, DPHE, CL, Dhaka.		Date: 27-06-2019				
Physical /Chemical/ Bacteriological Analysis of Water Sample						
Sample ID: CEN2019060128		Sample Receiving date: 19-06-2019				
Ref. Memo No: 46.03.2294.301.16.015.18-180 & Dated: 17-06-2019		Sample Source: Test Tube Well				
Sent by: Md. Ibrahim Khalil, Sub-asst. Engineer, DPHE, Ukhia Upazila, Cox's Bazar.		Dist: Cox's Bazar, Upa: Ukhia Upazila				
Care Taker: DPHE, Ukhia Upazila, Cox's Bazar (TTW-04) 1912		Union:, Vill.:				
Sample Collection date:		Date of Testing: 19/06/2019-26/06/2019				
LABORATORY TEST RESULTS:						
Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Alkalinity	-	145	mg/L	Titrimetic	-
2	Arsenic (As)	0.05	0.001	mg/L	AAS	0.001
3	Chloride	150-600	10	mg/L	Titrimetic	-
4	EC	-	288	µS/cm	Multimeter	-
5	Hardness	200-500	184	mg/L	Titrimetic	-
6	Iron (Fe)	0.3-1	0.52	mg/L	AAS	0.05
7	Manganese (Mn)	0.1	0.06	mg/L	AAS	0.03
8	pH	6.5-8.5	7.2	-	pH Meter	-
9	Total Dissolved Solid (TDS)	1000	142	mg/L	Multimeter	-
Comments: Sample was collected & Supplied by client. N.B: AAS - Atomic Absorption Spectrophotometer, LOQ - Limit of Quantitation.						
Test Performed by: 1.) Name: Mahabuba Sabina Motin Designation: Sample Analyzer Signature: <i>Mahabuba Sabina Motin</i> 27-06-19 2.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature: <i>Md. Saiful Alam Khosru</i> 27.06.19		Countersigned/Approved by: 1.) Name: Md. Biplab Hossain Designation: Chief Chemist Signature: <i>Md. Biplab Hossain</i> 27-06-19 2.) Name: Designation:				

	<p align="center">Government of the People's Republic of Bangladesh Office of the Chief Chemist Department of Public Health Engineering Central Lab, 38-39, Mohakhali C/A, Dhaka-1212 Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com</p>	
---	--	---

Lab Memo: 045/ CC, DPHE, CL, Dhaka.

Date: 11-07-2019

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2019070071	Sample Receiving date: 02-07-2019
Ref. Memo No: 46.03.2294.301.16.015.18-184 & Dated: 23-06-2019	Sample Source: Test Tube Well
Sent by: Md. Ibrahim Khalil, Sub-asst. Engineer, DPHE, Ukhia Upazila, Cox's Bazar.	Dist: Cox's Bazar, Upa: Ukhia Upazila
Care Taker: DPHE, Ukhia Upazila, Cox's Bazar (TTW-5) 5.04	Union: Vill.: Rohingya Camp-05
Sample Collection date:	Date of Testing: 02/07/2019-10/07/2019

LABORATORY TEST RESULTS:



Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Alkalinity	-	175	mg/L	Titrimetic	-
2	Arsenic (As)	0.05	0.001	mg/L	AAS	0.001
3	Chloride	150-600	15	mg/L	Titrimetic	-
4	EC	-	285	μS/cm	Multimeter	-
5	Hardness	200-500	190	mg/L	Titrimetic	-
6	Iron (Fe)	0.3-1	1.24	mg/L	AAS	0.05
7	Manganese (Mn)	0.1	0.06	mg/L	AAS	0.03
8	pH	6.5-8.5	7.7	-	pH Meter	-
9	Total Dissolved Solid (TDS)	1000	140	mg/L	Multimeter	-

Comments: Sample was collected & Supplied by client.

N.B: AAS - Atomic Absorption Spectrophotometer, LOQ - Limit of Quantitation.

Test Performed by:		Countersigned/Approved by:	
1.) Name: Mahabuba Sabina Motin	Signature 11-07-19	1.) Name: Mita Sarker	Signature 11-07-19
Designation: Sample Analyzer		Designation: Senior Chemist	
2.) Name: Md. Saiful Alam Khosru	Signature 11-07-19	2.) Name: Md. Biplab Hossain	Signature 11-07-19
Designation: Sample Analyzer		Designation: Chief Chemist	

Md. Biplab Hossain
 Chief Chemist
 Department of Public Health Engineering
 Central Laboratory Mohakhali, Dhaka

	Government of the People's Republic of Bangladesh Office of the Chief Chemist Department of Public Health Engineering Central Lab, 38-39, Mohakhali C/A, Dhaka-1212 Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com	
---	--	---

Lab Memo: 045/ CC, DPHE, CL, Dhaka.

Date: 11-07-2019

Physical /Chemical/ Bacteriological Analysis of Water Sample

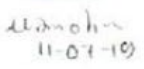
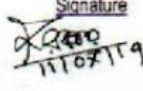

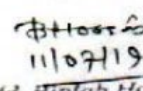
Sample ID: CEN2019070072	Sample Receiving date: 02-07-2019
Ref. Memo No: 46.03.2294.301.16.015.18-193 & Dated: 27-06-2019	Sample Source: Test Tube Well
Sent by: Md. Ibrahim Khalil, Sub-asst. Engineer, DPHE, Ukhia Upazila, Cox's Bazar.	Dist: Cox's Bazar, Upa Ukhia Upazila
Care Taker: DPHE, Ukhia Upazila, Cox's Bazar (TTW-6) 5.05	Union: Vill: Rohingya Camp-05
Sample Collection date:	Date of Testing: 02/07/2019-10/07/2019

LABORATORY TEST RESULTS:



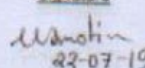
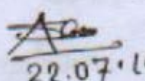
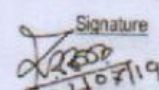
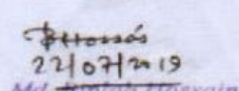
Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Alkalinity	-	170	mg/L	Titrimetic	-
2	Arsenic (As)	0.05	0.001	mg/L	AAS	0.001
3	Chloride	150-600	15	mg/L	Titrimetic	-
4	EC	-	270	µS/cm	Multimeter	-
5	Hardness	200-500	202	mg/L	Titrimetic	-
6	Iron (Fe)	0.3-1	0.09	mg/L	AAS	0.05
7	Manganese (Mn)	0.1	0.04	mg/L	AAS	0.03
8	pH	6.5-8.5	7.4	-	pH Meter	-
9	Total Dissolved Solid (TDS)	1000	133	mg/L	Multimeter	-



Comments: Sample was collected & Supplied by client.

N.B: AAS - Atomic Absorption Spectrophotometer, LOQ - Limit of Quantitation.

<u>Test Performed by:</u>		<u>Countersigned/Approved by:</u>	
1.) Name: Mahabuba Sabina Motin	Signature  11-07-19	1.) Name: Mita Sarker	Signature  11/07/19
2.) Name: Md. Saiful Alam Khosru	Signature  11.07.19	2.) Name: Md. Biplob Hossain	Signature  11/07/19
Designation: Sample Analyzer		Designation: Senior Chemist	
Designation: Sample Analyzer		Designation: Chief Chemist	

Md. Biplob Hossain
 Chief Chemist
 Department of Public Health Engineering
 Central Laboratory Mohakhali, Dhaka

	Government of the People's Republic of Bangladesh Office of the Chief Chemist Department of Public Health Engineering Central Lab, 38-39, Mohakhali C/A, Dhaka-1212 Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com					
Lab Memo: 068/ CC, DPHE, CL, Dhaka.		Date: 22-07-2019				
Physical /Chemical/ Bacteriological Analysis of Water Sample						
Sample ID: CEN2019070153		Sample Receiving date: 11-07-2019				
Ref. Memo No: 46.03.2294.301.16.015.18-206 & Dated: 07-07-2019		Sample Source: Test Tube Well				
Sent by: Md. Ibrahim Khalil, Sub-asst. Engineer, DPHE, Ukhia Upazila, Cox's Bazar.		Dist Cox's Bazar, Upa: Ukhia Upazila				
Care Taker: DPHE, Ukhia Upazila, Cox's Bazar (TTW-8) 5.06		Union:, Vill. Ukhia Camp-5				
Sample Collection date:		Date of Testing: 11/07/2019-20/07/2019				
LABORATORY TEST RESULTS:						
Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Alkalinity	-	195	mg/L	Titrimetic	-
2	Arsenic (As)	0.05	0.001	mg/L	AAS	0.001
3	Chloride	150-600	15	mg/L	Titrimetic	-
4	EC	-	354	µS/cm	Multimeter	-
5	Hardness	200-500	155	mg/L	Titrimetic	-
6	Iron (Fe)	0.3-1	0.31	mg/L	AAS	0.05
7	Manganese (Mn)	0.1	0.03	mg/L	AAS	0.03
8	pH	6.5-8.5	7.5	-	pH Meter	-
9	Total Dissolved Solid (TDS)	1000	167	mg/L	Multimeter	-
Comments: Sample was collected & Supplied by client. N.B: AAS - Atomic Absorption Spectrophotometer, LOQ - Limit of Quantitation.						
Test Performed by: 1.) Name: Mahabuba Sabina Motin Designation: Sample Analyzer Signature:  22-07-19 2.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature:  22.07.19		Countersigned/Approved by: 1.) Name: Mita Sarker Designation: Senior Chemist Signature:  22/07/19 2.) Name: Md. Biplab Hossain Designation: Chief Chemist Signature:  22/07/2019 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka.				

	Government of the People's Republic of Bangladesh Office of the Chief Chemist Department of Public Health Engineering Central Lab, 38-39, Mohakhali C/A, Dhaka-1212 Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com	
Lab Memo: 068/ CC, DPHE, CL, Dhaka.		Date: 22-07-2019
Physical /Chemical/ Bacteriological Analysis of Water Sample		
Sample ID: CEN2019070155		Sample Receiving date: 11-07-2019
Ref. Memo No: 46.03.2294.301.16.015.18-206 & Dated: 07-07-2019		Sample Source: Test Tube Well
Sent by: Md. Ibrahim Khalil, Sub-asst. Engineer, DPHE, Ukhia Upazila, Cox's Bazar.		Dist Cox's Bazar, Upa: Ukhia Upazila
Care Taker: DPHE, Ukhia Upazila, Cox's Bazar (TTW-10) <i>2E-02</i>		Union: Vill. Ukhia Camp-2E
Sample Collection date:		Date of Testing: 11/07/2019-20/07/2019

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Alkalinity	-	205	mg/L	Titrimetic	-
2	Arsenic (As)	0.05	0.001	mg/L	AAS	0.001
3	Chloride	150-600	15	mg/L	Titrimetic	-
4	EC	-	394	µS/cm	Multimeter	-
5	Hardness	200-500	145	mg/L	Titrimetic	-
6	Iron (Fe)	0.3-1	0.37	mg/L	AAS	0.05
7	Manganese (Mn)	0.1	0.04	mg/L	AAS	0.03
8	pH	6.5-8.5	7.4	-	pH Meter	-
9	Total Dissolved Solid (TDS)	1000	191	mg/L	Multimeter	-

Comments: Sample was collected & Supplied by client.
 N.B: AAS - Atomic Absorption Spectrophotometer, LOQ - Limit of Quantitation.

Test Performed by: 1.) Name: Mahabuba Sabina Motin Designation: Sample Analyzer <div style="text-align: right;"> <i>Mahabuba</i> <i>22-07-19</i> </div> 2.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer <div style="text-align: right;"> <i>AS</i> <i>22.07.19</i> </div>	Countersigned/Approved by: 1.) Name: Mita Sarker Designation: Senior Chemist <div style="text-align: right;"> <i>Mita Sarker</i> <i>22/07/19</i> </div> 2.) Name: Md. Biplab Hossain Designation: Chief Chemist <div style="text-align: right;"> <i>Biplab Hossain</i> <i>22/07/2019</i> Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka </div>
---	---