

Initial Environmental Examination

Project No. 52174-001
April 2022

Bangladesh: Emergency Assistance Project

02 small surface water treatment plants

DRAFT

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

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Emergency Assistance Project

ADB Project 52174-001 | Grant 0582-BAN | TA 9546 BAN

Initial Environmental Examination

Package

BANGLADESH: Emergency Assistance Project – 02 small surface water treatment plants constructed or expanded by 2024

Implementing Agency

Department of Public Health Engineering (DPHE)

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BAN: EMERGENCY ASSISTANCE PROJECT

Component: Water supply and sanitation

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The environmental impact assessment report 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.

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ABBREVIATIONS

ADB	Asian Development Bank
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BREB	Bangladesh Rural Electrification Board
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
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ETP	Effluent Treatment Plant
GoB	Government of Bangladesh
H&S	Health and Safety
IEE	Initial Environmental Examination
LGED	Local Government Engineering Certificate
MPEMR	Ministry of Power, Energy and Mineral Resources
NFP	National Forest Policy
NOC	No Objection Certificate
RHD	Roads and Highways
RRRC	The Refugee Relief and Repatriation Commission
SPS	Safeguards Policy Statement
SSC	Site Clearance Certificate
ToR	Terms of Reference
UN	United Nations
US EPA	United States Environmental Protection Agency
WB	World Bank

Executive Summary

1 The project is known as the Emergency Assistance Project (EAP). The project will support the Government of Bangladesh in addressing the immediate and urgent needs of the displaced persons from Myanmar in Cox's bazar District, as identified by the United Nations (UN) in its Joint Response Plan (JRP) (displaced persons). The project will mainly support the improvement of water supply and sanitation, disaster risk management, sustainable energy supply, and access roads. The first phase of the project is under implementation and planned to be completed by 2021. Now ADB is planning to grant additional financing and thus some additional subprojects are under formulation to be accomplished by 2024.

2 The project is aligned with the following impact: social recovery of displaced persons in Teknaf and Ukhiya 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. The additional financing planned for EAP is aimed to for the following impact: 'social recovery of displaced persons in Teknaf and Ukhiya camps accelerated'. The outcome of the additional financing is redefined as 'living conditions and resilience of displaced persons improved: people directly benefited: 855,000 displaced persons. People indirectly benefited: 444,000 host communities.

3 The subproject dealt in this report is under Output 01 which intend benefit 607,000 displaced persons¹ directly and 284,000 host communities indirectly. The subproject is: "Two (02) small surface water treatment plants constructed or expanded by 2024". The Surface Water Treatment Plants (SWTP) are targeted for both refugee and host communities. The first SWTP is to be located in Palongkhali, Ukhiya where 01 conventional and 01 portable will be treatment facility will be placed. The Naf River at Palongkhali BGB Camp Point, Ukhiya will serve as the source of water for the SWTP. The second SWTP will be located at Chandrakilla, Teknaf with same facilities (01 conventional and 01 portable treatment facility). A local lake fed by hilly streams will serve as the source of water.

4 The exact locations are yet to be pinpointed at this moment. The Executive agency (EA) of this subproject Department of Public Health Engineering (DPHE) intends to construct a similar kind of SWTP that is under implementation in Palongkhali BGB Camp Point, Ukhiya. The current plan is to construct another facility beside the existing facility which is expected to be very similar in design and size. Although final plan will be guided by the land available for purchase. The second site, aside Palongkhali is in Teknaf, a lake locally known as "Chandrakilla" or "Chander killa". However, package-wise detail design, orientation of the proposed facilities, space availability, soil testing, topographic survey etc. are yet to be performed (further explained in para 85). Therefore, the entire list is considered as sub-project and dealt with in this report.

5 **Objective:** Environmental Assessment is a prerequisite to any construction project in Bangladesh. This Initial Environmental Examination (IEE) has been prepared based on the Environmental Assessment and Review Framework (EARF) developed by the ADB and endorsed by Bangladesh Government. The IEE follows the guidelines of the Department of Environment (DoE) as required by the Environmental Conservation Rule (ECR) 1997 (amended 2002), essentially aligned with the Safeguard Policy Statement 2009 (SPS 2009) of ADB and will be disclosed in the websites of the ADB and the implementing agencies as per requirement of ADB and GoB. This document shall serve as the base of environmental assessment

¹ 71% of the uncovered household as per the JRP under WASH indicator

of the proposed sub-project to be implemented by the executing agency and guideline for environmental management activities on-site.

6 **Limitations:** As described in the earlier paragraph (para 80), the proposed facilities are still to be pinpointed with in the intended locations. The EA of this subproject, DPHE intends to construct similar facilities as the existing ones being implemented in Ukhiya. However, size and capacity of the facility is yet to be decided and only can be known after DPHE come into agreement with local authority and landowner. For Ukhiya site, DPHE already has a subproject under implementation and intends to construct similar structural measures, some appraisal information is available through DPHE led study². However, in the Teknaf site, any appraisal study yet to be conducted. As a result, this environmental impact study has been impeded, thus indicative in nature. 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.

7 The environmental category of the sub-project is listed in Schedule – 1 of ECR. As per Schedule 1 of ECR, integrated waste management subproject is likely to be classified as Red Category (Table II-4). Thus, SCC and ECC is required prior to commencement of the subproject. The SCC needs to be obtained preliminarily from the RRRC while ECC needs to be obtained from DoE. The project has been categorized as B for environment under the ADB's Safeguards Policy Statement 2009 (SPS).

8 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. 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.

9 The environmental category of the sub-project is listed in Schedule – 1 of ECR. As per Schedule 1 of ECR, surface water based pipe water supply subproject is likely to be classified as red category (Table II-4). Thus, SCC and ECC is required prior to commencement of the subproject. The SCC needs to be obtained from local authorities (respective Upazila parishad and District commissioner of Cox's Bazar) while ECC needs to be obtained from DoE. The project has been categorized as B for environment under the ADB's Safeguards Policy Statement 2009 (SPS).

10 The proposed subproject is envisaged to be constructed in Ukhia and Teknaf upazila which is situated south of Cox's Bazar and borders with the Rakhine state in Myanmar. The contract packages linked to the development of integrated water supply schemes (total 07 nos. to be implemented under EAP) will

² DPHE (2020) Sub-project Technical Appraisal Report: Design and Construction of Piped Water Supply with Surface Water Reservoir, Treatment System and Other Associated Facilities at Ukhiya, Emergency Assistance Project, Cox's Bazar. Reptot submitted by: Joint Venture of BETS Consulting Services Ltd., DevConsultants Ltd. (DevCon) & Institute of Water Modelling (IWM)

be implemented in the 27 nos. Refugee Camps in Ukhiya & Kutubpalang. Teknaf Game Reserve is west of Kutubpalong encompasses an area of 11,615 hectares.

11 **Asian elephant:** During field visit evidence of elephants visiting the region for water and food was observed (Figure III-13). It was found that elephants come to nearby hills in search of banana trees. The locals reported that the elephants also drink water from the hilly streams. However, elephants have not been reported in the region to be attacking humans. Locals opined; this is may be due to availability of enough food for the elephants in the region.

12 **Landform:** Teknaf Peninsula (covering Ukhiya and Teknaf upazila) is one of the longest sandy beach ecosystems (80 km) in the world. It represents a transitional ground for the fauna of the Indo-Himalayan and Indo-Malayan ecological sub-regions. Important habitats at the site include mangrove, mudflats, beaches and sand dunes, canals and lagoons and marine habitat. Mangrove forest occurs in Teknaf peninsula both as natural forest with planted stands and mostly distributed in the inter-tidal zone. The Teknaf peninsula mangroves supports the habitat of 161 different species of fish³. Teknaf reserved forest is one of the oldest reserved forests in Bangladesh.

13 **Disasters:** Most of the areas of Cox's Bazar district surrounded by hills, rivers and being adjacent to the Bay of Bengal, natural disaster visited the district every year. Subsequently, the inhabitants of the district suffer much by the disaster. Adding this, climate change effect has speed up the frequency natural disaster like, cyclone, tidal surge, flesh flood, excessive rainfall, rising temperature, increase salinity, land slide, erosion of riverbanks, thunderstorm, earthquake etc. and these are the major disaster for Cox's Bazar district. As part of history of natural disaster for the region there are few events are most remarkable and historic.

14 **Geology:** Cox's Bazar-Teknaf area consists of low coastal plain with dunes and hinders land behind the coast consisting of steep but low cliffs (Figure V-5). Several beaches and tidal flats developed in this area. The straight coastline and steep cliffs along this coast suggest that it has developed by faulting and down warping. This coast has modified by in different times with response to tectonic and marine transgression and regression.

15 **Soils:** There are four main soils or physiographic units can be recognized, viz. I) The higher hill ranges occupy a narrow belt: the most common soils are strong brown, friable, silty clay loams and silty clays, which grade into broken shale rock at 2-4 feet. All soils are strongly acid in reaction; II) The lower hill ranges are developed in unconsolidated sands and clays. Soils are mainly deep red, friable, clay loams to clays. All the soils are strongly acid and sandy soils are droughty; III) The coastal plains are underlain by heavy marine or tidal clays characterized by more sandy and silty deposit near the foot of the hills and along the course of rivers and streams which cross the plains. Near the coast, some of these soils become saline at the end of the dry seasons; IV) The tidal mangrove swamps are most extensive at the mouth of the Matamuhuri River Here the soils are grey clay flooded twice daily by saline water and unsuitable for agriculture.

16 **Temperature:** Generally, maximum temperature in the year reach between the last week of March and end of May. Temperature data is recorded at station Cox's Bazar. As dis discussed above, Teknaf is a upazila (subdistrict) of the Cox's Bazar zila (District). The average maximum temperature in Cox's Bazar is 31.28°C in April and minimum is 22.0°C in January (Data from BMD 2016).

³ Chowdhury, N. Shah Nawaz; Hossain, M. Shahadat; Das, Nani Gopal; Barua, Prabal (2010). "Environmental variables and fisheries diversity of the Naaf River Estuary, Bangladesh". *Journal of Coastal Conservation*. 15 (1): 163–180. doi:10.1007/s11852-010-0130-3

17 **Rainfall:** The trend of rainfall of Cox's Bazar district was as usual and normal before 1991, however, radical changes have been observed in the recent years, in particularly after the year 2000. Once, the rainfall and its continuation were steady according to the seasons of the year. Interest, 1994 a remarkable change in rainfall has observed. In general, there was no much rain during the month of January to April, and it happened during from April to June of the year. On the contrary, sometime rainfall occurs during the month of December which creates flooding.

18 **Hydrology:** The Moheshkhali Channel, Baak Khali and Naf rivers and Bay of Bengal are the main waterways of the region. The Moheshkhali Channel flows into the Bay of Bengal near Cox's Bazar and passes the north western boundary of the area of influence. The Bakkhali River originates from the Chittagong Hill Tracts and flows into the Bay near Cox's Bazar. Five other canals run through the hilly hinterland. They are the Reju, Inani, Mankhali, Rajachora and Mathabanga canals. In addition, a stream network runs through the camp area.

19 **Drinking water:** Camp 4 in Kutupalong depends on the groundwater and uses tube wells to access the resource (Sikdar 2010)⁴. 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)⁵. 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.

20 **Flooding:** 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.

21 **Landslides:** Results of a landslide hazard study at Cox's bazar by Ahmed et al (2020)⁶ concluded that: "the results reveal that an enormous forest area has been wiped out to build the camps in CBD⁷ that has significantly increased landslide vulnerability of the Rohingya refugees and their host communities. Landslides in the region largely occur in June and July, and consecutive 5-day cumulative rainfall of 95–220 mm could trigger landslides in high susceptible areas."

22 **Faunal Species:** The influx of population have a significant impact on wildlife by shrinking habitats and disruptions in breeding grounds are affecting nocturnal, crepuscular and diurnal wildlife. Apart from the degradation of forest land along region, 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 (IUCN 2002⁸).

⁴ 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.

⁵ 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.

⁶ Bayes Ahmed, Md. Shahinoor Rahman, Peter Sammonds, Rahenul Islam & Kabir Uddin (2020) Application of geospatial technologies in developing a dynamic landslide early warning system in a humanitarian context: the Rohingya refugee crisis in Cox's Bazar, Bangladesh, *Geomatics, Natural Hazards and Risk*, 11:1, 446-468, DOI: 10.1080/19475705.2020.1730988

⁷ CBD stands for Cox's Bazar District.

⁸ IUCN. (2002). Bio-ecological Zones of Bangladesh. Dhaka: IUCN-The World Conservation Union .

23 **Common birds:** Common bird species noted in the subproject area were Asian crow, myna, cuckoo, kingfisher, pigeon and dove satore, drongo, weaver bird choro, babui, and dahuk (Figure V-16). The mammals include fox, monkey, mongoose, Bengal monitor, various rodents etc (Khan 2019). There are also several species of frog, lizard and snake. Socio-economic and Socio-cultural Environment.

24 **Floral 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. There is a small section of mangrove forest on the coast near Kutupalong which encompasses a diverse ecosystem, including medicinal plants (BCAS, 2008).

25 **Asian Elephants:** There is evidence of presence of elephants in the raw water source area in Nayapara camp area (**Error! Reference source not found.**). Elephants now-a-days rarely visit the waterbody, but it is likely that they will visit frequently in the future when the waterbody will contain plenty of water. Host and Rohingya communities are encroaching on its habitat in the Teknaf Wildlife Sanctuary, and both resident and migratory elephants are facing a continuous shrinkage of their habitat and food supply. 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).

26 **Protected areas:** Originally designated as Teknaf game reserve in 1983, in December 2009 the Government of Bangladesh enhanced its status to a Wildlife Sanctuary protecting 11,615 hectares. It is located in Teknaf Upazila of Cox's Bazar District, and comprises a range of steep hills aligned north-south and bordered by the Bay of Bengal to the west and a narrow strip of lowlands and settlements along the Naf river to the south and east, and Inani reserve forest to the north.

27 **Risk assessment:** Following the method given in Methodology (Chapter VI, Section B) an impact matrix was developed for the subproject as shown in Table VI-4 and Table VI-5 Risk Matrix of evaluation of Identified Environmental Impacts and Risks of the proposed subproject at Chandrakilla SWTP below. This matrix serves the basis of the impact assessment and Environmental management plan (EMP).

Table: Risk Matrix of evaluation of Identified Environmental Impacts and Risks of the proposed subproject at Palongkhali SWTP

Potential Impacts	Impact Sign (beneficial = +ve Detrimental = -ve)	Magnitude	Likelihood	Risk Score	Impact size	Impact type	Mitigation possible? (y/n)	Residual impact*
Environmental Impacts During Planning phase (if not well planned)								
Permits, clearances, no objection certificate etc.	-	5	1	5	L	D	Y	N
Impacts of Extreme climatic event	-	3	3	9	L	D	Y	N
Protection of Asian elephant	-	5	1	5	R	I	Y	N
Failure to consider site specific hydrological system	-	5	1	5	L	D	Y	N
Loss of structures and existing utilities	-	5	3	15	L	D	Y	N
Sources of materials	-	3	2	6	L	D	Y	N
EMP implementation training	-	4	4	16	L	D	Y	M

Potential Impacts	Impact Sign (beneficial = +ve Detrimental = -ve)	Magnitude	Likelihood	Risk Score	Impact size	Impact type	Mitigation possible? (y/n)	Residual impact*
Environmental Impacts During Construction Phase								
Damage to physical and Cultural Heritage	-	1	1	1	L	D	Y	N
Removal of forest area/vegetated area	-	3	5	15	L	D	Y	M
Blockage of streams/change hydrological regime	-	4	1	4	L	D	Y	N
Construction work camps and pollute local waterbody/soils	-	3	3	9	L	D	Y	M
Excavations and soil disturbance	-	3	2	6	L	D	Y	N
Access road construction and disturbance local ecology	-	3	5	15	L	D	Y	N
Pile driving generated noise, vibration and soil/water pollution	-	3	5	15	L	D	Y	N
Waste pollution	-	3	4	12	L	D	Y	N
Water quality	-	3	4	12	L	D	Y	N
Air Quality	-	3	4	12	L	D	Y	N
Noise Level	-	2	5	10	L	D	Y	N
Hampering biodiversity protection in the region	-	3	2	6	L	D	Y	N
Socio-economic disturbance	-	2	2	4	L	D	Y	N
Lack of worker facilities	-	5	5	25	L	D	Y	N
Worker health and safety	-	5	5	25	L	D	Y	N
Community health and safety (including school going children)	-	5	5	25	L	D	Y	N
Site reinstatement	-	4	1	4	L	D	Y	N
Employment Generation and Increase in income	+							
Enhancement of Community Development Service	+							
Skill Enhancement	+							
Environmental Impacts During O&M Phase								
Hill/soil erosion and downhill siltation	-	3	1	3	L	I	Y	M
Site integrity and security risk (i.e. landslide)	+							
Water contamination from water usage	+							
Sludge management	+							
Biodiversity protection	+							
Occupational health and safety	+							
Waterlogging conditions reduced or non-existent	+							
Reduction of risk of vector borne diseases	+							
Clean water and easy access to the drinking water	+							

Potential Impacts	Impact Sign (beneficial = +ve Detrimental = -ve)	Magnitude	Likelihood	Risk Score	Impact sizeα	Impact typeβ	Mitigation possible? (y/n)	Residual impact*
Strengthen of bank areas reducing erosion	+							
Safer establishments on the banks of the canal	+							

Table: Risk Matrix of evaluation of Identified Environmental Impacts and Risks of the proposed subproject at Chndrakilla SWTP

Potential Impacts	Impact Sign (beneficial = +ve Detrimental = -ve)	Magnitude	Likelihood	Risk Score	Impact sizeα	Impact typeβ	Mitigation possible? (y/n)	Residual impact*
Environmental Impacts During Planning phase (if not well planned)								
Permits, clearances, no objection certificate etc.	-	5	5	25	L	D	Y	N
Impacts of Extreme climatic event	-	5	5	25	L	D	Y	N
Protection of Asian elephant	-	5	5	25	R	I	Y	N
Failure to consider site specific hydrological system	-	5	1	5	L	D	Y	N
Loss of structures and existing utilities	-	5	5	25	L	D	Y	N
Sources of materials	-	3	2	6	L	D	Y	N
EMP implementation training	-	4	4	16	L	D	Y	M
Environmental Impacts During Construction Phase								
Damage to physical and Cultural Heritage	-	1	1	1	L	D	Y	N
Removal of forest area/vegetated area	-	5	5	25	L	D	Y	M
Blockage of streams/change hydrological regime	-	4	1	4	L	D	Y	N
Construction work camps and pollute local waterbody/soils	-	3	3	9	L	D	Y	M
Excavations and soil disturbance	-	3	2	6	L	D	Y	N
Access road construction and disturbance local ecology	-	3	5	15	L	D	Y	N
Pile driving generated noise, vibration and soil/water pollution	-	3	5	15	L	D	Y	N
Waste pollution	-	3	4	12	L	D	Y	N
Water quality	-	3	4	12	L	D	Y	N
Air Quality	-	3	4	12	L	D	Y	N
Noise Level	-	2	5	10	L	D	Y	N
Hampering biodiversity protection in the region	-	3	2	6	L	D	Y	N
Socio-economic disturbance	-	2	2	4	L	D	Y	N

Potential Impacts	Impact Sign (beneficial = +ve Detrimental = -ve)	Magnitude	Likelihood	Risk Score	Impact size	Impact type	Mitigation possible? (y/n)	Residual impact*
Lack of worker facilities	-	5	5	25	L	D	Y	N
Worker health and safety	-	5	5	25	L	D	Y	N
Community health and safety (including school going children)	-	5	5	25	L	D	Y	N
Site reinstatement	-	4	1	4	L	D	Y	N
Employment Generation and Increase in income	+							
Enhancement of Community Development Service	+							
Skill Enhancement	+							
Environmental Impacts During O&M Phase								
Hill/soil erosion and downhill siltation	-	3	1	3	L	I	Y	M
Site integrity and security risk (i.e. landslide)	+							
Water contamination from water usage	+							
Sludge management	+							
Biodiversity protection	+							
Occupational health and safety	+							
Waterlogging conditions reduced or non-existent	+							
Reduction of risk of vector borne diseases	+							
Clean water and easy access to the drinking water	+							
Strengthen of bank areas reducing erosion	+							
Safer establishments on the banks of the canal	+							

Impacts during Planning Phase

(a) Site clearance

28 **Potential impacts:** Failure to obtain necessary consents, permits, NOC's can result in design revisions and/or stoppage of the works, even stop the construction project. In this case, most of the proposed areas for site are under forest and therefore under the jurisdiction of forest department. Obtaining a NOC from forest department is a requirement before starting of the construction. Permission of land needs to be obtained from the DC of Cox's Bazar while NOCs from local Upazila parishad is also required.

29 **Mitigation measures:** (i) Obtain Environmental Clearance Certificate (ECC) from Department of Environment and NOC DC, FD and Upazila parishad; (ii) acknowledge in writing and provide report on compliance all obtained permits, clearance, NOCs, etc.

(b) Impact of extreme climatic events

30 **Potential impacts:** Teknaf site is located in the hillock areas and prone to landslides/mudslides and erosion. The region is also vulnerable to flash floods during heavy rainfall events. Poor drainage and unplanned development also contribute to the added vulnerability of structures to extreme climatic events. Failure to address the extreme rainfall events and associated vulnerability/hazards in the designs may lead to damage to the structure and pose threat of nuisance in the locality which may include hydrological hazard, poor structure life etc.

31 **Mitigation measures:** (i) Ensure adequate water passage under the structure and shape the associated landscape so that water can be drained quickly from the site; (ii) ensure selection of latest weather coated painting and construction materials so that the structures can withstand heavy rainfall and flooding damage; (iii) ensure flood return period and local waterlogging information being considered in the design phase; (iv) ensure that heavy rainfall events can be converted into safe pathogen free water storage for long-term use considering the modern Rain Water Harvesting (RWH) technologies; (v) include solar panels and energy saving lights in design.

(c) Asian elephants

32 **Potential impacts:** Evidence of elephants were observed during field visit in Taknaf (Chndrakilla). The elephants mainly visit the area for food, especially banana. Also, the elephants drink water from the narrow streams that run to the likely reservoir site. According to the ecological study conducted by the project earlier in 2019, The “Asian Elephant frequently visits the waterbody at night in order to drink and bathe, which was confirmed by the sightings of footprints and interviewing the local people. Elephants commonly visit at night in order to avoid confrontation with people. Elephants (a group of six and a solitary animal) were seen in the forested hills not very far from Rohingya camps. Water is scarce in the hilly area, so this waterbody with plenty of freshwater throughout the year is crucial for the local people as well as the local wildlife and plants” (Khan 2019⁹).

33 **Mitigation measures:** The following measures are essential in planning the SWTP in Taknaf (Chandrakilla): (i) The waterbody should be developed in a way so that minimum artificial structures (e.g. concrete and metallic structures) are used. The structures should be restricted to any one side (e.g. dyke side), leaving other sides natural, so that animals do not hesitate to visit the waterbodies and plants can grow along the banks. (ii) Any structure must be durable and as low as possible so that the structure is less visible to elephants and other wildlife. Visible structures can be destroyed by elephants. (iii) The supply line should be placed underground with some markings on the surface so that people know the existence of underground supply line.

(d) Failure to consider local hydrological system

34 **Potential impacts:** Teknaf region is hilly and landslide/erosion prone. Reservoirs are to be located at the end points of the hilly stream. It will take large area with massive weight of water. Failure to account the geology, morphology and hydrological scheme of the area may lead to reservoir instability and cause landslide. Moreover, during flash floods or extreme rainfall events, flood and landslide in the region can be detrimental. Even such hazard may occur during construction when local topography and hydrological system is tampered with.

⁹ Khan, MMH (2015) Ecological Assessment of Some Selected Sites in Ukhiya And Teknaf, Cox's Bazar, Bangladesh, Final Report. TA-9546 BAN: Emergency Assistance Project, Asian Development Bank (ADB)

35 **Mitigation measures:** (i) detail assessment of the microhydrology and topography of the project site; (ii) design according to the sloping of the project area; (iii) avoid conventional raised plinth design that blocks water runoff, rather design should prioritize structure built on raised columns that can allow water to pass through; (iv) design can learn and adopt from the local traditional structures on the hill sides; (v) design needs to consider additional drainage facilities and water storage.

(e) EMP implementation training

36 **Potential impacts:** 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.

37 **Mitigation measures:** (i) conduct daylong EMP training with the engineers and workers for each project site; (ii) follow up with toolbox trainings and environmental management specific trainings; (iii) arrange regional training for contractors and implementing DPHE engineers.

Impacts and mitigation measures during Construction Phase

(a) Impacts from inadequate construction planning

38 **Potential impacts:** Inadequate construction planning may lead to local disasters. For example, ignoring local hydrological system during construction planning may create waterlogging, spread diseases and mudslides. The entire region is hilly with loose sand. Improper cutting elevated lands for labeling may cause landslides and associated accidents. Therefore, if the implementation of site-specific mitigation measures is not properly planned - including the clear and agreed assignment of responsibility - then it is probable that little appropriate action will be taken by construction contractors to prevent and minimize the environmental impacts of their activities.

39 **Mitigation measures:** (i) This is of utmost importance to note that this IEE is for both proposed sites and is not site specific since the detail design has not been on board. This IEE actually indicative of what needs to be considered during design and planning phase. Therefore, the Environmental Management Plan (EMP) stipulated in this EMP needs to take as advice for design and to avoid environmental consequence; (ii) To effectively prevent and minimize impacts that could arise during construction, mitigation measures specified in the EMP need to be incorporated in bid documents and contracts, and each contractor must be required to develop a Contractor Environmental Management Plan (CEMP) for each SWTP site reflecting all measures relevant to the contracted work, for approval before construction begins.

(b) Topsoil loss followed by soil erosion

40 **Potential impacts:** For the proposed facilities, four parameters have been considered for screening of environmental/ecological impacts during construction phase; these include access road, felling of trees, clearing of vegetation, and impact on aquatic (water) habitat. Teknaf site is located on slope with several undulations. Significant excavation, cut and fill is expected. The cut and fill will lead to severe soil loss, and if not properly managed, can cause localized landslide. Without a proper management system, soil and water population is also expected.

41 **Mitigation measures:** (i) At the sloped sites, temporary slope protection measures such as swales and berms should be used to slow overland flows, promote infiltration, and direct runoff away from active work areas. Protective ground coverings, such as mulch, can also be used to protect areas of exposed soil

from heavy rainfall and runoff; (ii) adequate water runoff passages should be considered by the design; structures, at not condition, should block the water passage; (iii) Any borrow pits established by contractors near any of the sites should be rehabilitated promptly once the required materials have been extracted, with slopes reshaped and revegetated to prevent the development of erosion problems.

(c) Impact on surface water quality

42 **Potential impacts:** Both proposed reservoir site is connected to streams. Ukhiya reservoir is connected to the Naf river and Plaongkhali khal. The Teknaf reservoir will be connected to downstream. Both sites are vulnerable to water pollution or contamination from stockpile materials and construction waste. Construction of structures and putting construction materials on the path of the streams may block the flow and cause flooding and waterlogging. Moreover, hill runoffs may also bring eroded materials and cause sedimentation problem.

43 **Mitigation measures:** Implement eco-friendly waste management system: practice waste minimization, reuse and segregation; provide adequate waste bins, enforce onsite rule of throwing waste into bins; provide separate storage area for solid waste and hazardous waste to contain spill area; and implement measures to mitigate sedimentation/siltation. In all sites follow a Removed Soil Management Plan linked to the Excavation Segmentation/Management Plan, specifying, e.g., separate areas for stockpiling "reusable soils" & "unsuitable & excess soils" appropriate stockpiling areas, on flat grounds & away from or not obstructing main surface drainage routes disposal of unsuitable & excess soils as soon as possible hauling trucks to be required appropriate cover & min 2 ft freeboard employ any combination of the following measures to prevent stockpiled soils & fine aggregates from being eroded or carried away by wind and rain: silt fences, sediment traps, sandbags, barrier nets, earth bunds, speed stilling humps along surface drainage routes, limiting stockpile to a maximum height of 2 m, &/or diversion drains to reroute surface runoff away from stockpiles, whichever would be appropriate for the site & site conditions. Monitor immediate low areas or valleys for drainage congestion.

(d) Impact on groundwater resources

44 **Potential impact:** The area starves in groundwater level. Work camps are likely to sink tube well in the area and contribute to decrease of local groundwater level and increase drawdown. The potential exists for drinking water sources to be contaminated by the seepage of wastes from workers camps through the soil profile into the GW aquifer (particularly if wells access the shallow aquifer). There are small hilly streams on the RoW potentially be contaminated seepage wastes from workers camp and stockpile materials. The effects are short term, minor and reversible by mitigation measure.

45 **Mitigation measures:** (i) Workcamps and labour shed should be constructed outside of the camp area; (ii) please follow the same mitigation measures advised for surface water contamination.

(e) Impact on noise

46 and labour shed should be constructed outside of the camp area; (ii) please follow the same mitigation measures advised for surface water contamination.

(f) Impact on Vegetation and hill erosion

47 **Potential impacts:** Both proposed sites are vegetated. The amount of vegetation to be removed in Ukhiya site is likely to be less as the proposed site is partly barren. However, the Teknaf site vegetation is dense and as mentioned earlier, elephants are attracted to the vegetation for their food. Therefore, vegetation removal will likely to be impacting the elephant as well as due to the site's elevated nature, vegetation removal is likely to trigger hill erosion.

48 **Mitigation measures:** Follow mitigation measures proposed in paragraph 256 for vegetation removal. Additional mitigation measures are: (i) Site location needs to be carefully chosen so that the least amount of vegetation has to be removed; (ii) in case of absolute necessity, a plan for replantation with native hill grown species needs to be prepared in advance of vegetation removal, which has to be approved by the environmental specialist of IA and EHSO from the contractor; (iii) in case of slope vegetation removal, a protection plan must be devised in advance in combination with steel net, geo-cell, bush planting, RCC toes, organic matter reinforcement etc.; (iv) devise site-specific plantation plans before the construction starts and update this EMP, identify how many trees are to be planted along with bushes and grass to project hill sides; choose only native species.

(g) Pollution from solid waste and sewage effluent

49 **Potential impacts:** Untreated sewage from the pit latrines could have the potential to enter surface water if not adequately designed and positioned to reflect the local hydrological and hydrogeological patterns. Periods of high rainfall could lead to the overflow of the pit and overland flow, or rapid through-flow of the effluent to surface water prior to its full digestion in the soil. Raw sewage can potentially impact surface water quality by promoting the growth of algae and delivering pathogens may be harmful to human and ecological receptors.

50 **Mitigation measures:** Receptacles for solid waste should be provided for the use of workers, and their contents should be disposed of in officially sanctioned local landfills. Construction waste should also be disposed of in legal local landfills. Clean construction waste such as excess soil or rubble should be used in landscaping on site or given to landowners and developers seeking fill material. As rudimentary standards prevail at local landfills, the contractors should take every opportunity to reduce the amounts of waste generated, and also collect recyclable material for processing by local operators. Grey water from temporary on-site kitchens and wash-up facilities should be directed to a settling basin, which should be filled in upon site closure. With regards to sewage, connections to local sewerage (or septic system in the case of worker camp) should be installed as the first step in the construction process, and temporary toilets connected to it.

(h) Occupational, Health, and Safety Risks

51 **Potential impacts:** Occupational hazards may arise if not properly managed (risk of fall and electrocution, etc). Increase in dust may cause health problems to workers. Insufficient supply and improper use of personal protective equipment (PPE) and lack of safety procedures may cause injuries or fatal accidents. For safety, there will be a need to interrupt electricity supply to existing businesses while new poles, conductors and other installations are put in place. This needs to be done in a phased manner allowing small sections of lines to be reconnected to the network, keeping down time to a minimum for existing users. Close contact with persons afflicted with diseases and lack of sanitation in workers camps may also pose health risks. Outbreaks of diseases like diphtheria and measles can be avoided by observing proper sanitation facilities and observing good personal hygiene habits.

52 Given the recent COVID-19 outbreak, it has been a new concern for the work site workers to keep safe health. It is expected that, on peak time there will be 30-40 workers at a time on each site, which can easily trigger COVID-19 human transfers. Such a situation can become disastrous and claim human life. There is also a risk of transmitting COVID-19 to the local residents.

53 **Mitigation measures:** There is invariably a safety risk when construction works such as excavation and earthmoving are conducted in populous areas. Workers need to be mindful of the occupational hazards, which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. The generic measures suggested are as followed: Comply with

requirements of Government of Bangladesh Labour Law of 2006 (amended in 2013) and all applicable laws and standards on workers' health and safety (H&S). Ensure that all site personnel have a basic level of environmental awareness training. If necessary, the environmental management specialist and/or a translator shall be called to the sites to further explain aspects of environmental or social behavior that are unclear. Produce and implement a site H&S plan which include measures as: (i) excluding the public from worksites; (ii) ensuring all workers are provided with and required to use personal protective equipment (reflectorized vests, footwear, gloves, goggles and masks) at all times; (iii) providing H&S training for all site personnel; (iv) documenting procedures to be followed for all site activities; and (v) maintaining accident reports and records.

54 Responding to the COVID-19 situation in Bangladesh Government has opened an online platform for all COVID-19 information and guidelines applicable in Bangladesh. The website can be accessed at <https://corona.gov.bd/>. The website also contains a national Guide to combat COVID-19 and a special guideline in Bengali language on preparing worksite in response to COVID-19. The Bengali guideline is attached with this IEE as Annex D. A graphical guideline specially prepared for ADB funded project has been prepared in English language and attached with this IEE as Annex E. Text version of the guideline (in English) is also attached as Annex F. Sample Emergency Team formation at worksites, sample health and safety monitoring plan and sample signboards has also been prepared and attached to this IEE as Annex G, Annex H and Annex I as a response to COVID-19.

Impacts and mitigation measures during operation phase

(a) Catchment erosion and reservoir siltation

55 **Potential impacts:** Siltation causes decrease in reservoir storage capacity, turbidity water in the reservoir area.

56 **Mitigation measures:** To reduce siltation, silt traps should be constructed to ensure deposition occurs before reaching the water dam. Desilting should be done to remove the sediment from the reservoir and the material removed from desilting shall not be deposited within a watercourse or floodplain of a watercourse; Buffer zones will be created and unnecessary tree cutting will not be permitted as this may lead to erosion enhancing sedimentation.

(b) Human elephant conflict

57 **Potential impacts:** If vegetation cover is not kept intact which are used as food for elephants, the elephants can be agitated. Moreover, during operation, elephants can be lured to the structures and water reservoir.

58 **Mitigation measures:** Make sure the plantation programme is 100% successful. Continuous monitoring of survival of the planted trees and density of the planted trees. If density of the plants begins to thin out, replant. Always ensure that the structures get covered with greeneries so that elephants don't see them. Include budget for plantation and monitoring for every year of operation.

59 **Environmental Monitoring:** Environmental monitoring and inspection will consist of: (i) environmental impact monitoring; and (ii) EMP performance verification (compliance monitoring). Environmental impact monitoring will assess the degree to which the project environmental management and mitigation measures are successful in avoiding impacts to the biophysical environment (soils, air quality, water quality) and the socio-economic environment (livelihoods, quality of life, occupational health and safety, public health and safety) during the project's construction and operation phases. The PMU will engage an environmental specialist for monitoring and reporting. EMP performance verification will assess

the performance of design consultants, contractors, facility operators and PMU in complying with, or adhering to, the EMP and CEMPs, beginning with documentary checks, clearances, and specialized implementation plans that must be obtained or developed before construction can begin. Performance verification monitoring will continue through the construction and operation phases. The PMU will conduct performance verification during the pre-construction and construction phases, after which this will become the responsibility of the IAs. Details of the monitoring requirements and tasks covering all sites and all three project implementation phases are compiled in an Environmental Management and Monitoring Table (EMoT), presented in Table VIII-1.

60 Concise quarterly environmental monitoring reports will be composed by the PMU, based on (i) monthly progress reports submitted by the contractors, which will include monitoring data collected by the site EHSOs; (ii) quarterly impact monitoring reports prepared PMU appointed independent environmental specialist; and (iii) its own performance verification activity. The environmental monitoring reports will reference national standards where appropriate (such as for air quality and noise), as well as benchmarks for project compliance and progress.

61 To ensure proper and timely implementation of the EMP and adherence to the agreed environmental covenants, the PMU will submit to ADB semi-annual environmental monitoring reports, based on quarterly progress reports of the PMU. The reports should confirm the project's compliance with the EMP and identify any environment-related implementation issues and necessary corrective actions and reflect these in a corrective action plan. The performance of the contractors will also be reported on with respect to environmental protection and impact mitigation. The operation and performance of the project GRM, as well as environmental institutional strengthening and training, will be included in the annual environmental progress report as well.

62 **Institutional strengthening:** The capacities of the IA and PMU to coordinate environmental management has been strengthened through engagement of national environmental consultants appointed by both PMU and ADB under the grant implementation consultancy. The PMU will lead the implementation of the EMP assisted by the consultants, with responsibility for such key tasks as ensuring project readiness; reviewing and approving designs and plans; ensuring that environmental information in bid documents and environmental clauses in construction contracts are on target; providing training on environmental mitigation measures; supervising and directing environmental monitoring; and providing guidance on environmental matters whenever needed. The work and leadership of the environmental consultants will strengthen environmental management and supervision capacity of the EA, IAs, PMU and contractors, and ensure the project's full compliance with the ADB's SPS.

63 Cost estimates for mitigation measures, environmental monitoring, public consultations, and capacity building are summarized in Table VIII-5 EMP implantation cost. Contractors will bear the direct costs of all mitigation measures during construction, which will be included in the tender and contract documents; this includes features built into facility designs in order to prevent environmental impacts from arising.

64 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.

65 **Stakeholder consultation:** Different stakeholders were consulted to give them the opportunity to express their views and concerns. As part of the process, they were also provided with relevant and sufficient information on the project prior to its start-up. These stakeholders include the central and local authorities, as well as the local population to determine their thoughts, opinions and feedback on the impact of the project. Attendees in the consultation meeting were apprised of the processes through which the project was to proceed toward implementation and the environmental impacts to arise out of such processes along with the steps to be taken toward mitigating the impacts. They were told about the impacts all of which could be easily mitigated. The audience expressed satisfaction of such mitigation measures. The public consultation was held during field visit of 19 August 2020. Representatives of DPHE PMU, PIU were also present in the consultation.

66 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.

67 **Conclusion:** The process described in this document has assessed the environmental impacts of all elements of construction and operation of Surface Water Treatment Plant (SWTP) in Ukhiya and Teknaf. All potential impacts were identified in relation to design, construction and operation phases.

68 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.

69 Some moderate negative impacts of the project will be felt during the construction phases which may involve hill erosion, water and waste pollution. The major significant impacts can come from disrupting the local biodiversity, upsetting human-elephant relationship, local hydrological system, hill erosion and waste pollution. Another major impact may be caused by the prevailing COVID-19 pandemic situation. Elevated noise and increase in traffic are expected to be within the existing level experienced by the local people. The contractor will be under specific orders for providing PPE to the workers engaged for the job. Strict site and labour camp health and safety regulation will be forced as per government and ADB guidelines. The IEE is indicative of the suggestions that should guide the topographic surveys, soil testing and detail designs. Site specific EMPs will be developed after detail design is developed and this IEE should be updated as well. Intensive plantation programme and keeping the structures invisible to the elephants has been suggested.

70 The major recommendations made in the IEE are as follows:

- Major negative impacts like disruption of local microhydrological systems, hill erosion, increasing noise level, air and water pollution at the pre-construction and construction phases should be taken care of by taking proper mitigation measures as suggested in the EMP section of this IEE.
- One major negative impact may occur from disrupting the human-elephant relationship. Intensive plantation programme has been suggested which will provide food for the elephants so that they do not enter in the site. Also, plantation programme needs to be arranged so that the site do not attract the elephants. Construction of watch towers to monitor elephant movement is also suggested.

- This IEE is indicative of suggestions to develop detail design. Once details design is done, the site specific EMPs must be developed and this IEE should be updated accordingly. The Site specific EMPs should be verified by the DPHE/ADB appointed Environmental Specialist.
- The EMP and EMP cost must be included in the bid documents prepared by DPHE.
- The contractor needs to prepare the site-specific CEMP prior construction works starts. The CEMP must be approved by PMU and ADB.
- DPHE should get clearance from DoE before start of the construction. This IEE is prepared in the view that this document belongs to DPHE and should be used for obtaining ECC from DoE. Any further instruction conveyed from DoE prior obtaining the ECC, DPHE is responsible to update this IEE accordingly. An Environmental Specialist should be appointed by DPHE prior construction works to develop and update the EMPs.

I. INTRODUCTION

A. Background and need of the project

71 The Government of Bangladesh (GoB) requested Asian Development Bank (ADB) for grant support to provide basic infrastructure and essential services to displaced persons. Given the humanitarian need and heart-wrenching condition of the displaced persons, ADB is providing grant financing of \$100 million for the first phase of the project. ADB support will be focused, selective, and well-targeted in the areas of (i) road access to and within camps; (ii) water and sanitation; (iii) energy supply; and (iv) disaster risk mitigation. It will build on the support provided by GoB and complement support provided by the United Nations (UN) agencies, the World Bank (WB) and other agencies. With the principle of putting people first, the project will seek to ease the vulnerabilities and risk of hunger, disease, and disaster. The project is known as Emergency Assistance Project (Project No. 52174-001, Grant 0582-BAN).

72 The project is known as the Emergency Assistance Project (EAP). The project will support the Government of Bangladesh in addressing the immediate and urgent needs of the displaced persons from Myanmar in Cox's bazar District, as identified by the United Nations (UN) in its Joint Response Plan (JRP) (displaced persons). The project will mainly support the improvement of water supply and sanitation, disaster risk management, sustainable energy supply, and access roads. The first phase of the project is under implementation and planned to be completed by 2021. Now ADB is planning to grant additional financing and thus some additional subprojects are under formulation to be accomplished by 2024.

B. Impact and outcome

73 The project is aligned with the following impact: social recovery of displaced persons in Teknaf and Ukhiya 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. The additional financing planned for EAP is aimed to for the following impact: 'social recovery of displaced persons in Teknaf and Ukhiya camps accelerated'. The outcome of the additional financing is redefined as 'living conditions and resilience of displaced persons improved: people directly benefited: 855,000 displaced persons. People indirectly benefited: 444,000 host communities.

C. Outputs

74 The EAP has the four outputs while the additional financing phase has five. Some of the outputs have been redefined in the additional financing planned to accomplish by 2024 and shown in the following paragraphs:

75 **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) integrated waste management facility with collection system; and (v) small surface water treatment plants. The additional financing aims to achieve the following outputs by 2024: (i) People

directly benefited: 607,000 displaced persons¹⁰; (ii) People indirectly benefited: 284,000 host communities)¹¹.

76 **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. The additional financing aims to achieve the following outputs by 2024: (i) People directly benefited: 128,250 displaced persons¹²; (ii) People indirectly benefited: 36,000 host communities)¹³.

77 **Output 3: Energy sources provided.** This includes providing the camp areas with (i) retained heat cookers; (ii) stand-alone solar powered streetlights with solar photovoltaic panels, battery boxes, and mini grid-connected streetlights; and (iii) access to electricity by augmenting substations, distribution lines, and transformers. The additional financing aims to achieve the following outputs by 2024: (i) People directly benefited: 750,000 displaced persons. People indirectly benefited: 200,000¹⁴ host communities.

78 **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 Cox's bazar to Teknaf, which is the main supply line. The additional financing aims to achieve the following outputs by 2024: (i) People directly benefited: 256,500 displaced persons; (ii) People indirectly benefited: 407,986 host communities).

79 **Output 5: COVID-19 Response.** Output 5 is related to the additional financing planned to respond to the COVID-19 pandemic situation prevailing in the country. This output consists of the following activities: (i) isolation with institutional quarantine facilities; (ii) diagnostic Facility Upgraded/expanded; (iii) emergency equipment and gender responsive personal protective equipment for managing COVID-19 outbreak procured and distributed to the health facilities; (iv) upgradation of emergency operation center; (v) Training of health; and (vi) hygiene kits distributed to women and girls in camps and host community.

D. Sub-project

80 The subproject dealt in this report is under Output 01 which intend benefit 607,000 displaced persons¹⁵ directly and 284,000 host communities indirectly. The subproject is: "Two (02) small surface water treatment plants constructed or expanded by 2024". The Surface Water Treatment Plants (SWTP) are targeted for both refugee and host communities. The first SWTP is to be located in Palongkhali, Ukhiya where 01 conventional and 01 portable treatment facility will be placed. The Naf River at Palongkhali BGB Camp Point, Ukhiya will serve as the source of water for the SWTP. The second SWTP will be located at Chandrakilla, Teknaf with same facilities (01 conventional and 01 portable treatment facility). A local lake fed by hilly streams will serve as the source of water.

81 The exact locations are yet to be pinpointed at this moment. The Executive agency (EA) of this subproject Department of Public Health Engineering (DPHE) intends to construct a similar kind of SWTP that is under implementation in Palongkhali BGB Camp Point, Ukhiya. The current plan is to construct

¹⁰ 71% of the uncovered household as per the JRP under WASH indicator

¹¹ Population of Teknaf upazila

¹² 15% of the camp population are covered through 4 e-vouchers shops

¹³ 1,500 people can be supported by each cyclone shelters. For 24 cyclone shelters, 36,000 people will get shelter

¹⁴ 150,000 houses will be supported by solar powered electricity through nano grid

¹⁵ 71% of the uncovered household as per the JRP under WASH indicator

another facility beside the existing facility which is expected to be very similar in design and size. Although final plan will be guided by the land available for purchase. The second site, aside Planongkhali is in Teknaf, a lake locally known as “Chandrakilla” or “Chander killa”. However, package-wise detail design, orientation of the proposed facilities, space availability, soil testing, topographic survey etc. are yet to be performed (further explained in para 85). Therefore, the entire list is considered as sub-project and dealt with in this report.

82 The proposed facilities are located in the host community to supply potable water to the Rohingya Refugee Camps in Cox’s Bazar district. Location map of the proposed facilities are shown in Figure I-1 and Figure I-2.

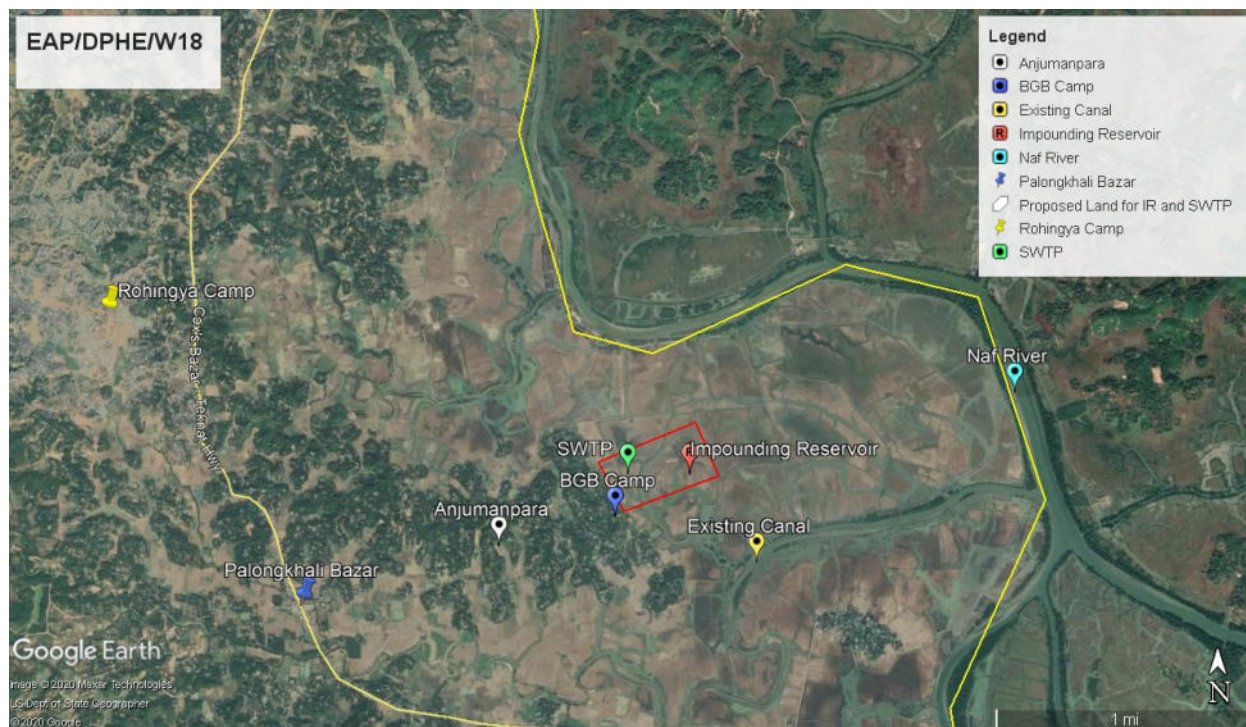


Figure I-1 Location map of the proposed subproject in Ukhiya BGB camp point; the proposed subproject intended be implemented beside the existing EAP/DPHE/W18 subproject

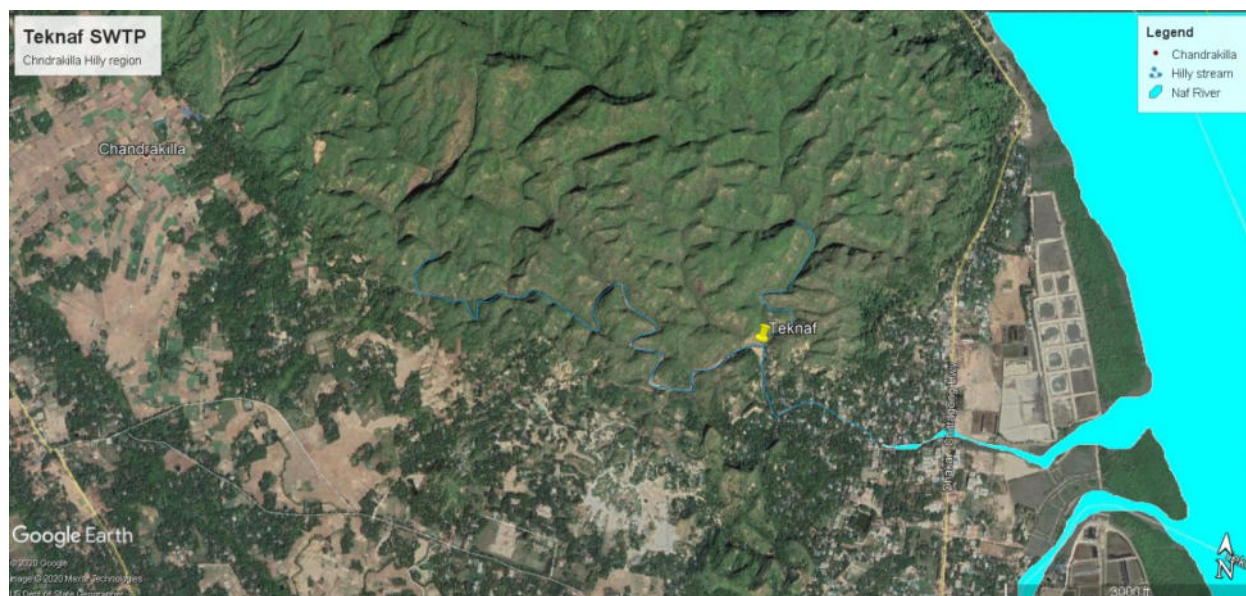


Figure I-2 Location of the proposed Teknaf SWTP site with physical features

E. Objective, purpose and limitations of the report

83 **Objective:** Environmental Assessment is a prerequisite to any construction project in Bangladesh. This Initial Environmental Examination (IEE) has been prepared based on the Environmental Assessment and Review Framework (EARF) developed by the ADB and endorsed by Bangladesh Government. The IEE follows the guidelines of the Department of Environment (DoE) as required by the Environmental Conservation Rule (ECR) 1997 (amended 2002), essentially aligned with the Safeguard Policy Statement 2009 (SPS 2009) of ADB and will be disclosed in the websites of the ADB and the implementing agencies as per requirement of ABD and GoB. 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.

84 **Purpose:** The primary purpose of the IEE is to investigate and describe impacts of the proposed subproject to the existing environmental elements. Specifically, the study aims to predict the potential impacts of the project activities and recommend mitigation and abatement measures for impacts (in the pre-construction, construction and operational stages of development) that are considered potentially adverse to the surrounding environment.

85 **Limitations:** As described in the earlier paragraph (para 80), the proposed facilities are still to be pinpointed with in the intended locations. The EA of this subproject, DPHE intends to construct similar facilities as the existing ones being implemented in Ukhiya. However, size and capacity of the facility is yet to be decided and only can be known after DPHE come into agreement with local authority and landowner. For Ukhiya site, DPHE already has a subproject under implementation and intends to construct similar structural measures, some appraisal information is available through DPHE led study¹⁶. However, in the

¹⁶ DPHE (2020) Sub-project Technical Appraisal Report: Design and Construction of Piped Water Supply with Surface Water Reservoir, Treatment System and Other Associated Facilities at Ukhiya, Emergency Assistance Project, Cox's Bazar. Reprot submitted by: Joint Venture of BETS Consulting Services Ltd., DevConsultants Ltd. (DevCon) & Institute of Water Modelling (IWM)

Teknaf site, any appraisal study yet to be conducted. As a result, this environmental impact study has been impeded, thus indicative in nature. Table I-1 below gives a comparative scenario of availability and lack of information required to develop this IEE.

Table I-1 Availability of information for development of this IEE report

Data available	Data lacks
Location of the surface water source	Water availability study; layouts; length and passage of transmission main; length and passage of distribution main; passage and length of access roads; amount of excavation and places of excavation; boundary; length, height and placement of the embankment, size and capacity of the reservoir; amount of vegetation removal etc.
Information of existing subproject under implementation	
Appraisal report for Ukhiya site	

86 As mentioned earlier, this IEE is indicative in nature given the information lacks as illustrated in Table I-1 and thus intend to be used as environmental advice to the detail design consultants. Once the detail design is done, this IEE needs to be updated with site specific information, environmental plan and mitigation measures before the contract is awarded.

87 **Specific objectives:** The Project requires that the laws and regulations of Bangladesh are applied in full. The Project is then subject to approval under the Government of Bangladesh's Environment Conservation Act (1995) (ECA) and Environment Conservation Rules (1997).

88 Further to the reference of Paragraph 86, this IEE report aims to provide guidance on safeguard screening, assessment, institutional arrangement and process to be followed for components of the project, where design takes place after Boards approval. This IEE:

- (i) describes the project and its components;
- (ii) explains the general anticipated environmental impacts and mitigation measures for the subprojects;
- (iii) specifies the requirements that will be followed in relation to screening and categorization, assessment, and planning, including arrangements for meaningful consultation with affected people and other stakeholders and information disclosure requirements;
- (iv) assesses the capability of the project proponents to implement national laws and ADB's requirements, and identifies needs for capacity building;
- (v) specifies implementation procedures, institutional arrangements, and capacity development requirements; and
- (vi) specifies monitoring and reporting requirements. Moreover, this IEE is to ensure, in line with ADB EARF, that the sub-project, 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.

F. Scope of this report

89 This report fulfils the requirements of IEE under the provisions of the ECR 1997 and its amendments. The IEE identifies potential environmental and social impacts and issues associated with undertaking the proposed project. It provides an outline of the potential positive and negative impacts as a result of the Project and proposes suitable mitigation and management measures.

90 The scope of this report and the subsequent IEE is specific to the sub-project. It does not provide any assessment for any other/future developments or activities at the location or anywhere else within Cox's Bazaar Area. Should any further development be planned as result of either this Project or other related work, additional planning and assessment to the requirements of the Government of Bangladesh must be carried out specifically in relation to that proposed development.

91 In general, this IEE intends to:

- Examine and describe the existing status of the various ecological, physical and human related components surrounding the project area;
- Predict the potential significant impacts of the project on the surrounding environment during the pre-construction, construction, operations and maintenance stages and recommend appropriate mitigation and abatement measures; and
- Identify residual impacts of the project and recommend appropriate short-term and long-term management plans.

G. Approach and methodology

92 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.

93 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. Additional tools and methods used in the IEE has been described in relevant sections.

1. Data sources of IEE

94 The following documents were used as reference in the preparation of the IEE report:

- Available technical reports from various organization
- Available laws, rules, regulations, acts, policies from Bangladesh Government websites
- Maps from open sources and various governmental and non-governmental websites
- Data from secondary literatures in including books and relevant websites

2. Scoping and gathering baseline data

95 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.

96 The objectives of undertaking the scoping activities were:

- To provide an early link among the implementing agency, the recipient and affected community and the IEE preparer;
- To ensure that the IEE will address only relevant issues and concerns;
- To present the scope of environmental studies, issues and alternatives that requires thorough examination and consideration in the master plan; and

- To ensure complete coverage of potential environmental and social issues that is required under the ADB Environmental and Social Considerations.

H. Structure of this report

97 Following the ADB SPS 2009, the Report is structured as follows:

Executive Summary

- | | |
|-------------------|---|
| Chapter 1 | Introduction provides the background on the project, purpose of this report, approach and methodology |
| Chapter 2 | Policy, Legal, and Administrative Framework presents a review of relevant national laws and policies, international environmental obligations, and ADB's environmental requirements, procedure of environmental clearance, environmental categorization |
| Chapter 3 | Description of the Project provides a brief description of the Project, the location, size and need, description of project components |
| Chapter 4 | Analysis of Alternatives presents the alternatives considered during the feasibility study in order to arrive at the best option. |
| Chapter 5 | Description of the Baseline Environment includes details on the baseline data for environmental conditions in the project area (current features and conditions, pre-project) |
| Chapter 6 | Anticipated Potential Project Impacts identifies the potential environmental, economic and social impacts from pre-construction, construction, and operation phase. |
| Chapter 7 | Environmental Mitigation and Management Plan |
| Chapter 8 | Environmental Monitoring Program and Institutional Responsibilities outlines the environmental monitoring program, institutional responsibilities including the cost of implementing the EMP |
| Chapter 9 | Grievance Redress Mechanism describes the process of addressing complaints |
| Chapter 10 | Stakeholder 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 11 | Conclusion and recommendation |

Annexes

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Introduction

98 This section of the IEE details the Administrative Framework for the Project, covering national requirements as well as applicable international treaties and conventions. The intent of this section is to lay out the regulatory and non-regulatory performance requirements for all stages of the Project. For the purposes of this report, only those regulatory elements directly relevant to the proposed Project will be discussed.

B. Environmental Legislation Framework

1. Overview of the project approval process

99 Key legislation governing the environmental approvals process for the proposed Project is the Bangladesh Environmental Conservation Act, 1995 (BECA, 1995)¹⁷ and the Environmental Conservation Rules (ECR, 1997)¹⁸

100 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

101 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

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

- **Project Authorization Letter:** Formal authorization of the Project by the Local Government Engineering Department 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/upazila parishad 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.

¹⁷ The Act was amended by Act Nos 12 of 2000, 9 of 2002, and 50 of 2010.

¹⁸ The ECR was amended in 2002, 2005, 2010 and 2017.

- **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.

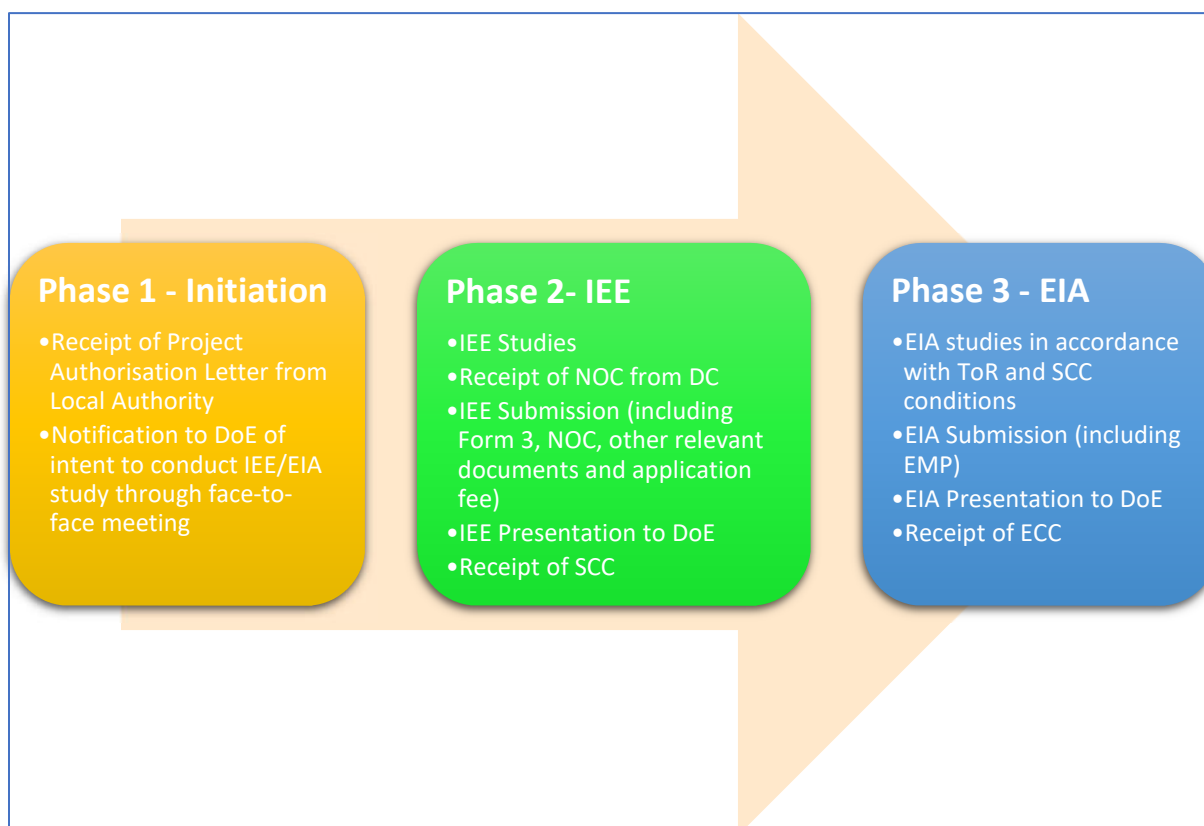


Figure II-1 Environmental approval framework

103 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 Immovable Property Act (1982)	Application required	To acquire and compensate for any Project land	Ministry of Land and Deputy Commissioner
Bangladesh Electricity Act (1910) and Regulations	Permission /licence required	Laying down or placement of electricity supply lines.	Rural Electrification Board/Power Development Board

104 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:

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:

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 Relevant Policies and Strategies

105 This section summarizes the National Laws and describes the procedure for obtaining environmental permits to allow project implementation. Over the years the Government of Bangladesh has enacted environmental acts, rules, policies and regulation toward imposing restrictions facilitating minimization / mitigation of likely impacts due to development projects. The most important Act is Environmental Conservation Act, 1995 (ECA, 1995) and Environmental Conservation Rules (ECR, 1997).

1. National Environmental Policy 1992

106 The National Environmental Policy was adopted in 1992 and is now under revision. It embraces different sectors related to agriculture, forest, power, health, transport, housing etc. The central theme of policy is to ensure protection and improvement in environment. The policy gives a thrust to sustainable development and long-term use of natural resources. The National Environment Policy contains policy statements and strategic options with regard to population and land-use management, management and utilization of natural resources and other socio-economic sectors, as well as the necessary arrangements for the implementation of the policy. The policy enables:

- the country to strike a dynamic balance between population and resources while complying with the balance of ecosystems;
- to contribute to sustainable and harmonious socio-economic development such that, both in rural and urban areas, and well-being in a sound and enjoyable environment; and
- To protect, conserve and develop natural environment.

2. National Water Policy (NWP) 2004

107 The National Water Policy 2004 (NWP) aims for sustainable management of water. The Policy also integrates the environmental impact assessment for water development projects. The policy stresses on issues related to climate change such as:

- Augmentation of dry season flows;
- Awareness raising in consumptive use of surface and ground water;
- Structural and non-structural mitigation measures (early warning systems).

3. National Forest Policy (NFP 1994)

108 National Forest Policy (NFP) was established in 1994. Under this policy it is proposed to increase the forest cover and to promote and oversee forestry activities. The policy fixed the target of forest cover at least 20% of geographic area by the year 2015. Tree plantation on the roadside verges courtyards of rural organization such as Union Parishad, school, Eidgah, mosque-Moktob, temple, club, orphanage home, madrasa etc. and other fallow lands around will be encouraged. The government will encourage this type of initiative and extend technical and other supports.

4. Bangladesh Climate Change Strategy and Action Plan (BCCSAP 2009)

109 The Bangladesh climate change strategy and action plan were approved in 2009. The climate change plan is built on six pillars namely i) food security, social protection and health; ii) Comprehensive Disaster Management; iii) infrastructure; iv) research and knowledge management; v) Mitigation and low carbon development; and vi) capacity building and institutional. The strategy and action plan emphasize on ensuring existing assets (e.g., coastal and river embankments) are well maintained and fit for purpose and that urgently needed infrastructure is put in place to deal with the likely impacts of climate change. - enhance the capacity government ministries, civil society and private sector to meet the challenge of climate change.

5. National 3R Strategy for waste management (2010)

110 The National 3R strategy was passed by the Department of Environment (DoE) in 2010 in the following context found by the strategy paper itself: (i) Lack of landfill site: Local government bodies have been struggling to find suitable land for sanitary land filling; (ii) Lack of hazardous waste disposal facility: At present there is no secured landfill site available in the country for disposal of hazardous industrial waste.

Apart from secured landfill site there is no facility in the country for treatment and recycling of hazardous waste. Industrial units are facing problems with off-site management of waste; (iii) Absence of a Strategy; (iv) Lack of institutional capacity; (v) Lack of Public Cooperation. The main objective of this 3R strategy is to delineate ways and means of achieving national 3R goals through providing a uniform guideline for all stakeholders. Specific objectives of this strategy are to: (a) address the key issues and challenges of waste management acting as a barrier for promotion of 3R in the country; (ii) define the roles of various actors to promote 3R in the country; and guide the creation of enabling conditions for success regarding implementation of 3R in the country.

D. Legal Instruments

111 The Ministry of Environment and Forests (MoEF) prepare the environmental policies. MoEF also has formulated regulation toward clearance of projects from environmental angles based on environmental impact assessment report. The Department of Environment (DoE) is responsible for environmental issues while forest issues are looked after Department of Forests. Over the years the MoEF has adopted number of legal instruments in the form Acts for the protection and conservation of the environment. Table II-2 summarizes the Environmental Legislation applicable to the sub-project.

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

No.	Environmental Legislation / Act	Objective	Relevance to the Project	Responsible Institution
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, fisheries depletion, health problems and fish and aquatic species contamination.	Secure clearance certificate on water resource development subprojects	Ministry of Water Resources
9	Wetland Protection Act 2000	Advocates protection against degradation and resuscitation of natural waterbodies such as lakes, ponds, beels ¹⁹ , 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	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

¹⁹ 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
		labourers, misconduct rules, income and benefits, health and fire safety, factory plan		
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
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	Public and private sector participation in the development and management of the energy subprojects.	Ministry of Power, Energy and Mineral Resources

No.	Environmental Legislation / Act	Objective	Relevance to the Project	Responsible Institution
		of the energy sector and to bring the entire country under electrification.	Provides guidelines for renewable energy subprojects	
17	Standing Order on Disaster, 1999 (Updated 2010)	Enhances capacity at all tiers of government administrative and social structures for coping with and recovering from disasters	Geographical information system (GIS) technology will be applied at the planning stage to select location of cyclone shelter considering habitation, communication facilities, distance from the nearest cyclone center, etc Advice from the concerned District Committee should be obtained prior to final decision	Ministry of Disaster Management and Relief
18	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

E. Applicable International Agreements

112 Aside from the legal framework on environment, Bangladesh is also a party to several international conventions, treaties and protocols related to environmental protection. The applicable international conventions, treaties and protocols are described in Table II-3.

Table II-3 Applicable International Conventions, Treaties and Protocols

	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

113 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 ECA 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.

114 The environmental category of the sub-project is listed in Schedule – 1 of ECR. As per Schedule 1 of ECR, surface water based pipe water supply subproject is likely to be classified as red category (Table II-4). Thus, SCC and ECC is required prior to commencement of the subproject. The SCC needs to be obtained from local authorities (respective Upazila parishad and District commissioner of Cox's Bazar) while ECC needs to be obtained from DoE.

Table II-4 DoE Classification of construction project according to ECR 1997

Subproject	Component	Equivalent in Schedule I of ECR	DoE Classification
Surface water-based pipe water supply system	<ul style="list-style-type: none"> Development of surface water reservoir along with dam and hydraulic control structures; Water treatment plant with distribution pipe network, and standpipe water distribution points. 	<p>Water treatment plant;</p> <p>Water, power, and gas distribution line laying/relaying/extension.</p>	Red

2. Environmental Category: ADB

115 The Safeguards Policy Statement (SPS 2009) of ADB provides guidance on the environment category of projects based on the degree of anticipated environmental impacts. ADB environmental safeguards objectives are: (i) to ensure the environmental soundness and sustainability of projects and (ii) to support the integration of environmental considerations into the project decision-making process. ADB environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts. The initial process of categorization involves filling out a sectoral Rapid Environmental Assessment (REA) checklist. A project is classified as one of the four environmental categories (A, B, C, or FI) based on the most environmentally sensitive component. Categories are as follows:

Category A: Project that is likely to have significant adverse environmental impacts which are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA), including an environmental management plan (EMP), is required.

Category B: Project with potential adverse environmental impacts that are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE), including an EMP, is required.

Category C: Project that is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications need to be reviewed.

Category FI: Project is classified as category FI if it involves the investment of ADB funds to, or through, a financial intermediary.

116 The project has been categorized as B for environment under the ADB's Safeguards Policy Statement 2009 (SPS).

G. Relevant Occupational Health and Safety Laws and Rules

117 During construction, the subproject will conform to the occupational and health related rules as outlined in the Table II-5 below.

Table II-5 Occupational and health safety related rules in Bangladesh

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	<ul style="list-style-type: none"> - 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
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 workplace 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.

H. Institutional Capacity

118 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.

119 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. The project

120 **Need for the project:** The refugee crisis of 2017 caused an urgent need for additional drinking water in the Teknaf region. Various reservoirs were quickly built. Lacking in this process, however, was and still is a common starting point, and consequently utilization of the region's water resources is not optimal. On the other hand, with only sporadic rainfall in dry season, the water table dropped to the point where water supplies for Rohingya settlements are reached at critical level. The daily ration of water for camp dwellers reduced from the normal minimum standard of 20 litres a day per person to 15 litres a day in dry period. As always, reducing water availability increases concern over hygiene and health standards and the potential of water borne diseases. A large number of deaths and hospitalizations at one of the world's mostly dense refugee camps in Bangladesh causes due to poor sanitation. According to United Nations (UN), water-borne diseases hospitalized more than 59,000 refugees last rainy season. Under this subproject, a reliable supply of potable water will be provided to the residents of the camp and immediate surroundings, which comes along with many benefits for instance, an improvement of public health conditions, provide employment to local residents.

121 **Scope:** The subproject scope includes construction and operation of 02 small surface water-based pipe water systems from BGB camp point, Palongkhali, Ukhiya and Chandrakilla, Teknaf. Beside 02 conventional SWTP, 02 portable SWTP will be also installed. The piped water supply system is designed to meet the demand of the population of approximately 100,000 people living in the camps and host community along the camp with capacity 20 LPCD (liter per capita per day).

122 The subproject consists of development of surface water reservoirs including dam with hydraulic structures as well as water treatment systems, transmission and distribution network with standpipes and associated facilities. Detailed proposal for the subprojects and their specific locations have not been finalized yet. However, DPHE informed that the Palongkhali SWTP is likely to be located beside the existing (under implementation) SWTP and the components are likely to be similar. The following project description is, therefore, based on the Palongkhali SWTP.

B. Study area

123 The proposed subproject is envisaged to be constructed in Ukhiya and Teknaf upazila which is situated south of Cox's Bazar and borders with the Rakhine state in Myanmar. The contract packages linked to the development of integrated water supply schemes (total 07 nos. to be implemented under EAP) will be implemented in the 27 nos. Refugee Camps in Ukhiya, Kutubpalang and Teknaf. Teknaf Game Reserve is west of Kutubpalang encompasses an area of 11,615 hectares.



Figure III-2 location of the proposed SWTP in Ukhiya BGB camp point with source water intake route and possible intervention areas

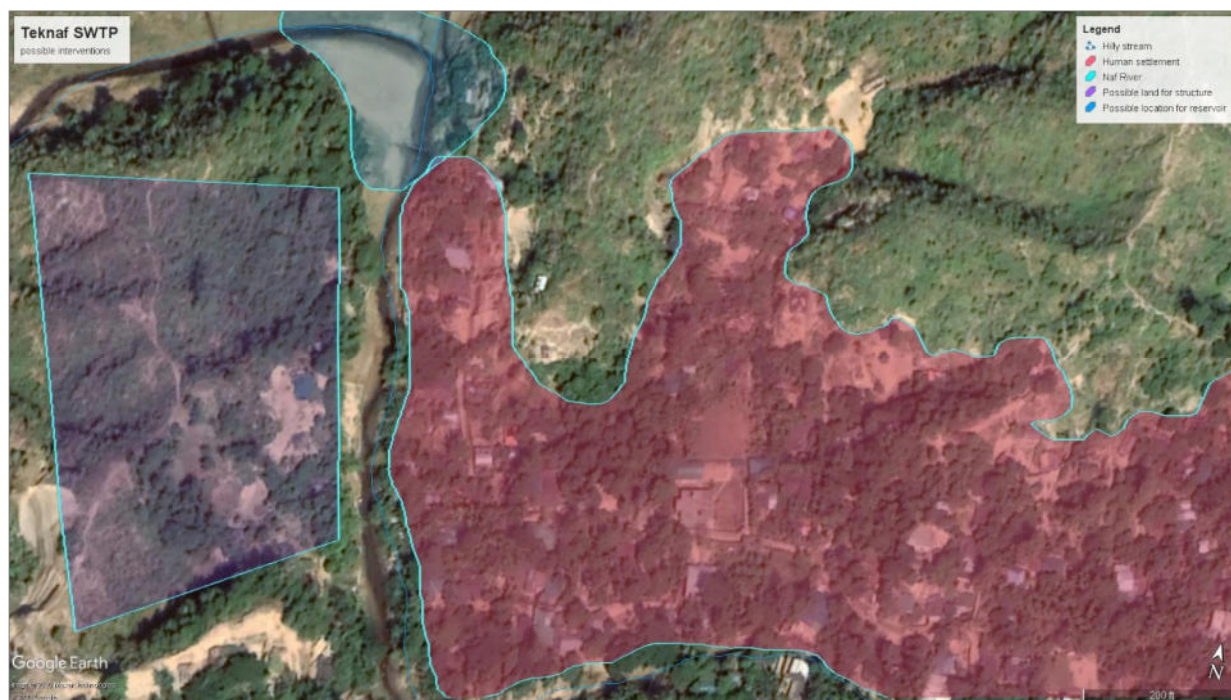


Figure III-2 Location of the proposed SWTP in Teknaf with possible intervention area

C. Existing Water Supply System in the Camp

124 At the level of households in camps and host communities, water is generally used to drink, cook, wash and clean. Other uses are agriculture and small industries. Water demand in the humanitarian sector (the refugees) is defined at 20 liters per capita per day (l/c/d). For the BGB camp point and Chandrakilla reservoir the water demand for the refugees is considered since the refugees are the main beneficiaries.

125 Unlike the other camps located in Ukhia, groundwater in Teknaf is not available due to its hydrological constraint. The location will serve mainly the host community and a few camps located in Teknaf. The hilly stream and small lake here supply drinking water to the host communities and the camps, but only in limited quantities, because the storage potential of the lake is largely left unused. In the current situation, the water is retained by a temporal earthen weir across the narrow opening.

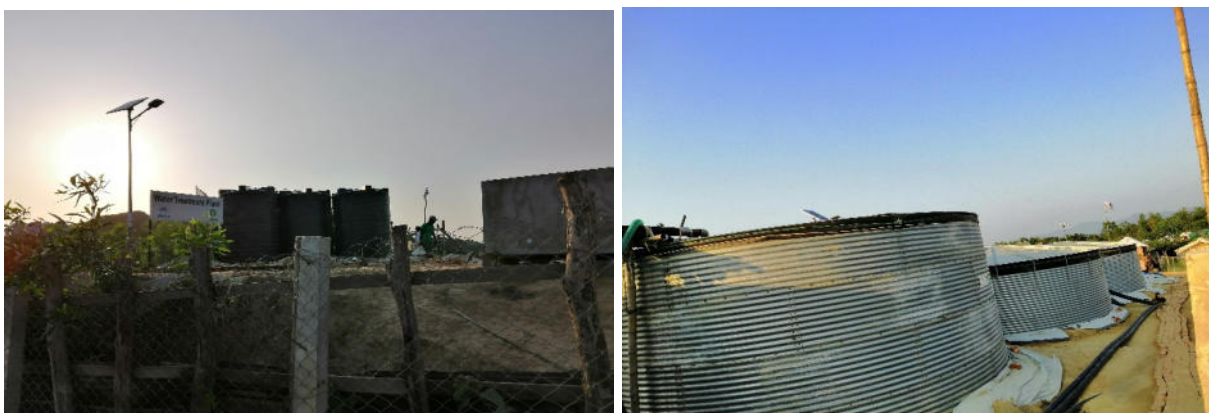


Figure III-3 Water supply system in the camps

126 Water quality and natural water supply from catchment areas is poor in the camp due to poor vegetation cover in the catchment areas and hills. As a consequence, the water is muddy and evaporation rate is high. The visible pollution level, including water pollution, especially by single-use plastic and other packaging material, was high in and around the waterbody since it is situated just beside the camp.

127 According to the feasibility and concept design report done by UNHCR, currently a water treatment plant is functioning in Teknaf camps for purifying and supplying the water to the refugees (Figure III-3). The conventional treatment process e.g. sedimentation, filtration and chlorination are followed in the plant. Treated water is supplied in tap stands placed inside the camp through a pipeline network. The refugees can collect water twice a day; morning and evening. The current average amount of water supplied is 20 L/P/C/D (Liter per capita per day). The Rohingya people collect the water from the tap stands using different size of containers (**Error! Reference source not found.**).

128 For host populations the water demand is highly dependent on the setting. The host population does probably not have unlimited access to drinking water and water demands will probably be between 20 l/c/d and 70 l/c/d (UNHCR, 2019). In a more developed area as Cox's Bazar water demands will be higher. Besides domestic and drinking water there are some small industries and agriculture in the downstream areas of Teknaf.

Table III-1 Water demand in the camps of Teknaf

Location	Use in l/day	m3 /dry season (180d)
Host community (Teknaf)	3339560	601121
Brick factory	700	126



Figure III-4 Existing water collection system in the camps

D. Hydrological investigation of Ukhiya SWTP²⁰

1. Water source (Ukhiya SWTP)

129 The surface water sources may be river, lake, spring or impounding reservoir. The choice of a surface water source from the options is mainly governed by the water quality, yield, location with respect to the service area and its availability for use. For selecting a source, the following factors were considered:

- Lean period discharge and dependable flow in the case of river is the source;
- Area and storage capacity in the case of lake or impounding reservoir;
- Secured availability of raw water in the long run;
- Quality of raw water during monsoon and during dry season;
- Risk of inundation of intake structure due to cyclonic storm or water surge;
- Distance of treatment plant from raw water intake structure;
- Whether by gravity or intermittent pumping required for transmission of raw water;
- Social and environmental impact on extraction of water from river or reservoir.

130 **Naf river:** Naf River is a trans-boundary river marking the border of Bangladesh and Myanmar. It is an elongated estuary in the extreme southeast of Cox's Bazar district dividing the district from Arakan (Myanmar). It originates in the northern hills of Myanmar and enters Bangladesh near Palong Khali of Ukhiya upazila of Cox's Bazar district. The river flows through Ukhiya and Teknaf and discharges into the Bay of Bengal near Sabrang in Teknaf upazila, Cox's Bazar. The river is 62 km long. BWDB has one hydrometric station on the river at Teknaf and data from 1968 are available. Its width varies from 1.61 km to 3.22 km.

²⁰ As per DPHE (2020) Sub-project Technical Appraisal Report: Design and Construction of Piped Water Supply with Surface Water Reservoir, Treatment System and Other Associated Facilities at Ukhiya, Emergency Assistance Project, Cox's Bazar. Reprot submitted by: Joint Venture of BETS Consulting Services Ltd., DevConsultants Ltd. (DevCon) & Institute of Water Modelling (IWM)

The Naf River's average depth is 128 feet (39 m) and maximum depth is 400 feet (120 m). Akyab in Myanmar is on the left bank and Teknaf upazila of Cox's Bazar district is on the right bank of the river. The river is influenced by tidal activity. The tide originates from the Indian Ocean and travels through the Bay of Bengal and arrives at Cox's Bazar and Teknaf Coast. The tide is semi diurnal - two highs and two lows are about the same height with slight diurnal inequality. The actual course of water level changes within two envelopes. The one spring tide (higher high water and lower low water) and the other neap tide (lower high water and higher low water). As the tidal wave moves along the Naf river, the frictional forces cause gradual decay in the tide. The process is further accelerated by upstream flow. There is seasonal variation of high tide and tidal range. High tide increases from January and attains highest value during July to September and then starts falling. (Source: Feasibility Study for Water Supply Facilities for Cox's Bazar, DPHE, December 2019).



Figure III-5 **Naf river**

2. Rainfall Time Series and Design Rain

131 A rainfall time series was received from the Bangladesh Meteorological Department in Dhaka. It was received in raw csv format. The data was verified against local observations obtained from the Regional Meteorological Office in Cox's Bazar on November 21, 2018. The BMD data is a time series consisting of 3 hourly rainfalls in millimeters. The series run from 2005 through 2017 (Figure III-6).

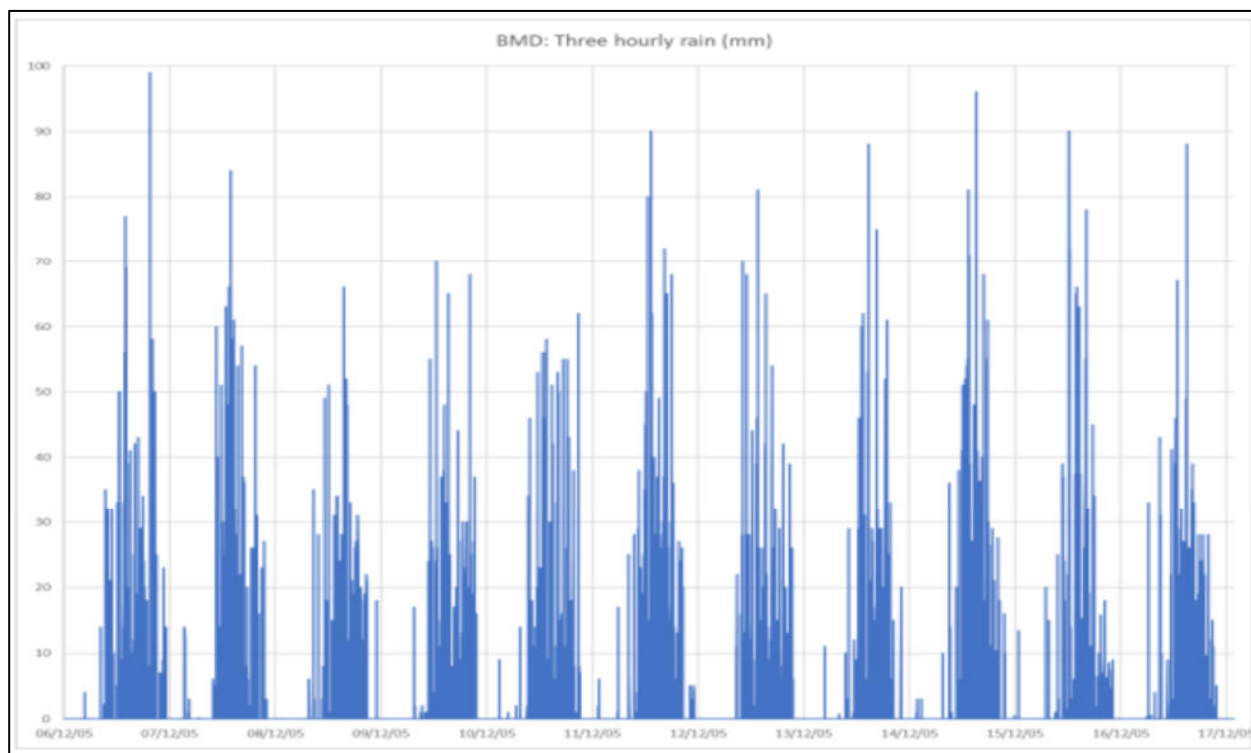


Figure III-6 3-hourly rainfall from 2005 through 2017 (source: BMD)

132 Figure III-6 clearly shows the difference between dry and wet seasons. Furthermore, it can be seen that on two occasions the rain came close to a value of 100 mm in 3 hours and that values between 80 and 100 mm occur roughly every year and a half.

133 Given the lack of meta-information associated with the time series, we used a straightforward statistical approach to derive design rain time series for a dry year, an average year and an extreme event, where the return period associated with the extreme event is ten years, roughly in accordance with the number of years between 2005 - 2012 and 2001 - 2011.

134 These design time series are displayed in the following Figure III-7. They consist of daily rainfall values in mm, occurring in the fictional (future) year 2022.

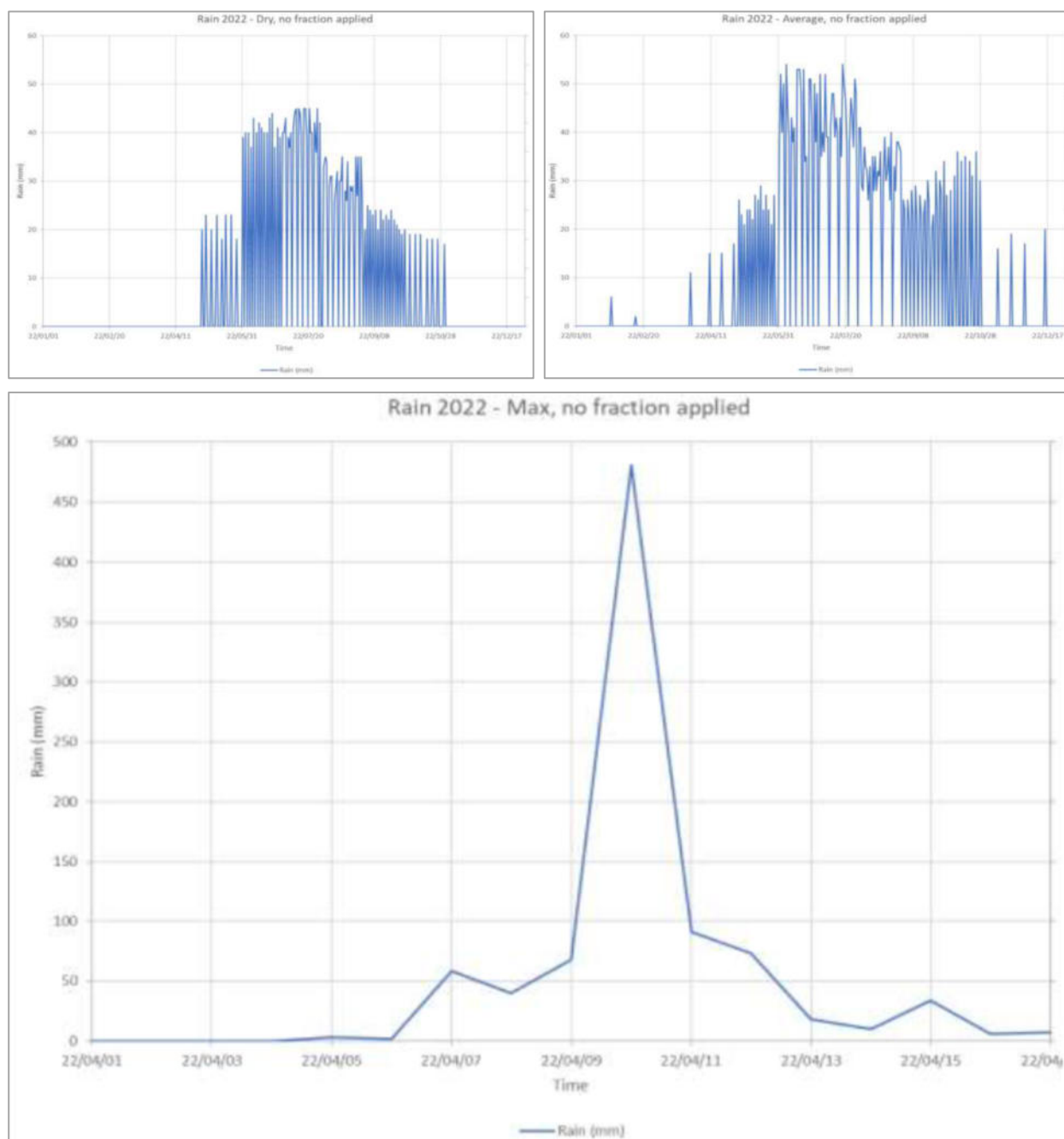


Figure III-7 (top left) Design rainfall for a dry year; (top right) Design rainfall for an average year; (bottom) Design rainfall for an extreme T10 event (all values for a fictional year 2022)

3. Water quality (Ukhiya SWTP)

135 The length of the river from Teknaf estuary at Sabrang to Palongkhali at Ukhiya is about 50 km. A huge quantity of runoff from upstream hills and catchment areas flows through the Naf river to Bay of Bengal during monsoon and resists salinity intrusion in the upstream. As a result, water in the upstream of the Naf river remains fresh and almost free of salinity. A water sample was collected from Palongkhali point of Naf river in September 2019 and tested in the laboratory of ABM Water Company. The results are shown in Table III-2. It can be concluded based on the above study that water from Naf river near Palongkhali, Ukhiya (about 50 km up of the Sabrang Point, Teknaf) contains salinity below WHO Drinking Water Standard 2004 specially during the period from May to October. Therefore, Naf river water may be considered as suitable to use as raw water source for potable water supply after treatment.

Table III-2 Results of water quality test of Naf river (DPHE 2020)

Sl no.	Water quality parameter	Unit	Result	WHO guideline for drinking water 2004
1	pH	-	6.67	6.5-8.5
2	Total dissolved solids (TDS)	mg/l	73	1000
3	Total Hardness (EDTA) as CaCO ₃		24	200-500
4	Manganese (Mn)		0.163	0.4
5	Total Iron (Fe)		1.20	<0.30
6	Chloride (Cl)		35.93	<250
7	Ammonia - Nitrogen (NO ₃ - N)		Nil	1.5
8	Fluoride (F)		Nil	1.5
9	Magnesium - Hardness (Mg)		4.6	-
10	Calcium Hardness (Ca)		2.4	<75
11	Sulphate (SO ₄)		4.0	<400

4. Location of impounding reservoir (Ukhiya SWTP)

136 DPHE had been searching for a suitable land for installation of surface water reservoir-based treatment plant and other associated components with the objective of treating water for providing potable water supply to Rohingya Refugees Camps, Ukhiya Town and the local community. Based on the criteria of establishing an efficient surface water treatment plant, 50 acres of land is identified and selected.

137 DPHE has planned to take lease the 50 acres of land for a period of 20-years from a Waqf Estate of area about 1500 acres and will execute construction/installation of required components of treatment plant. The landowners are also willing to make this arrangement in exchange of receiving cash money. The contractual agreement between the DPHE and the landowners will be done with a legal terms and conditions for 20 years soon.

138 The land is located in Anjumanpara village and at the adjacent to the Palongkhali BGB Camp under Palongkhali Union in Ukhiya Upazila. The land is 1.5 km far from the right bank of Naf river. Ukhiya Rohingya Refugee Camps and Uhkiya Upazila Town are positioned 12 km and 15km far from the proposed location in north respectively. The Palonkhali khal is flowing 0.5 km south and Phingkhali khal 1 km north of the land. The land is almost flat up to the right bank of Naf river in the west and become inundated at a depth of 1.5m every year during monsoon. In the post monsoon it becomes almost dry except tide water entry and exit twice a day from Naf river through a man-made cannel. There are hills and mountains in the other three sides of the land from which small Springs/Charas originate during monsoon but most of them become dry during dry season.

139 The proposed location of the land is close to the availability of plenty of raw water from Naf river with allowable limit of chloride content as per WHO Drinking Water Standard 2004. Moreover, two natural khals (Palongkhali & Phingkhali Kahls) with sweet water flow from upstream hills may supplement during shortage of water supply from Naf river due to salinity during dry period.

E. Description of the subproject components

140 As described earlier, at this moment retentive layout for the Ukhiya SWTP is available. As per DPHE officials, the upcoming designs will be similar to the existing one. The following paragraphs describe the subproject components based on the previous design and latest layouts (Figure III-8) of proposed Ukhiya SWTP. No information of Teknaf SWTP is available till now.

1. impounding reservoir and associated facilities (palongkhali)

141 **Impounding Reservoir and Earthen Embankment.** An impounding reservoir of area 30 acres has been proposed to be constructed in the premises of 50 acres leased/purchased land. An earthen embankment (height= 1.5m, crest width= 3m, slope= 2:1 and 2.5:1 on outside and inside of the embankment respectively) will be constructed around the reservoir. The earth to be excavated inside the reservoir up to the depth of 4m. The excavated soil will be put and compacted along the alignment of the reservoir embankment. The extra soils will be deposited and compacted for the development of rest 20-acre land. The impounding reservoir will have a small compartment of area 2 acres which will be connected to the existing man-made canal. The technical details are presented in Table III-3.

142 A small water control structure with the provision of flap gate which will only allow the flow of water inside the compartment and resist the out flow. The compartment will be connected with the main part of impounding reservoir with another water control structure with the provision of inflow and out flow of water. Therefore, water will be allowed to flow inside the impounding reservoir through the water control structure during monsoon and high tide of Naf river and can be stored by closing water control structure between the compartment and the impounding reservoir. On the other hand, the flow from the compartment to the reservoir can stopped if the salinity increases in the Naf river.

Table III-3 Technical Details of Impounding Reservoir and Estimation of Water Volume at Ukhiya

General Information	
Total land area*	50 acres
Impounding reservoir area	30 acres
Area for impounding reservoir	382 x 318 m ²
Size of 20-acre occupied area	318 x 254 m ²
Impounding Reservoir (IR) Technical Data	
Depth from IR bottom level to embankment top	1.5+4.0 (below ground) = 5.5m
Perimeter Embankment	
Height from EGL to embankment top	1.5m
Water height above EGL	1m
Outer side slope of embankment	2(H): 1(V)
Inside Slope	2.5(H): 1(V)
Top width and pavement	3m & 0.10m thick RCC
Bottom width of embankment	9.75m with outside turfing

General Information	
Slope protection (outside of embankment)	Turfing
Slope protection (inside of embankment)	Polythene, clay blanket t = 200 mm; brick lining/pitching = EGL to highest water Level
Embankment material	Rolled filled soil
IR Design and Construction Data	
Depth of excavation below ground	4.0m
First berm location & width	At EGL and width = 2m
Excavation – 1 (after 1st berm)	Depth = 2m & slope - .5(H): 1(V)
2nd Berm Location & width	After excavation -1, width = 2m
Excavation - 2 (after 2nd berm)	Depth = 2m, slope - 1.5(H): 1(V)
Embankment slope length in horizontal projection from EGL to IR bottom	10m
Total bottom width = (Embankment bottom width + slope bottom width below EGL)	19.75 (in all 4 sides of IR)
Length of IR at bottom = {382 - 3 (distance from boundary) - 19.75x 2}	339.5m
Width of IR at bottom = {318- 3 (distance from boundary) - 19.75 x2}	272.5m
Small Reservoir of 2 - Acres at corner of IR	
Reservoir slope	Same reservoir slope of IR
Size configuration	Square
Dimension at bed level	90m x 90m
Water Volume Estimation	
Free board of IR	500mm
Water depth	5.0m
Length & width at water surface level, Lx B	364.5m x 297.5m
(a) Volume of water at rectangular part beyond slope	$339.5 \times 272.5 \times 5.0 = 462568.75\text{m}^3$
(b) Volume as rectangular = embankment slope part + earth under Slope + (a)	$364.5 \times 297.5 \times 5.0 = 542193.75\text{m}^3$
(c) Volume in sloped embankment with underneath soil	$542193.75 - 462568.75 = 79625\text{m}^3$
(d) Volume of only water in sloped embankment (43.6%)	$79625 \times 0.436 = 34716.5\text{m}^3$
(e) Total water volume = (a) + (d) with corner 2 acre	$462568.75 + 34716.5 = 497285\text{ m}^3$
Deduction of Embankment of 2 Acre at Corner- 2 Sides:	Just same section of main IR
(f) Total Length of Embankment of 2 acre inside Bigger IR	$120.65 + 117.5 = 238.15\text{m}$
(g) Cross sectional area of embankment of 2 acre	98m ²
(h) Volume occupied by embankment soil of 2 acre (f x g)	$238.15 \times 98 = 23338.7\text{ m}^3$
Gross Volume of Water in IR = (e) - (h)	$497285 - 23338.7 = 473946\text{ m}^3$

143 Road around the Impounding Reservoir. RCC road of length 1520m and width 3.0m has been proposed to be constructed on the embankment around the impounding reservoir in order to make it stable and facilitate easy monitoring and inspection of the level and quality of water in the impounding reservoir.

144 Electrical Substation. An electrical substation has been proposed to be constructed in the treatment plant compound. Substation is a part of an electricity generation, transmission, and distribution system. Substation transform voltage from high to low, or the reverse, or perform any of several other important functions. Between the generating station and consumer, electric power may flow through several substations at different voltage levels. A substation may include transformers to change voltage levels between high transmission voltages and lower distribution voltages, or at the interconnection of two different transmission voltages.

145 Barbed Wire Fencing. Barbed wire fencing (height 2.13m, RCC column and footing 2.43m spaced) has been planned to be constructed around the treatment plant compound in order to ensure security of the installations.

146 **Plantation.** Plantation around the impounding reservoir and in the open space of the plant compound will be done for beautification of the area. It plays an important role in maintaining the balance in nature. It has a great impact on the environment by reducing incidences of global warming. The need for plantation has become even greater these days because of the growing pollution in the environment.

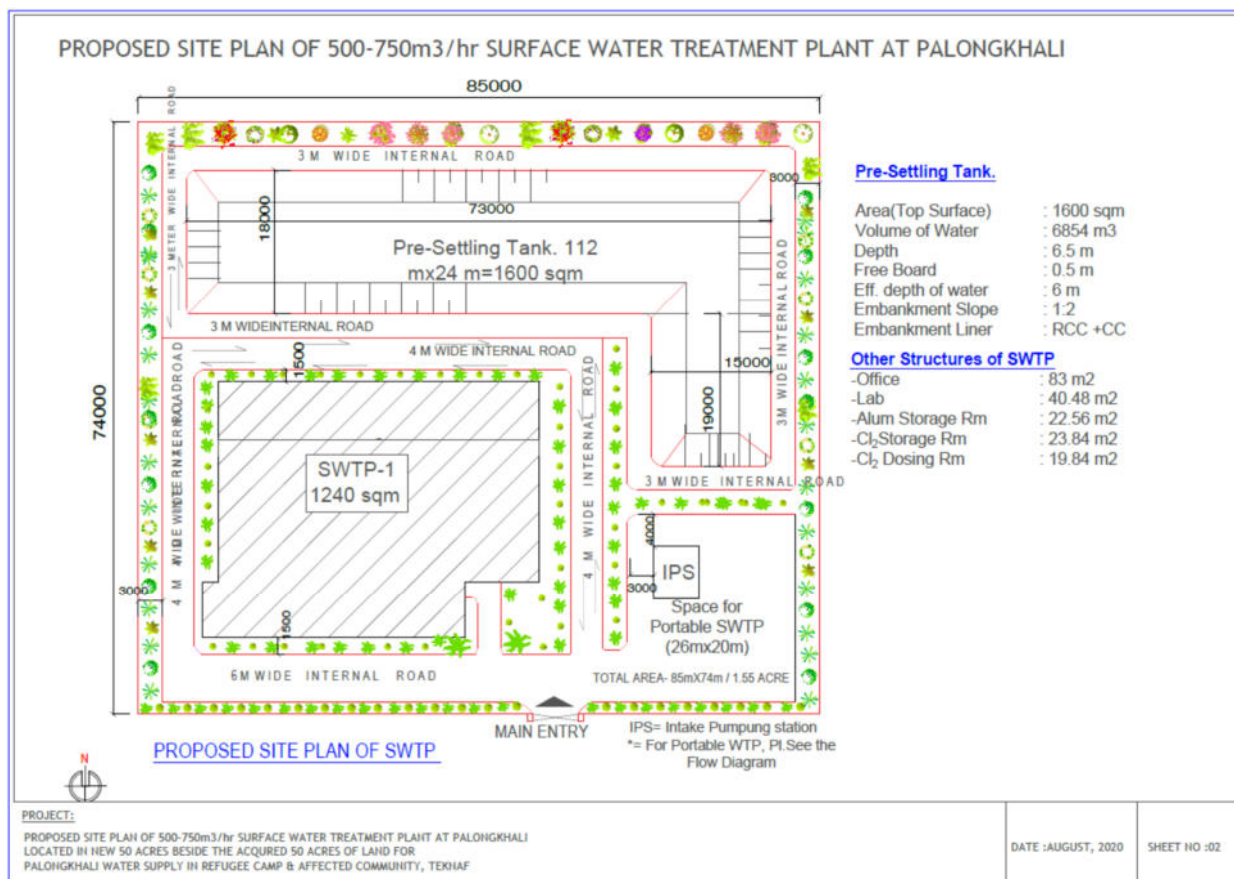
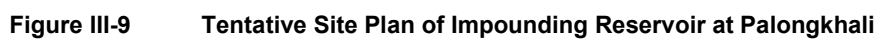


Figure III-8 proposed site plan for Ukhiya SWTP



2. Water transmission main (palongkhali)

147 About 15km transmission pipeline (HDPE PN10, PE-100, SDR 17) of diameter 400mm will be laid from treatment plant compound to Kutupalong mega camp. The pipeline may further be extended up to Ukhia Upazila Town if needed. The clear water from the treatment plant will be delivered to the camps and Ukhia Town in order to mitigate current crisis of potable water supply.

148 HDPE pressure pipe will be laid at least 1.1m depth from earth level. Trench width will be 0.5m along with pipe diameter including trimming, dressing and levelling of trench bed. Open cut method will be used and upper part of the trench will be filled with compacted sand. However, 450 mm nominal dia. MS/GI pipe of thickness 8mm will be laid for bridge/culvert crossing/washout/drain/road crossing (for heavy Traffic). All the roads damaged due to pipe laying activity will be restored in their original condition with supply of all materials including suitable withdrawn materials including restoration of the holes made in the bridge/culvert.

149 All necessary precautions will be undertaken to protect the utility services such as electric and telephone cables, poles, bailing out water, shoring etc. Proper stacking shall be done for the excavated earth by the side of the road.

150 Disinfection the pipelines with chlorinated water will be carried out by chlorinated water containing 150mg/l of chlorine as per specification. However, the detail layout of the transmission line will be finalized conducting detail survey by the contractor during implementation.

3. Portable surface water treatment plant (palongkhali)

151 **Portable Surface Water Treatment Plant (SWTP).** Initially, a surface water treatment plant of capacity 400 m³/hr will be installed in the compound (Table III-4). The SWTP will be container based (container size is 5 X 40ft where the number dependent upon final design), so that it can be moved to the desired site and can produce high quality water within short time. Treatment plant will meet and complies with WHO guidelines for potable water. However, number of portable treatment plant will be increased with the increase of distribution network and population coverage. However, final design may vary (Figure III-10).

152 Two pumps including one standby pump will be used for water intake from pre-settling basin to the portable water treatment plant. The plant is provided with consumables Alum, Calcium Chloride, Zeolite and Biologically Activated Carbon (BAC). However, liquid Cl dosing in final stage of treatment to meet water safety requirements. In addition, ozone water sterilization technology kills and eliminates pathogens in real time without use of chemicals. After treatment, the treated water will be pumped through the transmission pipeline system to the treated water reservoirs.

Table III-4 Technical Specification of Portable SWTP

Component	Description
Capacity	400 m ³ /hour
Raw water source	Impounding reservoir
Treated water	Must complies WHO guidelines and Bangladesh standard
Mobility	ISO container
Raw water Intake	Submersible pump
Pump	
Capacity	520 litres/min

Component	Description
Type	Single impeller centrifugal electric pump
Frequency	50 Hz
Input power	< 4kW each
Input current	> 5A each
Head	19m
Power	
Source	Diesel generator
Output	100 kVA, 50 Hz
Current	95 Amps
Fuel Consumption	20 litres/hr @ 100% load
Engine Speed	1500 rpm
Fuel Tank Capacity	500 litres diesel fuel storage tanks
Container	
Dimension	5 X 40-foot container
Chemical Dosing Facilities	Alum. As coagulation, alum dosing facilities consist of dissolving tanks and dosing devices. Diaphragm pump is recommended because it is simple and economical.

153 Intake Piping and Pump House. About 500m pipeline (API-5L, Grade B, ERW Pipe, Thickness 7mm) of diameter 300mm have been proposed to be installed for taking water from the impounding reservoir to the SWTP. Pipe will be laid at least 1.1m depth from earth level. Trench width will be 0.5m along with pipe diameter including trimming, dressing and levelling of trench bed. Open cut method will be used, and upper part of the trench will be filled with compacted sand. However, pump house of 1000L capacity with brick and cement concrete foundation has been proposed to be constructed.

154 Pre-Settling Tank. A primary settling is done in the unit of pre-sedimentation tank in the entrance of raw water to the WTP. It reduces turbidity of raw water before flowing to the clarifier and filter bed. It reduces coagulant and chlorine consumption before flocculation and filtration and reduces treatment cost. A pre-settling tank with capacity of 4000m³ has been proposed in the treatment plant compound.

155 Treated Water Reservoir. Total 30 nos. of food-grade plastic water tank of 10,000 litre capacity for supply of water manufactured from liner low density polyethylene (ILDPE) will be installed at different locations in the camps. Twenty (20) elevated reservoirs are also proposed for storing the treated water at different locations in the host community. 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.

156 Distribution Pipeline for Rohingya Camps. 1km pipeline (HDPE, PN 10, Thickness 6.60 mm) of diameter 110mm, 2 km pipeline (HDPE, PN 10, Thickness 4.50 mm) of diameter 75mm and 1.5km pipeline (HDPE, PN 10, Thickness 3.80 mm) of diameter 63mm have been proposed to be installed for distribution of treated water in the Rohingya Camps.

157 Distribution Pipeline for Host Community. 1km pipeline (HDPE, PN 10, Thickness 6.60 mm) of diameter 110mm, 1km pipeline (HDPE, PN 10, Thickness 4.50 mm) of diameter 75mm and 2km pipeline

(HDPE, PN 10, Thickness 3.80 mm) of diameter 63mm have been proposed to be installed for distribution of supply of treated water in the host community.

158 However, identification as well as preparation of the layout plan showing distribution network, treated water reservoir, community tap location etc. considering the existing network system in consultation with local administration, camp leader and WASH partners will be done by performing detailed topographic survey of the targeted areas.

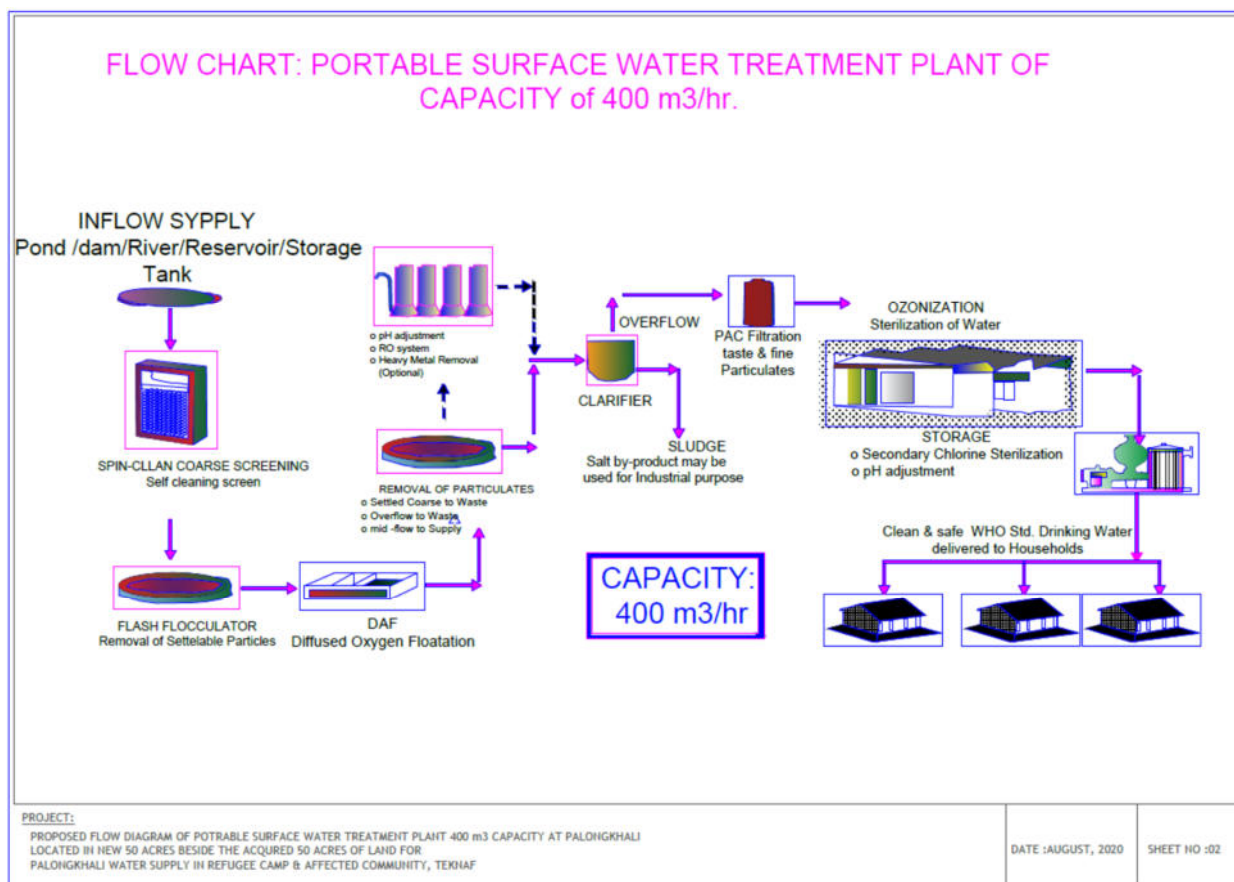


Figure III-10 Proposed design of the portable SWTP at palongkhali

4. SWTP site at Chandrakilla, Teknaf

159 **Source of water:** As mentioned earlier Chindrakilla site has not been studied for hydrology and topography yet. The site is a 'green field' and the locality is densely vegetated. The hilly streams from various small hills run through the region (Figure III-11). Locals use these streams as drinking water source after little treatment. The streams were visited during 19 August 2020 were found to be full of water with high flow.



Figure III-11 Source of water (hilly streams) for proposed SWTP at Chandrakilla

160 **Reservoir area:** The possible reservoir area is the junction of two narrow hilly streams that run through the entire region. The possibility is that the reservoir will be constructed on this junction so that the reservoir can collect all the hilly streams' water at one collection point (Figure III-12 and Figure III-13).



Figure III-12 Satellite image of the possible location of the reservoir



Figure III-13 View of the possible reservoir area for proposed SWTP at Chandrakilla

161 **Asian elephant:** During field visit evidence of elephants visiting the region for water and food was observed (Figure III-13). It was found that elephants come to nearby hills in search of banana trees. The locals reported that the elephants also drink water from the hilly streams. However, elephants have not been reported in the region to be attacking humans. Locals opined; this is may be due to availability of enough food for the elephants in the region.



Figure III-14 Evidence of elephants visiting in the region

162 **Access road:** There is a need to construct an access road to the reservoir, which is about 1.5km. The current condition of the road is very poor. The road in question is earthen and narrow and needs improvement of drainage system (Figure III-15).



Figure III-15 Condition of access road

F. Operation and Maintenance

163 Providing necessary manpower, equipment, chemicals including all electrical power costs with full operation and maintenance to run the SWTP for two-year including trial run will be carried out by the contractor. This O&M period will be best illustration of the successful commissioning of the scheme. 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.

G. Implementation Schedule

164 Substantial time is required spanning the continuum of subproject design and 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.

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

- i. Early floods in April/May,
- ii. Late floods in September/October,
- iii. Natural calamities (cyclone/tornado, excessive floods) occur in April/May and October/November.
- iv. 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.

166 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.

167 Summing up, over a 12-month period, major works are advisable to take place from 1st quarter, 2021.

IV. ANALYSIS OF ALTERNATIVES

A. Prelude

168 The primary objective of the “analysis of alternatives” is to identify the location/technology for a particular sub-project that would generate the least adverse impact and maximize the positive impacts. The preliminary assessment of the project 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 in each location.

B. Current proposal

169 The proposed sites have been identified for construction and operation of SWTP to supply quality drinking water in the camps and host communities. Based on the Rapid Environmental Assessment (REA) Checklist provided in the Environmental Assessment and Review Framework (EARF) of ADB for this Emergency Assistance Project (EAP), it was found that the current proposal will have some moderate effects on environment and society. However, the benefits will outweigh the negative effects. Summary of the impacts of current proposal is given in Table IV-1.

Table IV-1 Negative impact of current proposal on environment and society

Sector	Impact	
	Palongkhali, Ukhia	Chanderkilla, Teknaf
Presence Important features along the route	No	Hill forest, local houses on access roads
Land	Waqfo State, land to be leased, damming an excavation is expected	Government land, damming an excavation is expected
Presence Agricultural/cropped land	Close by, no impact will occur if EMP is followed	Close by, no impact will occur if EMP is followed
Village affected	No	Yes (some people live there temporarily)
Families affected	No	Yes
Loss of structures	No	No
Impact on Common properties	No	No
Trees to be chopped down	No	Yes
Presence of sensitive ecosystem	River, presence of birds and fishes	Hill forest around, presence of elephants
Presence of waterbody	Naf river	The SWTPs will be based on hilly streams that are present in some sites
Tribal population affected	No	No

C. Discussion of Alternative Solutions

170 An analysis of subproject alternatives was undertaken during the subproject design to determine the best way of achieving the subproject objectives while minimizing environmental impacts. The following alternatives were considered:

- **Groundwater:** Groundwater is scarce, particularly in the subproject area. Shallow aquifers are likely to dry up in dry season (December–March) as the groundwater table is lower. Moreover, shallow tube-wells are considered more at risk of contamination than that from deep tube-wells and dry up quicker than deep tube-wells. However, the deep tube-wells mainly dispense saline water and the salinity may be a further risk to water quality, as sea water levels rise and saline intrusion increases.

- **Reverse Osmosis:** Reverse osmosis is a water purification process that uses a partially permeable membrane to remove ions, unwanted molecules and larger particles from drinking water. RO is a fairly new technology which make drinking water out of seawater. Although this provides high quality water, the method is too expensive to consider as an option for the entire population.

171 These options were not considered viable from both economic and technical points of view.

D. No Project Scenario

172 In addition, not undertaking the subproject - the “No Action Alternative” - was also considered. However, not undertaking the subproject would not realize the objective of improving water supply, and the “No Action Alternative” was deemed neither a reasonable nor prudent course of action.

V. DESCRIPTION OF BASELINE ENVIRONMENT

A. Location setting and extent

173 **Ukhiya upazila:** Ukhiya Upazila is an Upazila under Cox's Bazar District in the Division of Chittagong, Bangladesh. It is located at 21.2833° North, 92.1000° East. It is bounded by Ramu on the north, Myanmar and Naikhongchhari on the east, Teknaf on the south, the Bay of Bengal on the west. Ukhiya thana was established in 1926 and was promoted into an upazila in 1983. The upazila is consisted of five Union Parishads: (i) Halda Palong; (ii) Ranta Palong; (iii) Raja Palong; (iv) Jalia Palong and (v) Palong Khali. Ukhiya Upazila covers an area of 261.8 sq km, located in between 21°08' and 21°21' north latitudes and in between 92°03' and 92°12' east longitudes (Banglapedia 2018). The area is bounded by Ramu upazila on the north, Teknaf upazila on the south, Arakan state of Myanmar and Naikhongchhari upazila on the east, the Bay of Bengal on the west. See Figure V-1 for details. More than half of the upazila is under Ukhiarghat protected forest. The refugee camp situated in Ukhiya is within the protected forest.

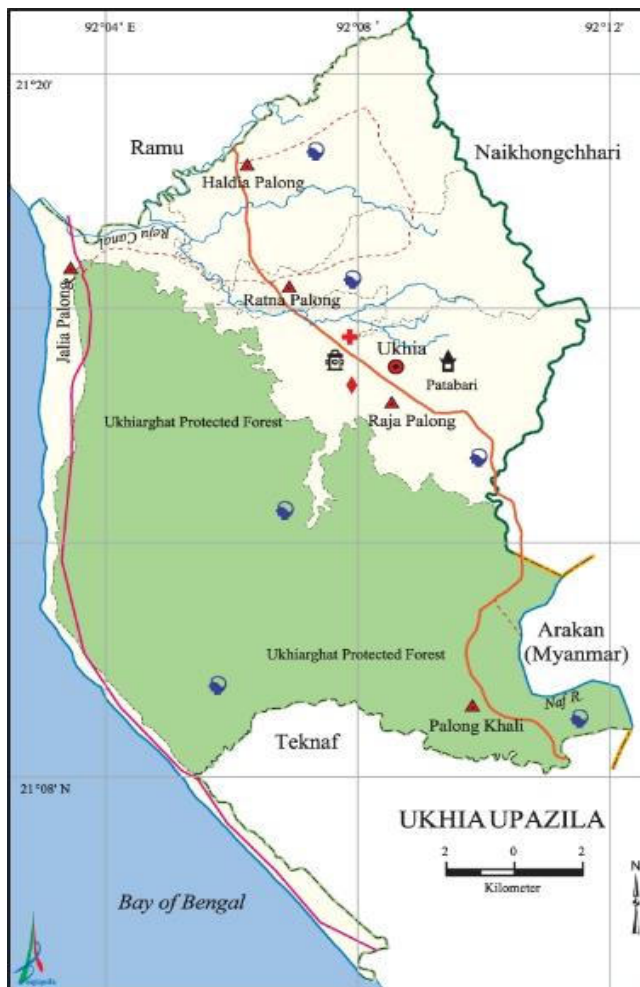


Figure V-1 Location map of Ukhiya upazila

Source: <http://en.banglapedia.org/images/e/ee/UkhiyaUpazila.jpg>

174 **Teknaf upazila:** Teknaf is an Upazila of Cox's Bazar District in the Division of Chittagong, Bangladesh. It forms the southernmost point in mainland Bangladesh (St. Martin's Island is the southernmost point). The name of the region comes from the Naf River which forms the Eastern boundary of the upazila²¹. It shares the border with Myanmar. Teknaf Upazila with area of 388.68 sq km, is located in between 20°23' and 21°09' north latitudes and in between 92°05' and 92°23' east longitudes. It is bounded by ukhia upazila on the north, the Bay of Bengal on the south, arakan state of Myanmar on the east, the Bay of Bengal on the west. Teknaf upazila, located on the south east extremity of Bangladesh, is 86 km on the south of Cox's Bazar Town. See Figure V-2 for details.



Figure V-2 Location map of Teknaf upazila

Source: http://en.banglapedia.org/index.php?title=Teknaf_Upazila

²¹ Wikipedia (undated), URL: https://en.wikipedia.org/wiki/Teknaf_Upazila. Date accessed: 8 August 6, 2020

B. Physical Environment

1. Landform and ecology

175 Teknaf Peninsula (covering Ukhiya and Teknaf upazila) is one of the longest sandy beach ecosystems (80 km) in the world. It represents a transitional ground for the fauna of the Indo-Himalayan and Indo-Malayan ecological sub-regions. Important habitats at the site include mangrove, mudflats, beaches and sand dunes, canals and lagoons and marine habitat. Mangrove forest occurs in Teknaf peninsula both as natural forest with planted stands and mostly distributed in the inter-tidal zone. The Teknaf peninsula mangroves supports the habitat of 161 different species of fish²². Teknaf reserved forest is one of the oldest reserved forests in Bangladesh.

176 The hill area covers 14,602 ha, accounting for 41.8% of the total area. According to its height and morphology, the hill area can be divided into two types: medium-high hills and medium-low hills. The area of medium-high hills is approximately 6940 ha, and the heights of the hills range from 150 to 300 m. The slopes of these hills range from steep (30–50% slopes) to excessively steep (>70% slopes). The hill ranges, which are interrupted by streams and valleys, are oriented from north to south, and they developed over sedimentary rocks. The area of medium-low hills, which developed over soft sedimentary rocks, is 7436 ha, and the hill heights are less than 150 m. The slopes range from excessively steep by steep to slightly steep (<5% slopes). Erosion is very common in steep to very steep areas, while it is less common in flatter areas. Deep soils only developed in flatter areas. Narrow and broad ridges are found alongside the low hills²³.

177 Historically, the main uses of the land of the region were small-scale agricultural crop production, betel nut/leaf cultivation and another homestead agroforestry (UNDP 2018)²⁴. Along with settlement, the clearing of the native

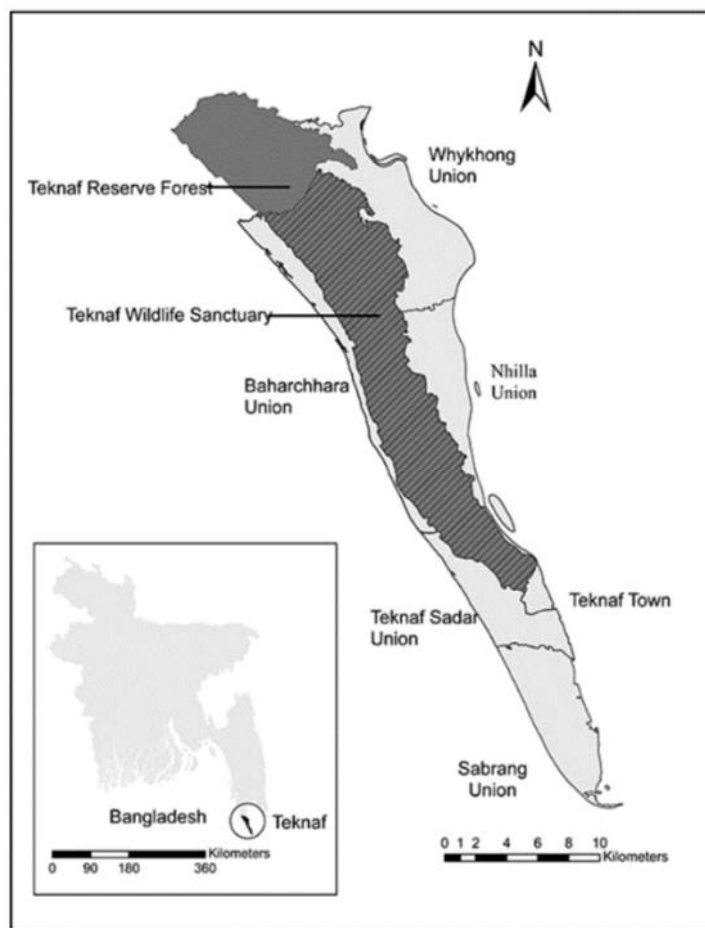


Figure V-3 Ecologically critical areas around Teknaf

Source: Tani M and Rahman MA (2017) *Chapter 1 Introduction*, in Teknaf in Deforestation in the Teknaf Peninsula of Bangladesh, Masakazu Tani and Md. Abiar Rahman (eds.)

²² Chowdhury, N. Shah Nawaz; Hossain, M. Shahadat; Das, Nani Gopal; Barua, Prabal (2010). "Environmental variables and fisheries diversity of the Naaf River Estuary, Bangladesh". *Journal of Coastal Conservation*. 15 (1): 163–180. doi:10.1007/s11852-010-0130-3

²³ A.Z.M. Moslehuddin, Md. Abiar Rahman, S.M.A. Ullah, M. Moriyama, and Masakazu Tani (2017) *Chapter 2 Physiography, Forests, and People* in Teknaf in Deforestation in the Teknaf Peninsula of Bangladesh, Masakazu Tani and Md. Abiar Rahman (eds.)

²⁴ UNDP Bangladesh and UN WOMEN Bangladesh 2018. Report on Environmental Impact of Rohingya Influx. Dhaka, Bangladesh, p 106. Springer.

vegetation has had one of the greatest impacts on the natural reserve forests in this region. Currently, the main use of the land includes site for the construction of hotels and resorts, the development of urban and tourism facilities, agriculture, aquaculture and salt farming, human settlement, shrimp hatcheries, fishing and dry fish processing.

178 The region, now a degraded forest land, includes three Ecologically Critical Areas (ECAs)—the western, coastal zone of Teknaf Peninsula, St Martin’s Island, and Sonadia Island, and two Protected Areas (PA) – the Himchari National Park and the Teknaf Wildlife Sanctuary (TWS). The Inani National Park, proposed as a protected area but not officially established as one, is considered a key biodiversity area and should be treated as a critical habitat. Figure V-3 presents the ecologically critical and conserved areas around the region.

2. Disasters

179 Most of the areas of Cox’s Bazar district surrounded by hills, rivers and being adjacent to the Bay of Bengal, natural disaster visited the district every year. Subsequently, the inhabitants of the district suffer much by the disaster. Adding this, climate change effect has speed up the frequency natural disaster like, cyclone, tidal surge, flesh flood, excessive rainfall, rising temperature, increase salinity, land slide, erosion of riverbanks, thunderstorm, earthquake etc. and these are the major disaster for Cox’s Bazar district. As part of history of natural disaster for the region there are few events are most remarkable and historic.

180 The most historic and destructive cyclone of 1991 severely affected the whole Cox’s Bazar district. All the 8 Upazilas of the district hit by the cyclone. Mostly St. Martin, Kutubdia, Materbari, Dhalghat, many parts of Moheshkhali and Teknaf was severely affected. In an average the tidal surge by the wind speed rise from 20 to 30 feet, and 72 hours continuous water stagnated by the high tide of the sea. There was cyclone in 1994 and 1997 too which were also affected the overall resources, community life, household, cattle head, crops, infrastructure, green trees, communication system etc.

181 The following areas are identified by the Cox’s bazar District Disaster management Plan²⁵: Under Ukhia-Jaliapalong, Sonarpara, Dailpara, Lamburipara, Sonaichari, Nidania, Inani, Shafir bil, Ruppoti, Bailyakhali, Imamerdail, Sepotkhali, Maderbonia, Monkhali, Nolbila, Balukhali, Goalmara, Thainekhali and Rahmoter bil. Figure V-4 presents a Hazard Calendar of the upazila.

²⁵ Development of District Disaster Management Plan District: Cox’s Bazar, District Disaster Management Committee, Cox’s Bazar. August 2014. Government of Bangladesh.

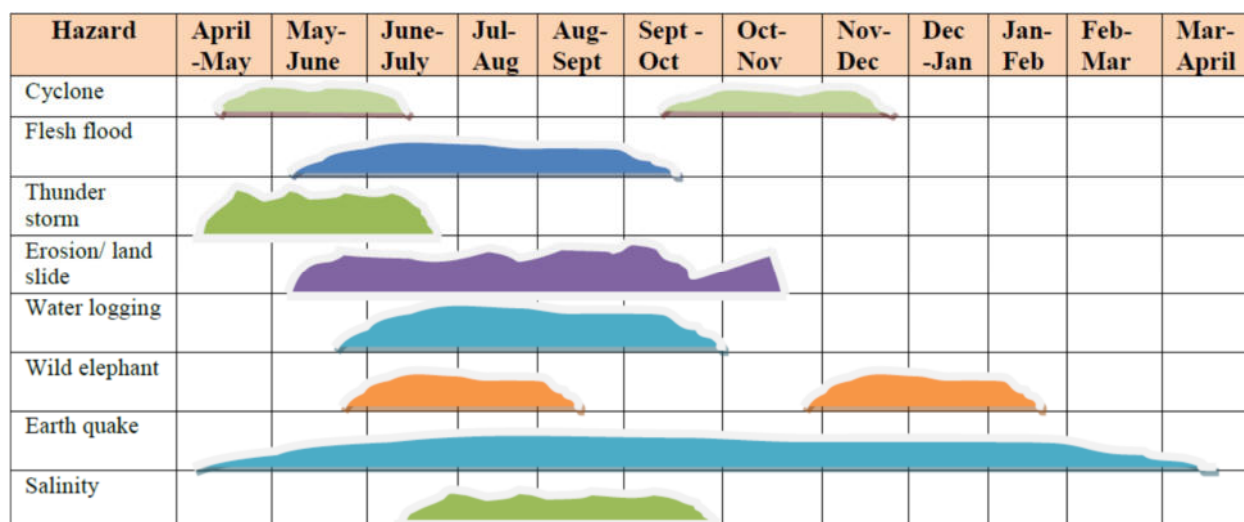


Figure V-4 Hazard Calendar of the Upazila

3. Geology, Topography, and Soils

182 **Geology:** Cox's Bazar-Teknaf area consists of low coastal plain with dunes and hinders land behind the coast consisting of steep but low cliffs (Figure V-5). Several beaches and tidal flats developed in this area. The straight coastline and steep cliffs along this coast suggest that it has developed by faulting and down warping. This coast has modified by in different times with response to tectonic and marine transgression and regression. The beach morphology is another decisive factor which also related to the development of the coast. The beach slope of Cox's Bazar to Teknaf varies from 2 ° to 9 ° and surf zone varies from 70 to 215 meter. In some cases, the morphology of this coast favors the formation of high velocity longshore current (Ahsan and Rashid, 2016²⁶). There is a very narrow strip of less than 100-meter beach from Cox's

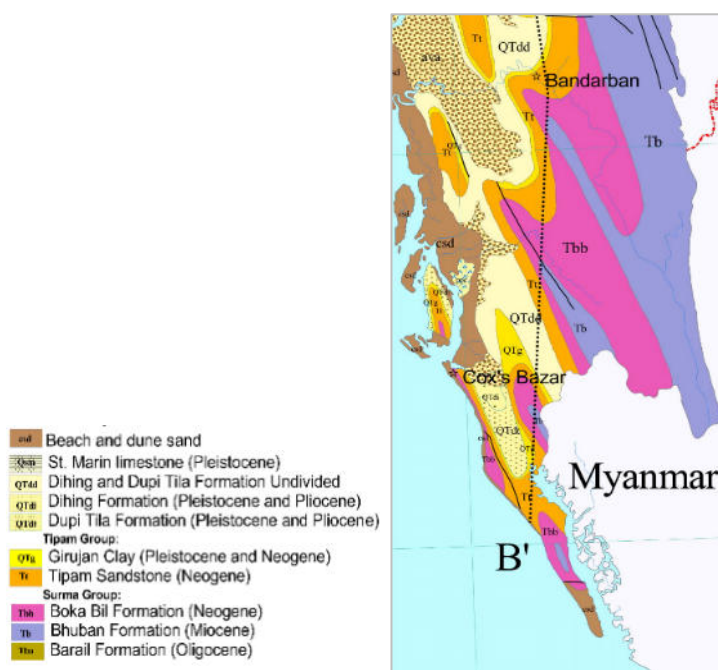


Figure V-5 Geological formation of Teknaf region (adopted from GSB 2001)

²⁶ Ahsan, K. and Rashid, MB. (2016) Coastal Process in the Cox's Bazar-Teknaf Area of the Eastern Coast of Bangladesh, In book: Book of Abstracts (IX PIANC - COPEDEC - 2016 Ninth International Conference on Coastal and Port Engineering in Developing Countries) Chapter: Coastal Zone and Coastal Risk Management, Publisher: PIANC COPEDEC IX 2016

Bazar to Teknaf, between the hills and the Bay of Bengal (GSB, 2001²⁷).

183 **Teknaf piedmont:** The Teknaf piedmont plain is situated alongside the hills, mainly on their western side, but is found sporadically on the eastern and south sides of the hills (Figure V-5). Sea level fluctuations with eustatic changes of sea level have also an effect on the coastal morphology of this coast. Erosion takes place mainly monsoon time when sea level rises about 1m in comparison with the post monsoon. Seasonal rise of sea level combined with relative sea level rise produce high waves which occasionally erode the base of Tertiary hills in this coast that facing the open sea. Frequent low to moderate earthquake events of about 4 to 6 Mb in recent years and other signatures like uplifted paleo-beach, wave cut platform, bioturbated boulder, river terraces etc. attest to neo-tectonic activities in Cox's Bazar-Teknaf area which also plays a vital role for the development of this coast.

184 **Tidal floodplain:** The tidal floodplain, which runs from north to south through the peninsula, is located between the hills and the Naf River (on the eastern side of the hills). The area consists of broad, high, and low ridges and depressions. Numerous canals divide the landscape, some of which are subjected to tidal flooding. During the rainy season, most of the areas become mildly inundated with rainwater and occasionally suffer flash floods during heavy rainfall.

185 **Dakhin Nhila structure:** Dakhin Nhila structure lies under Teknaf upazila of Cox's Bazar district and bounded by latitude 20°52' to 21°07'N and longitude 92°08' to 92°18'E and is situated at extreme south east of Bangladesh territory. The maximum elevation is about 266m above mean sea level. The northern pitch is represented by low relief due to saddle separating from Inani anticline, whereas southern pitch abruptly merges with the plain land (Banglapedia, undated²⁸).

186 **Soils:** There are four main soils or physiographic units can be recognized, viz. I) The higher hill ranges occupy a narrow belt: the most common soils are strong brown, friable, silty clay loams and silty clays, which grade into broken shale rock at 2-4 feet. All soils are strongly acid in reaction; II) The lower hill ranges are developed in unconsolidated sands and clays. Soils are mainly deep red, friable, clay loams to clays. All the soils are strongly acid and sandy soils are droughty; III) The coastal plains are underlain by heavy marine or tidal clays characterized by more sandy and silty deposit near the foot of the hills and along the course of rivers and streams which cross the plains. Near the coast, some of these soils become saline at the end of the dry seasons; IV) The tidal mangrove swamps are most extensive at the mouth of the Matamuhuri River. Here the soils are grey clay flooded twice daily by saline water and unsuitable for agriculture.

187 The major soil types are red, alluvial, muddy and sandy soil. The soils of the Dupitila formations were formed on unconsolidated and compact rocks, moderately well to excessively drained and probably the oldest of the area. See Figure V-6 for details.

²⁷ Geological Survey of Bangladesh (GSB) (2001) Original Geological Map by Md. Khurshid Alam, A.K.M. Shahidul Hasan, and Mujibur Rahman Khan, (Geological Survey of Bangladesh), and John W. Whitney, (United States Geological Survey) 1990, Digitally compiled by F.M. Persits, C.J. Wandrey, R.C. Milici, (USGS), and Abdullah Manwar, (Director General, Geological Survey of Bangladesh).

²⁸ Banglapedia (undated) Geological Structure. Banglapedia. National Encyclopedia of Bangladesh. URL: http://en.banglapedia.org/index.php?title=Geological_Structure Date Accessed: 14 May 2020.

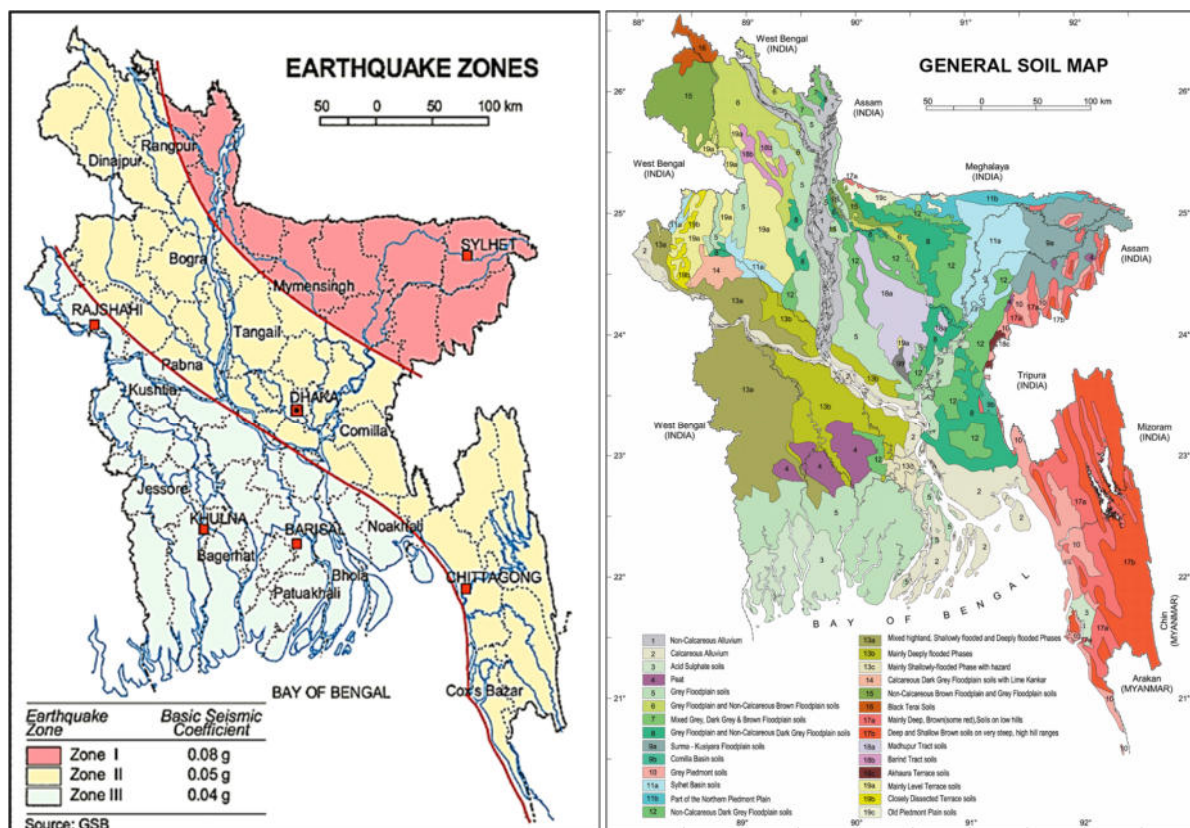


Figure V-6 Earthquake zone and general soil map of Bangladesh

188 **Seismicity:** In the earthquake zoning map (Figure V-7) Geological Survey of Bangladesh, 26 percent of Bangladesh falls in high risk, 38 percent moderate and 36 percent in low risk zone in terms of earthquake vulnerability. The distribution of recorded earthquakes indicates a major clustering of seismicity around the Dauki Fault and scattering of other events along other major fault systems of Bangladesh. The magnitude of the earthquakes is moderate (4-6, magnitude in Richter scale) and majority of them are shallow depth. According to Geological Survey Bangladesh (GSB, undated²⁹) Teknaf falls in medium intensity seismic zone (Zone-II, Basic Seismic Coefficient 0.05g).

²⁹ Geological Survey of Bangladesh (GSB) (undated) Earthquake Zones of Bangladesh. Publication type: Map. Available at: <http://www.gsb.gov.bd/site/view/commondoc/Geo-scientific%20Map/>, date accessed: 15 May 2020.

189 Again, according to the Bangladesh National Building Code (2010)³⁰, Bangladesh has been divided into 4 category of earthquake zone (Figure V-7) and Teknaf falls into Zone 3 ($Z = 0.28$). Teknaf has both sandy coast and hilly region, a combination of alluvial flood plain and sandy sea-shore area. Although the hilly region is less susceptible to liquefaction, it is formed by sandy and clayey soil and the area bottom of the hill

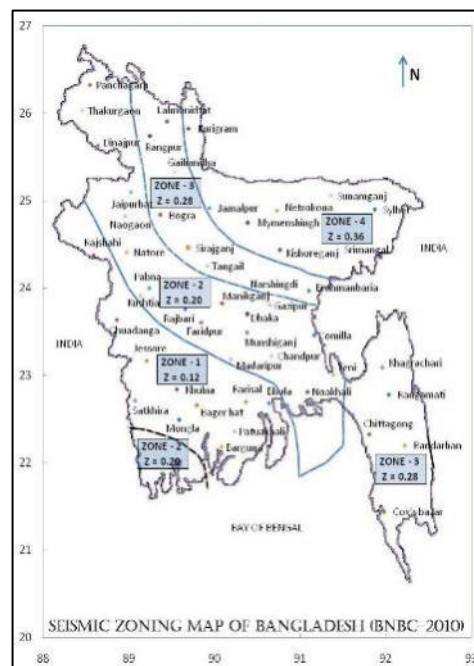
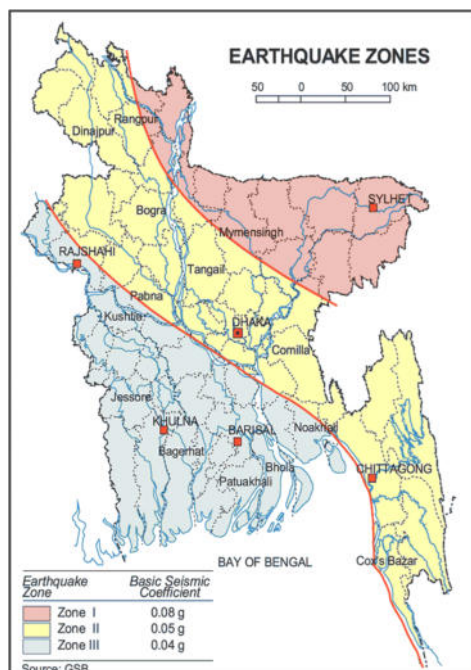


Figure V-7 Earthquake zonation map of Bangladesh, by GSB (undated) and BNBC (2010)

also liquefy if the intensity of shaking is high, which may cause landslide in the highly region. On the other hand, flood plains and seashore areas consisting of fine sand and silt deposit with shallow water table in most of the places, which may liquefy during a strong earthquake.

4. Climate and Meteorology

190 **Temperature:** Generally, maximum temperature in the year reach between the last week of March and end of May. Temperature data is recorded at station Cox's Bazar. As dis discussed above, Teknaf is a upazila (subdistrict) of the Cox's Bazar zilla (District). The average maximum temperature in Cox's Bazar is 31.28°C in April and minimum is 22.0°C in January (Data from BMD 2016). See Figure V-8 for details³¹.

³⁰ Bangladesh National Building Code (BNBC) (2010) Bangladesh National Building Code (BNBC), Housing and Building Research Institute, Dhaka, Bangladesh.

³¹ Source: <https://weather-and-climate.com/average-monthly-Rainfall-Temperature-Sunshine.cox-s-bazar,Bangladesh>, Date Accessed: 7 August 2020.

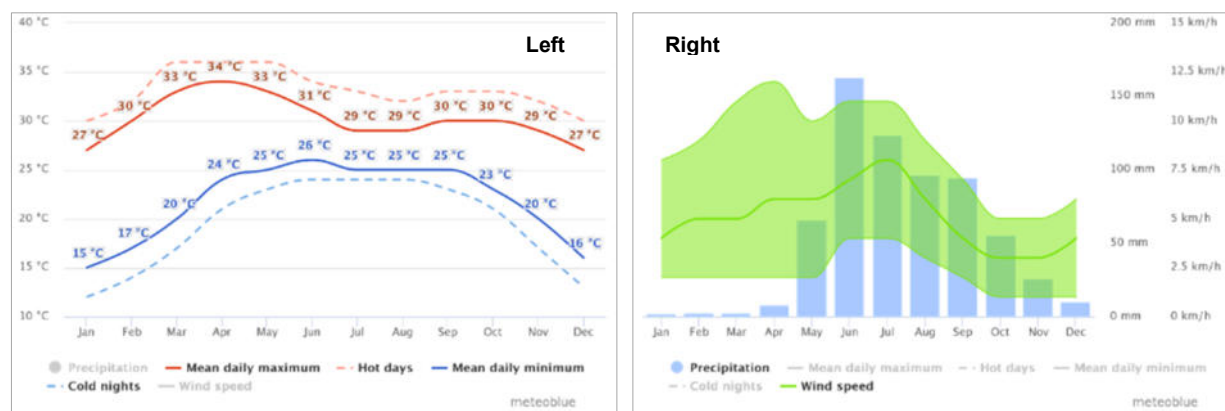


Figure V-8 Left: Temperature pattern in Cox's Bazar; Right: Rainfall pattern in Cox's Bazar

191 **Rainfall:** The trend of rainfall of Cox's Bazar district was as usual and normal before 1991, however, radical changes have been observed in the recent years, in particularly after the year 2000. Once, the rainfall and its continuation were steady according to the seasons of the year. Interest, 1994 a remarkable change in rainfall has observed. In general, there was no much rain during the month of January to April, and it happened during from April to June of the year. On the contrary, sometime rainfall occurs during the month of December which creates flooding. The variation in the precipitation between the driest and wettest months is 401 mm. See Figure V-9 for details³².

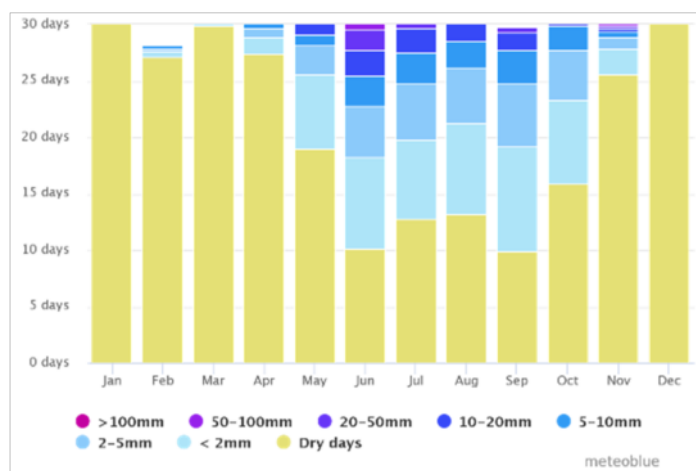


Figure V-9 Rainfall analysis (amount) for Cox's Bazar station

³² Source: <https://weather-and-climate.com/average-monthly-Rainfall-Temperature-Sunshine,cox-s-bazar,Bangladesh> Date Accessed: 7 August 2020..

192 The seasonal variation of the rainfall is shown in Figure V-10. The wet season is starting around April and ending in October (7 months). This leaves the months November to March as the dry season (5 months).

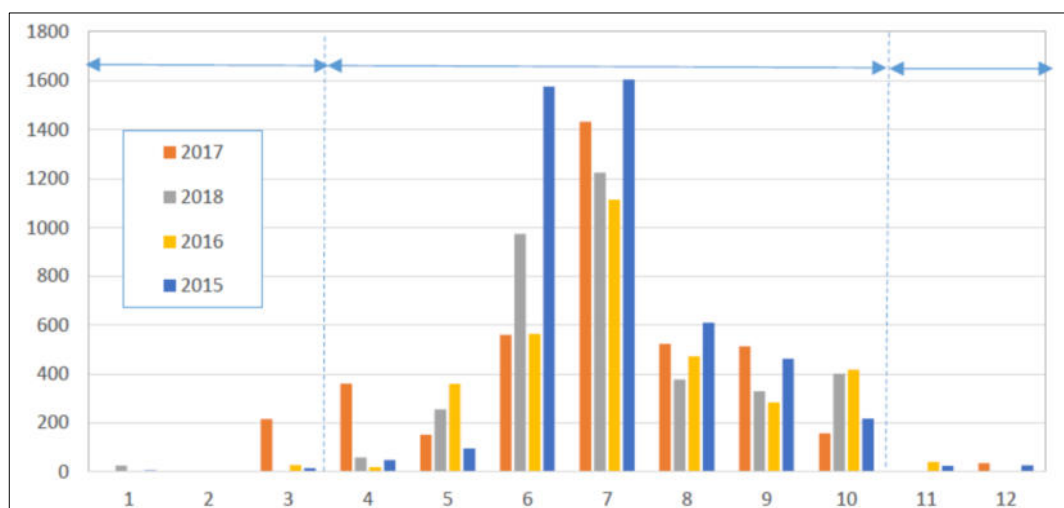


Figure V-10 Monthly precipitation in Cox's Bazar from 2015 to 2018 (Source: BMD, Cox's Bazar) indicating dry season, pre-monsoon, monsoon, and post-monsoon.

193 **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% respectively and the average humidity recorded was 77.99%.

194 **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 V-11³³, and this pattern is assumed to reflect the conditions of the subproject area.

5. Hydrology (Surface Water and Ground water)

195 The Moheshkhali Channel, Baak Khali and Naf rivers and Bay of Bengal are the main waterways of the region. The Moheshkhali Channel flows into the Bay of Bengal near Cox's Bazar and passes the north western

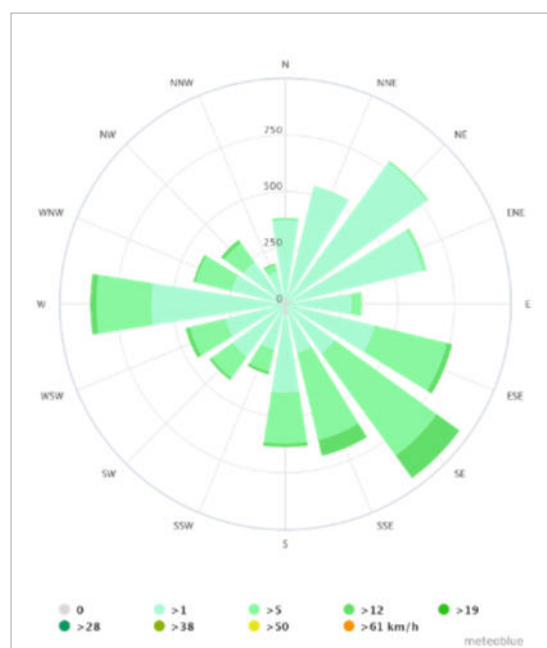


Figure V-11 Windrose diagram of Cox's Bazar (Source: BMD, data modelled by meteoblue.com)

³³ URL: https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/cox%27s-bazar-airport_bangladesh_6301081, date accessed: 7 August 2020.

boundary of the area of influence. The Bakkhali River originates from the Chittagong Hill Tracts and flows into the Bay near Cox's Bazar. Five other canals run through the hilly hinterland. They are the Reju, Inani, Mankhali, Rajachora and Mathabanga canals. In addition, a stream network runs through the camp area.

196 **Naf river:** It flows along the southernmost border line of the country. It originates in the northern hills of Myanmar and enters Bangladesh near Palong Khali of Ukhia upazila of Cox's Bazar district. The river flows through Ukhia and Teknaf and discharges into the Bay of Bengal near Sabrang (Teknaf upazila, Cox's Bazar). Most of the downstream reach of the river demarcates the Myanmar-Bangladesh border. The river is 62 km long. BWDB has one hydrometric station on the river at Teknaf and data from 1968 are available.

197 There are 14 canals in the Upazila, which flow throughout the Upazila. Reju Canal-starting from Rejur mukh crosses painnasia, sonaichoara, sonarpara, chorpara, jummapara and lamburi para. It has length of 7 kilometres. Monkhalai Canal-starting from Monkhalai mouth up to Nuton Chaka para. It is 8 kilometres. Sowankhali Canal- it is 8-kilometre-long started from Swankhali area and stretched upto Bay of Bengal. Chepokhali Canal-It is 10 kilometre long started from Madarbonia and arrives to Chepotkhali. Inani Canal-it is 15 kilometre long started from Chenchuli to Inani. Inani Choto Canal-It is 20 kilometre long started from Chenchuli to Inani. Paglir Canal- 8-kilometre-long canal started from Guarerdeep and stretches to Patabari area. Duchori Canal-the canal is 15 kilometre long started from Tuturbil to Madhurghona. Goyalmara Canal-it is 18 kilometre long starting from Tuturbil and upto Modhurghona. Balikhali Canal-the canal starting from Modhurchara and reached to the Naf river covering a length of 7 kilometre. Thiankhali Canal-It is 8-kilometre-long starting from Achortoli to Naf river crossing through Tarulapara and Fashiakhali. Palongkhali Canal- This is 14-kilometre-long starting from Nojumora falls into Naf river crossing different parts of Ukhia and Teknaf Upazila. Balukhali Canal: a 6-kilometre-long started from Madhuchara reaches to the Naf river crossing through BGB camp, Chowdhur para and Barua para. Figure V-12 represents the stream network in the region.

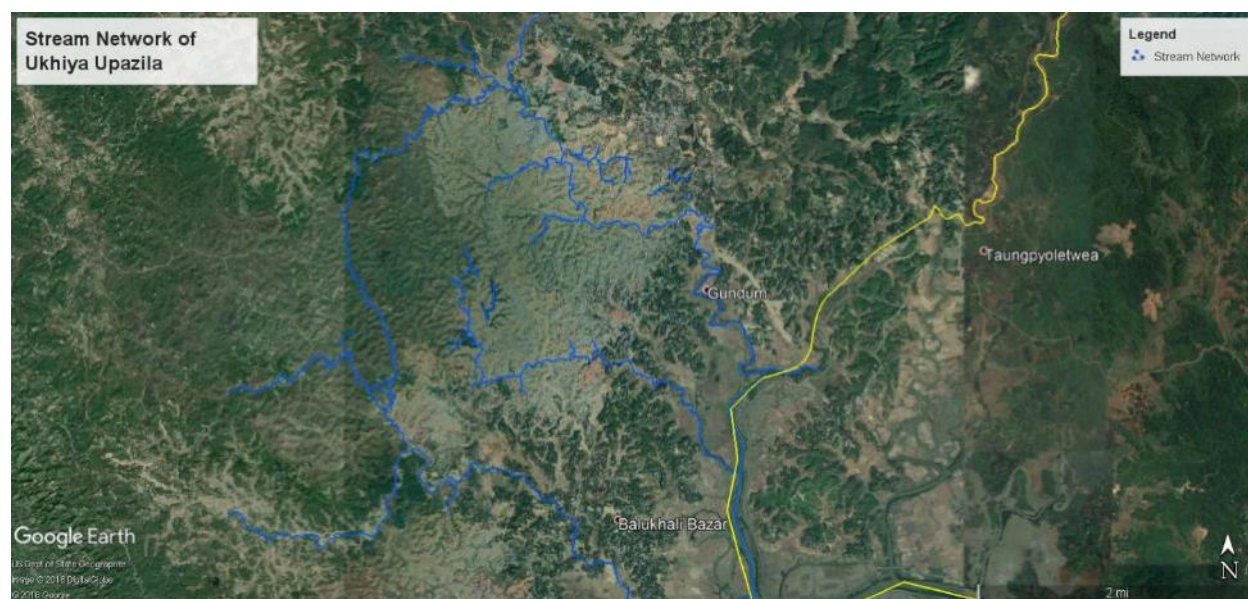


Figure V-12 Stream network in the Sub-project area

198 **Reju Khal:** The khal has originated from Arakan boarder of Myanmar and Wading hills, it has flowed through Nihongchoriupazila of Bandarban entering into Holodiapalong of Ukhia Upazila and Khunia

union of Ramu Upazila. It has finally entered Jaliapalong of Ukhia and arrives at Bay of Bengal. It is about 20 kilometres long within Bangladesh.

199 **Ground water:** Bangladesh is considered rich in ground water resources. Properties of ground water storage reservoirs and volumes of annual recharge determine ground water resources. In this region, ground water level is shallow, usually ranges between 5-7m³⁴.

200 Ground water information of Ukhiya upazila is unavailable, however some information of Teknaf is accessible. In general, Teknaf is covered with alluvium and sedimentary bedrock (Rahman and Woobaidullah 2020³⁵). These deposits have a low transmissivity of 400 sqm/day. These deposits are not favourable aquifers for extensive withdrawal. Aquifer material is covered with 25-30 m thick zone of silt and clay. Clay thickness gradually increases towards the Bar. Sandy materials are predominantly medium to coarse (Alam et al. 2003³⁶). A shallow aquifer of about 20-50m thickness exists near the surface. Main aquifer is deep seated whose nature and extent are not known. Shallow aquifer exists at a depth of about 50m the depth to the main aquifer is not precisely known. Aquifers are semi-confined to confine in nature (Figure V-13³⁷).

201 The Teknaf area belongs to a zone where complex groundwater condition exists and is unsuitable for tube wells (UNDP 1982³⁸). The entire Teknaf peninsula falls into a zone which characterized by a complex geology of folded tertiary sediments with very low potential for large-scale groundwater development (UNDP 1982). Despite of an annual rainfall estimated to be around 4000mm according BMD data, most of the precipitated water flows to the Bay of Bengal as runoff due to absence of significant water-bearing formations, i.e., aquifers in the study area (Rahman and Woobaidullah 2020). There are some localized occurrences of low-yielding water bearing formations

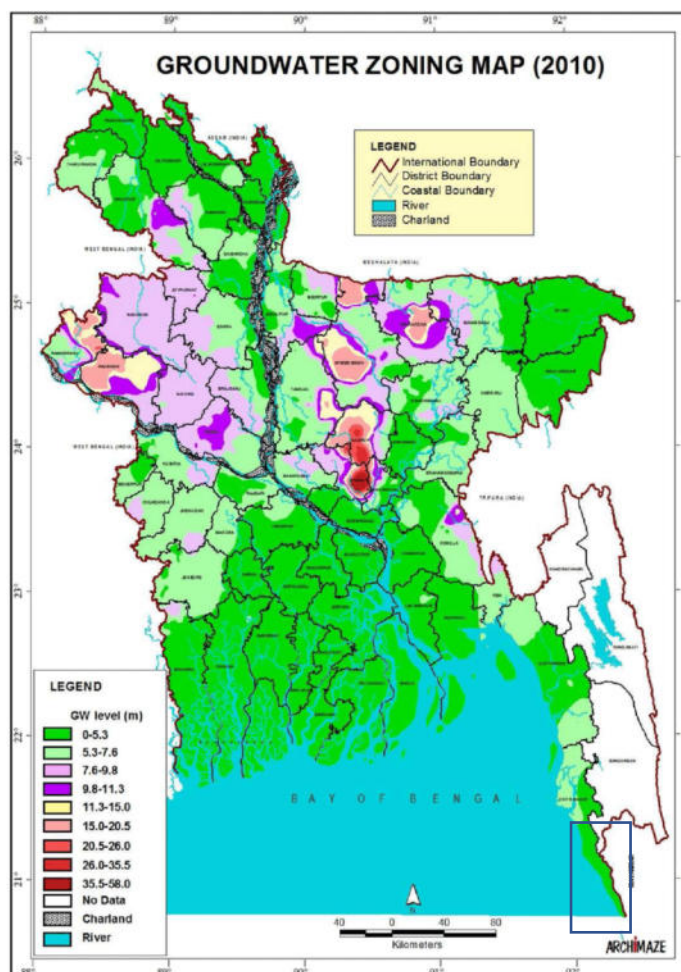


Figure V-13 Groundwater zonation map of Bangladesh (Source: BARC 2015). Blue rectangle represents project area

³⁴ BARC, Bangladesh agricultural research council, September 2015. URL: <http://www.barc.gov.bd/>

³⁵ Rahman, MM. and Woobaidullah, ASM. (2020) Groundwater resources exploration in a Hillock Valley at Lada refugee camp, Teknaf using electrical resistivity soundings. Arabian Journal of Geosciences (2020) 13:90 <https://doi.org/10.1007/s12517-020-5056-y>

³⁶ Alam M, Alam MM, Curray JR, Rahman MLC, Gani MR (2003) An overview of the sedimentary geology of the Bengal Basin in relation to the regional tectonic framework and basin-fill history. Sediment, Geology 155:179–208

³⁷ BARC (2015) Bangladesh agricultural research council, September 2015. URL <http://www.barc.gov.bd/>, date accessed: 15 May 2020.

³⁸ UNDP Bangladesh and UN WOMEN Bangladesh 2018. Report on Environmental Impact of Rohingya Influx. Dhaka, Bangladesh, p 106 (including cover).

at a depth around 10 m at certain locations in Taknaf which can house the low-yielding dug wells (large-diameter wells).

6. Flooding, Water Logging and Drainage Pattern

202 Eastern side of the upazila comprising high land and gradually down towards the western side. Matamuhuri River is flowing beside the upazila in north-east and north-west direction. Several natural streams act as the natural drainage system of the region. The mainland surrounding the upazila is generally high from the level of tide. 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. Figure V-14³⁹ shows a flood vulnerability Factor Map of Bangladesh. The study region falls into high vulnerability region (score >9).

7. Land Slides and erosion

203 The two main streamlets, Kalatali Chara and Reju Khal, cut the cliff into three sections: Bahar Chara-Kalatali Chara (BK), Kalatali Chara-Reju Khal (KR), and Reju Khal-Boro Inani Khal (RI). The distance between the coastline and the base of the cliff at the Bahar chara area is about 200 m and decreases southward to 10 m at Boro Inani khal (Rahman and Khan, 1995)⁴⁰. The cliff slope angle varies from place to place. In the northern part, from Bahar chara to Kalatali chara (section BK), the slope angle varies from 30 ° to 40 °, but from Kalatali to Reju khal (section KR) it ranges between 35 ° to 60 °. In the southern part, from Reju khal to Boro Inani khal (section RI), the slope angle varies from 50 ° to 70 °. In the section BK, from Bahar chara to Kalatali chara, landslide activity was not noticeable. Landslide activity causes several slope failures in the section KR and it increases towards the south in the section RI. Most landslides are shallow failures occurring along a plane parallel to the slope surface (Rahman and Khan, 1995).

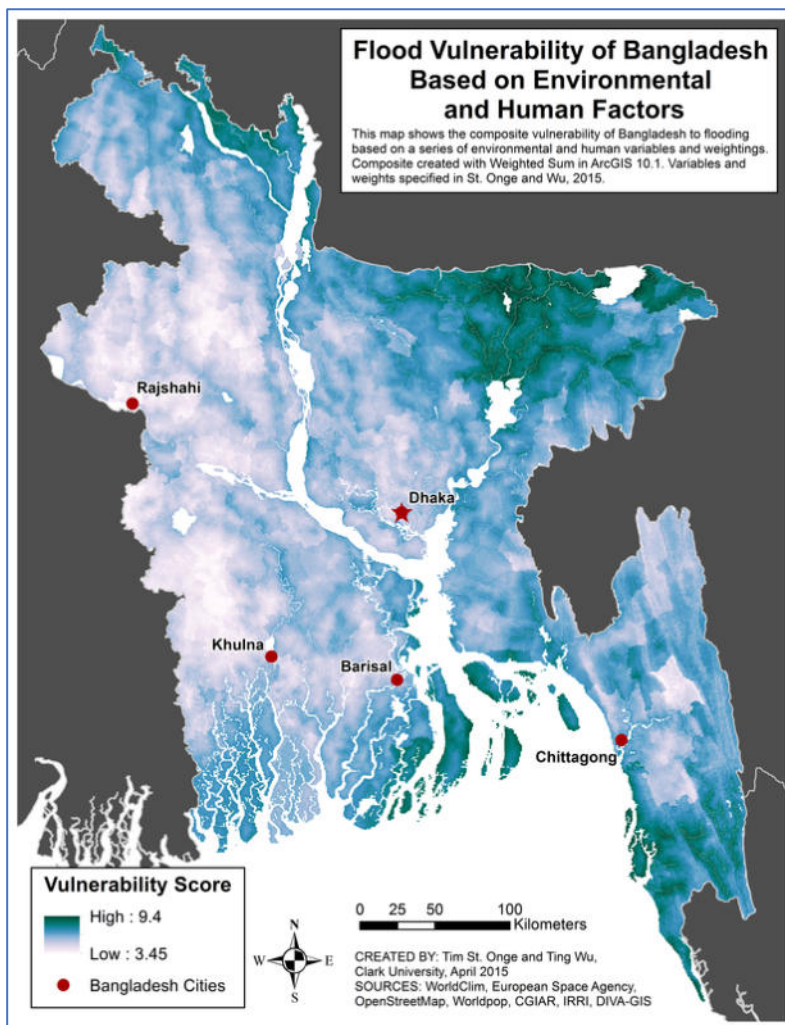


Figure V-14 Flood vulnerability map of Bangladesh

³⁹ WorldClim, SRTM map by Tim St. Onge and Ting Wu, Clark University, May 2015. URL: <http://timstonge.weebly.com/gis-portfolio.html>, Date accessed: 7 August 2020.

⁴⁰ Rahman, H. and Khan, YA. (1995) Landslides and stability of coastal cliffs of Cox's Bazar area, Bangladesh. *Natural Hazards* 12(2):101-118, DOI: 10.1007/BF00613071

204 Land slide is a major problem in the Cox's Bazaar and Teknaf mountain zones, of Bangladesh by killing people every year besides damaging the properties and blocking the public utilities. Rabby and Li (2019)⁴¹ found that in Cox's bazar District, 124 landslides occurred during the period of 2001-2017. A landslide Hazard zonation map is produced by CDMP in 2012 (Figure V-15⁴²). The highest risk is posed in the Rohingya Refugee Camp in Teknaf, north-western side of the upazila. In Hill cutting and the clearing of vegetation cover increased the risk of hill and land slide at the time of monsoon rains. As denuded hills become dry and usually generate cracks, and in the rainy season there is more chance that water will enter into the denuded hills through the cracks. As a result, there is a high risk of local landslides which could cause the destruction of the shelters and potential casualties (UNDP/UNWOMEN 2018)⁴³.

8. Air Quality and Dust

205 Baseline data on air quality for the subproject area is not available. In accordance to the camp 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.

206 Indoor air pollution in the camp areas 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

207 Noise level data is not available for the region. The major causes for noise in the subproject area are the vehicle movement (motorcycles, pick-up, mini-trucks, CNG rickshaw and auto-rickshaws), playing of loud-speaker and mass people gathering (for advertising of products and political, social and religious

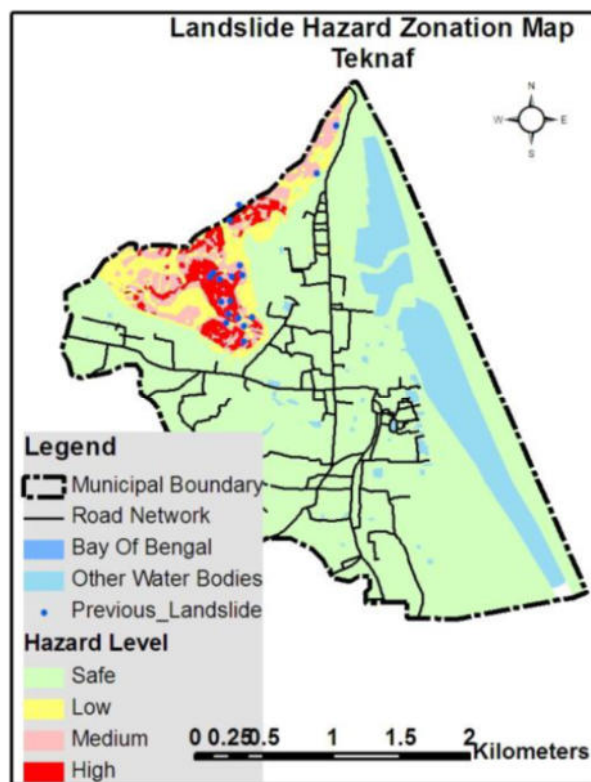


Figure V-15 Landslide zonation map of Teknaf (CDMP 2012)

⁴¹ Rabby, YW. And Li, Y. (2019) Landslide Inventory (2001–2017) of Chittagong Hilly Areas, Bangladesh. Data 2020, 5(1), 4; <https://doi.org/10.3390/data5010004>.

⁴² Comprehensive Disaster Management Programme (CDMP) (2012) Report on the Landslide Hazard Zonation mapping at Cox's Bazaar and Teknaf in Bangladesh. Comprehensive Disaster Management Programme (CDMP-II), Ministry of Food and Disaster Management (MoFDM), Disaster Management and Relief Division (DMRD), Government of the People's Republic of Bangladesh, April 2012. Prepared by Data Experts Ltd. and ADPC.

⁴³ UNDP Bangladesh and UN WOMEN Bangladesh 2018. Report on Environmental Impact of Rohingya Influx. Dhaka, Bangladesh, p 106 (including cover).

aspects) and local market. This is a common experience of the peri-urban population that noise poses a threat to the ill / physically weak people health and nerves.

10. Health and Sanitation

208 No reliable data available on health and sanitation.

11. Solid Waste Management

209 With the increase population and rapid urbanization, it is natural that generation of solid waste will also increase. If these wastes are not properly managed, it can have detrimental effects on the environmental quality. So, collection and management of solid waste is a great challenge for the Ukhiya and Teknaf Upazila. No specific information on the Upazilas is available. However, some information on Cox's Bazar solid waste management is available in the form of literatures, especially focusing on Kutupalong Rohingya Refugee camp. Cox's Bazar district has limited infrastructure for solid waste management. This is particularly the case within the rural communities near to the Kutupalong Camp. There are currently no landfill sites available for the camp or host communities and Bangladesh has banned the use of waste incinerators. There are a number of solid waste management projects either proposed or planned by the government of Bangladesh and other agencies including landfill construction and waste collection.

C. Biotic Environment

1. Terrestrial Faunal and Floral Species

210 **Faunal Species:** The influx of population have a significant impact on wildlife by shrinking habitats and disruptions in breeding grounds are affecting nocturnal, crepuscular and diurnal wildlife. Apart from the degradation of forest land along region, 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 Ukhiya, Teknaf, Inani and Himchari under Cox's Bazar South Forest Division.

211 **Common birds:** Common bird species noted in the subproject area were Asian crow, myna, cuckoo, kingfisher, pigeon and dove satore, drongo, weaver bird choro, babui, and dahuk (Figure V-16). The mammals include fox, monkey, mongoose, Bengal monitor, various rodents etc (Khan 2019⁴⁴). There are also several species of frog, lizard and snake. Socio-economic and Socio-cultural Environment.

⁴⁴ Khan, MMH (2015) Ecological Assessment of Some Selected Sites in Ukhiya And Teknaf, Cox's Bazar, Bangladesh, Final Report. TA-9546 BAN: Emergency Assistance Project, Asian Development Bank (ADB)



Figure V-16 Terrestrial fauna of Cox's bazar

212 Flora Species: The forestland in the 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 Teknaf Wildlife Sanctuary. The sanctuary is rich in flora and contains several different ecosystems including hill forest, mangrove formation and sand-dune (Uddin et al. 2013). Feeroz (2013) recorded a total of 538 plant species under 102 families and 370 genera from TWS.

213 The plant species found in Cox's Bazar are: Coconut (*Cocos nucifera*), Betel nut (*Areca catechu*), 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 V-17). Among crop-field vegetation, aman is grown during summer rains and boro (winter rice) cultivated by irrigation in winter. For a complete list of wildlife in the subproject area see Annex A.



Figure V-17 Terrestrial flora of Cox's bazar

2. Aquatic species

214 There was very little water (mostly polluted) in the waterbody during the survey, so no fish species was recorded. However, the water was found poor in plankton content indicating poor quality of water. The phytoplankton content was found at 2,532 per litre and zooplankton content 200 per litre. A total of 6 species of phytoplankton (*Cyclotella* sp. – 196 per litre, *Monoraphidium griffithii* – 762 per litre, *Navicula placentula* – 585 per litre, *Peridinium* sp. – 204 per litre, *Stauroneis anceps* – 585 per litre and *Strombomonas verrucosa* – 200 per litre) and 2 species of zooplankton (*Chromogaster* sp. – 103 per litre and *Prorodon* sp. – 97 per litre) were recorded (Figure V-18).

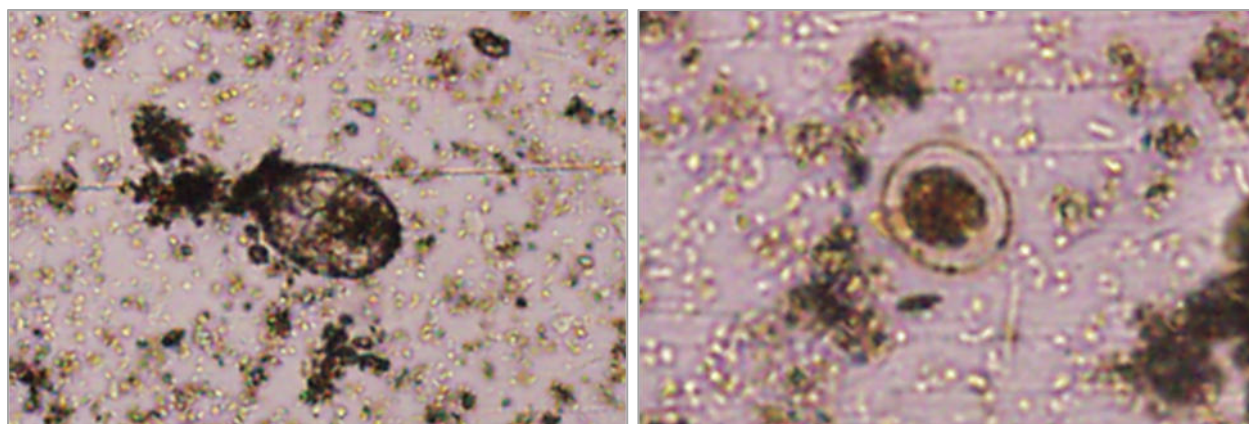


Figure V-18 Microscopic photos of some planktons found in the waterbody (Source: Khan 2019)

3. Asian elephants

215 The globally endangered Asian Elephant (*Elephas maximus*) is 'critically endangered' in Bangladesh. 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.



Figure V-19 Asian elephants found in Cox's Bazar (Source: Khan 2015)

216 There is evidence of presence of elephants in the raw water source area in Nayapara camp area (Figure V-19). Elephants now-a-days rarely visit the waterbody, but it is likely that they will visit frequently in the future when the waterbody will contain plenty of water. Host and Rohingya communities are encroaching on its habitat in the Teknaf Wildlife Sanctuary, and both resident and migratory elephants are facing a continuous shrinkage of their habitat and food supply. 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).

4. Protected Areas (PAs)

217 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. Figure V-20 shows the ECA areas of Cox’s bazar, while Figure V-21 shows the protected areas of Cox’s bazar.

218 Originally designated as Teknaf game reserve in 1983, in December 2009 the Government of Bangladesh enhanced its status to a Wildlife Sanctuary protecting 11,615 hectares. It is located in Teknaf Upazila of Cox’s Bazar District, and comprises a range of steep hills aligned north-south and bordered by the Bay of Bengal to the west and a narrow strip of lowlands and settlements along the Naf river to the south and east, and Inani reserve forest to the north.

219 The sanctuary is comprised of 10 forest beats under three forest ranges of Cox’s Bazar (south) Forest Division. It is a hilly mixed-evergreen sub-tropical forest with secondary plantations and covers an area of 11,615ha with a length of 32km (north-south) and width of 5km at the north end and 3km at the south end. The area consists of intervals of steep hills and valleys. The moist sub-tropical maritime climate of the sanctuary has three seasons: spring (March to

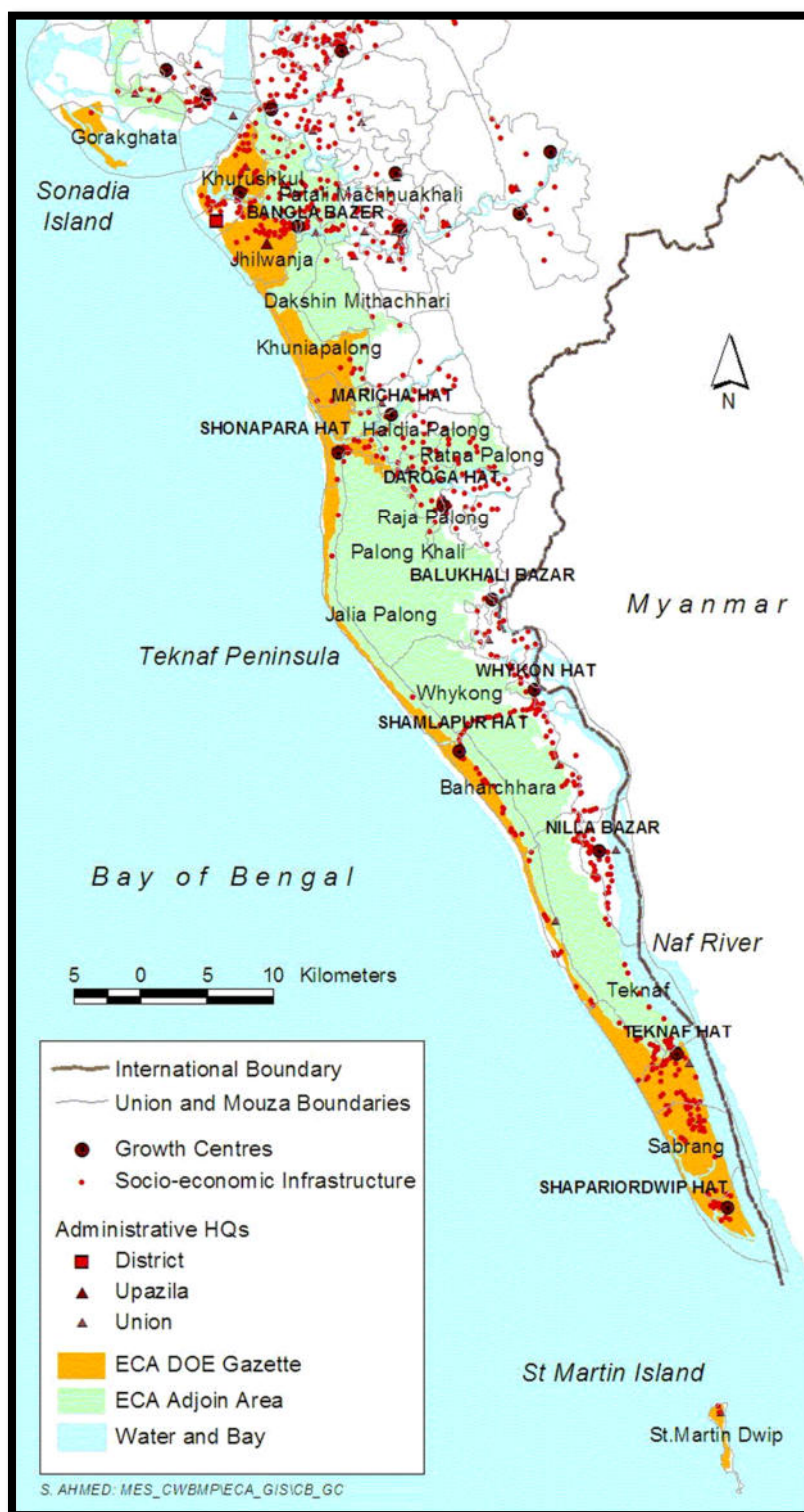


Figure V-20 ECAs in Cox's Bazar

April), monsoon (May to October) and winter (November to February; Bari & Dutta 2004). The sanctuary is rich in flora and contains several different ecosystems including hill forest, mangrove formation and sand-dune (Uddin et al. 2013).

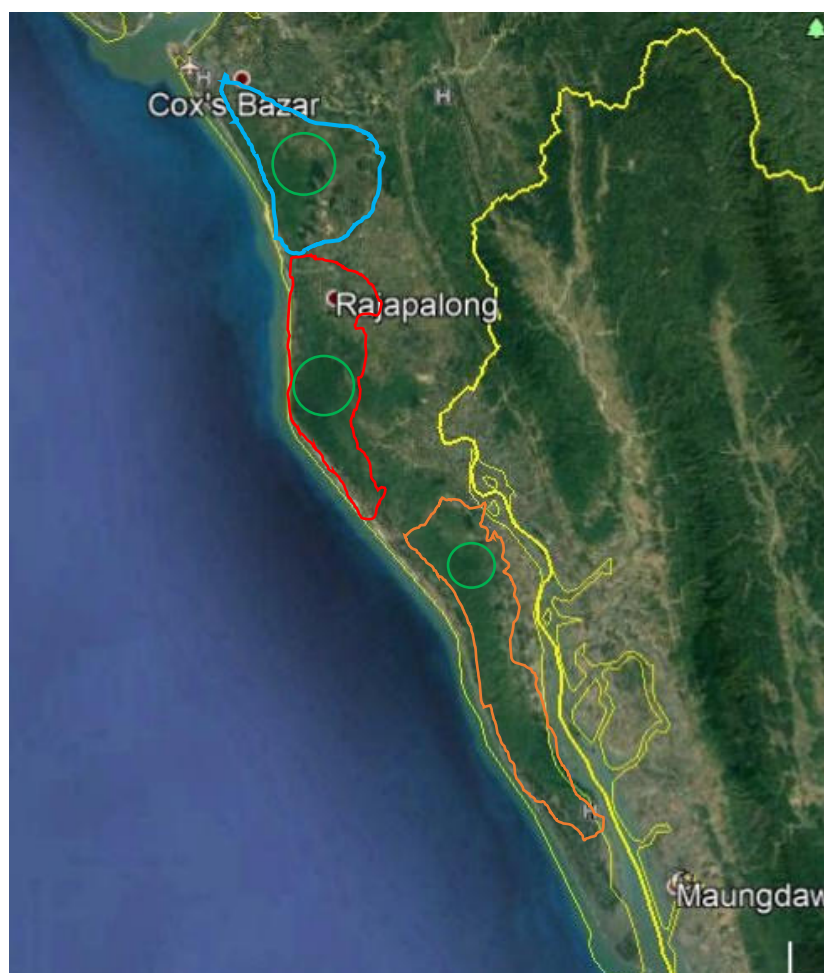


Figure V-21 Biodiversity rich areas in Ukhiya and Teknaf under three protected areas (Himchari National Park – blue border, Sheikh Jamal Inani Wildlife Sanctuary – red border, and Teknaf Wildlife Sanctuary – orange border) showing the best remaining habitats in green circle.

D. Socio-economic environment

1. Population

220 As of the 2011 Bangladesh census, Ukhiya has a population of 207,379. Males constitute 51.45% of the population, and females 48.55%. This Upazila's eighteen up population is 51749. Ukhiya has an average literacy rate of 16.8% (7+ years), and the national average of 32.4% literate⁴⁵. According to the 2011 Bangladesh census, Teknaf had a population of 200,607. Males constituted 51.81% of the population,

⁴⁵ "Population Census Wing, BBS". 2011. Data accessed August 7, 2020

and females 48.19%. The population aged 18 or over was 64,417. Teknaf had an average literacy rate of ~26% (7+ years), against the national average of 32.4%⁴⁶.

2. Land Use Pattern, Status of Housing and Built-up Infrastructure

221 The subproject areas are mixed zone of urban and peri-urban area with residential and agricultural zone. The road side infrastructures are mainly residential houses (pucca, semi-pucca, tin shed and katcha), shops, bazars, educational and religious institutes (Figure V-22). Unlike most of Bangladesh, about half of Cox's Bazar district is hilly; on the eastern border with Myanmar are the Arakan hills. Due to sandy soil, agricultural cultivation is not very suitable in Teknaf. In Teknaf, only 5.5% of the land is cultivable with a cropping intensity of 136%, well below the 193% national average. Most of Teknaf consists of highlands. The rest is tidal floodplain (19.57%) with high salinity and piedmont plain (9.03%). 39% of Teknaf comprises of forests (Masakazu and Tani, 2017). The Naf river, located east of the Upazila and forming a natural border with Myanmar, inundates land close to the riverbanks during the rainy season (June-September). This land on the riverbanks is mostly used for shrimp cultivation, an important activity in the region and a source of labor income for poorer households (WFP, 2017).

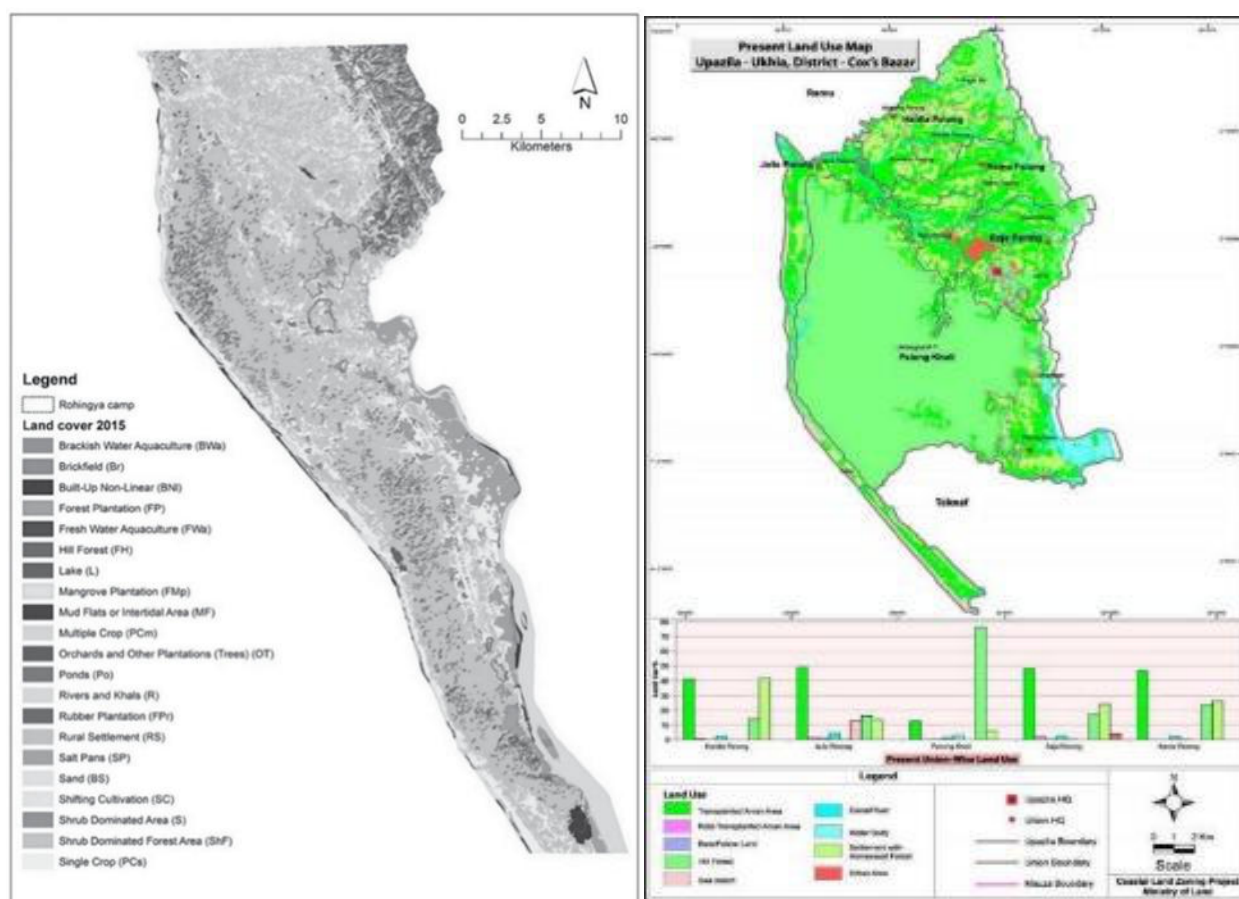


Figure V-22 Land use map of Teknaf and Ukhiya

⁴⁶ http://en.banglapedia.org/index.php?title=Teknaf_Upazila, date accessed: 7 August 2020

3. Income source

222 **Teknaf:** Main sources of income Agriculture 44.95%, non-agricultural labourer 6.51%, commerce 21.88%, transport and communication 1.96%, service 4.27%, construction 0.79%, religious service 0.36%, rent and remittance 2.46% and others 16.82%. Ownership of agricultural land Landowner 27.34%, landless 72.66%; agricultural landowner: urban 18.86% and rural 29.28%⁴⁷.

223 **Ukhiya:** Main sources of income Agriculture 54.40%, non-agricultural labourer 10.61%, industry 0.36%, commerce 15.05%, transport and communication 3.40%, service 0.34%, construction 1.45%, religious service 0.34%, rent and remittance 1.46% and others 12.95%⁴⁸.

4. Access to electricity and sanitation

224 **Teknaf:** Access to electricity - All the wards and unions of the upazila are under rural electrification network. However, 17.91% of the dwelling households have access to electricity. Sources of drinking water - Tube-well 81.78%, tap 0.96%, pond 9.61% and others 7.65%. Sanitation - 36.15% (rural 29.20% and urban 66.44%) of dwelling households of the upazila use sanitary latrines and 38.95% (rural 43.83% and urban 17.68%) of dwelling households use non-sanitary latrines; 24.90% of households do not have latrine facilities.

225 **Ukhiya:** Access to electricity - All the unions of the upazila are under rural electrification network. However, 19.03% of the dwelling households have access to electricity. Sources of drinking water - Tube-well 81.92%, tap 0.47%, pond 3.26% and others 11.34%. Sanitation - 31.27% (rural 28.70% and urban 50.34%) of dwelling households of the upazila use sanitary latrines and 43.66% (rural 45.42% and urban 30.60%) of dwelling households use non-sanitary latrines; 25.07% of households do not have latrine facilities.

⁴⁷ http://en.banglapedia.org/index.php?title=Teknaf_Upazila, date accessed: 7 August 2020

⁴⁸ http://en.banglapedia.org/index.php?title=Ukhia_Upazila, date accessed: 7 August 2020

VI. ANTICIPATED IMPACTS AND MITIGATION MEASURES

A. Introduction

226 An environmental impact is defined as any change to an existing condition of the environment. Findings of the assessment are presented according to pre-construction, construction and operational periods. The impacts will be determined as significant, positive or negative, direct or indirect, long term or short term. The magnitudes of environmental effects have been expressed quantitatively where possible, but in most cases qualitative evaluations are made based on past experience. This Chapter of the Environmental Impact Assessment Report describes the probable environmental effects resulting from the implementation the Project during the preconstruction, construction and operating period.

B. Impact assessment method

1. Scope of assessment

227 The scope of the assessment captures the understanding on the envisaged risks and impacts assessed during the scoping exercise of this impact assessment study as well as the risks identified during baseline assessment and impact evaluation process. The key environmental and social issues identified are further elaborated in the following sections.

(c) Spatial scope of assessment

228 The ADB SPS stipulates that the spatial scope of impact analysis should be shaped by consideration of the project's area of influence. The area of influence for a project is defined in the SPS (p.06) as follows:

“Impacts and risks will be analyzed in the context of the project's area of influence. This area of influence encompasses (i) the primary project site(s) and related facilities that the borrower/client (including its contractors) develops or controls, such as power transmission corridors, pipelines, canals, tunnels, access roads, borrow pits and disposal areas, and construction camps; (ii) associated facilities that are not funded as part of the project (funding may be provided separately by the borrower/client or by third parties), and whose viability and existence depend exclusively on the project and whose goods or services are essential for successful operation of the project; (iii) areas and communities potentially affected by cumulative impacts from further planned development of the project, other sources of similar impacts in the geographical area, any existing project or condition, and other project-related developments that are realistically defined at the time the assessment is undertaken; and (iv) areas and communities potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that might occur without the project or independently of the project. Environmental impacts and risks will also be analyzed for all relevant stages of the project cycle, including preconstruction, construction, operations, decommissioning, and postclosure activities such as rehabilitation or restoration.”

229 Given the scale and context of the present project, the focus of impact analysis is squarely on the first of the above categories, the primary project sites. As noted in the project description earlier in this report, the project does not have any associated facilities as defined by the ADB SPS. With regards to potential cumulative impacts, there are no other developments planned in the vicinity of the Teknaf package site. In case of Palongkhali site, since the subprojects are similar in nature, and actually will as two units, it can be taken as the impact will be of similar nature.

230 With regards to the primary project sites and their access roads and possible borrow pits, the analysis of impacts in this report takes into account potential impact receptors located within 150-200 m of the sites. This is a standard rule of thumb based on the assumption that impacts such as noise, dust and disruptions would not be experienced strongly beyond that distance, except in extreme or special circumstances. Within that general zone, primary consideration is given to receptors situated closest.

(d) Temporal scope of assessment

231 Analysis of impacts and definition of suitable mitigation measures should take in all phases of the project's evolution. Impacts may arise most obviously and visibly during construction, but the impacts of design and siting decisions made in the preconstruction phase, as well as the effects of intended and unintended activity at facility sites over the entire duration of the infrastructure's operating period, also need to be considered.

232 **Pre-construction phase (design impacts):** The design process offers considerable opportunities to reduce environmental impacts, through appropriate choice of materials, systems, work processes and equipment. For example, equipment and climate-control systems with the lowest associated greenhouse gas emissions (e.g., high-efficiency heating equipment, electric motors and lighting), as well as energy saving features (e.g., extra insulation, double-glazed windows, passive solar heat capture) should be incorporated in the designs to the greatest extent feasible. Incorporating such elements will help to maximize climate change mitigation as a feature of the project.

233 **Pre-construction phase (siting impacts):** The selection of a facility site has the potential to generate environmental impacts based on:

- (i) the physical characteristics of the site itself (e.g., topography, soils, drainage, exposure to natural hazards, past and present land uses);
- (ii) the proximity of the site to impact receptors (e.g., water bodies, sensitive habitats, residences, schools, hospitals, public spaces);
- (iii) the amount and type of work required to connect the facility to transport networks and service infrastructure; and
- (iv) the distance between the facility and other facilities to which it is functionally linked.

234 **Construction phase impacts:** Impacts likely to arise during the construction phase relate to the physical activities that take place both at construction sites and at locations where related activity occurs, such as access roads, haul roads, and any borrow pits, quarries or spoil dumps established specifically to support construction of the site or sites in question. Although infrastructure construction is an inherently disruptive activity, many impacts of construction activity are well understood and amenable to minimization with appropriate construction site management.

235 **Operation phase impacts:** Impacts during use of infrastructure are generally of lesser magnitude and severity than construction impacts, and arise from regular operations and maintenance activity, but also from things that go wrong with these activities, such as accidents, fires, explosions and releases of harmful substances. Proper preparation and use of operations and maintenance manuals and protocols, as well as training of personnel and regular monitoring, are key means of preventing and minimizing operation phase impacts.

2. Assessment methods

236 Potential impacts were initially identified through a screening checklist (Annex B). Some common indicators used to define impact are its duration, its spatial effect, ability to prevent or reverse negative

effects and mitigation measure effectiveness. In practice, each planned activity under the Project works was checked for its potentials to cause negative and positive impacts on the social, economic, physical and ecological environments. Environmental impacts were grouped according the Project stage when they are likely to occur, namely the pre-construction, construction and operation phases of the Project's development. The significance of impacts was defined according to their severity extent and duration using the adjectives, low, moderate high, significant, positive or negative; direct, indirect and cumulative during Pre-construction, Construction and Operation periods of the Project alignment. The definition of these terms as applied to the Project are as follows:

237 Assessment of potential impacts requires a multi-disciplinary approach in which a wide range of issues are taken into consideration to identify and determine which potential Project impacts may be significant and therefore require the application of reasonable and effective management and/or mitigation. Most projects result in positive and negative potential impacts on the environment, society and economy, all of which are identified and assessed in this section.

238 Certain impacts identified in this section have the potential to be significant. The determination of whether a given potential impact is significant depends on several factors:

- The potential for on-site and off-site impacts;
- The potential for direct and indirect impacts;
- The frequency and duration of a potential impact;
- The geographic area affected by a potential impact
- The period of time affected by any potential impact;
- The sensitivity of the receiving environment; and
- The degree of confidence with which the potential impacts of the action/activity are known and understood.

(a) Risk Assessment Matrix

239 Measures of potential impact significance as part of the Project planning and assessment phase presented in this IEE have been determined using a risk-based model. The risk-based model is a two-dimensional matrix of 'magnitude of impact' and 'likelihood'. Both are assigned score between 1 and 5 based on severity or probability and multiplied to obtain the 'risk band'.

240 The 'magnitude of impact' is a 5-point based scale set by expert's judgement. The scale and its explanation are given in Table VI-1.

Table VI-1 Explanation and assignment of scores to 'magnitude of impact'

Colour Band	Incidental	Minor	Moderate	Major	Severe/catastrophic
Score	Score: 1	Score: 2	Score: 3	Score: 4	Score: 5
Explanation	Impacts such as localized or short-term effects on habitat, species or environmental media.	Localized, long term degradation of sensitive habitat or widespread, short-term impacts to habitat, species or environmental media	Impacts such as localized but irreversible habitat loss or widespread, long-term effects on habitat, species or environmental media	Widespread and persistent changes in habitat, species or environmental media	Persistent reduction in ecosystem function on a landscape scale or significant disruption of a sensitive species.

241 The 'likelihood' is also a 5-point based scale set by expert's judgement. The scale and its explanation are given in Table VI-2.

Table VI-2 Explanation and assignment of scores to 'likelihood'

Colour Band	Rare	Unlikely	Seldom	Occasional	Likely
Score	Score: 1	Score: 2	Score: 3	Score: 4	Score: 5
Explanation	Rare or unheard of	Reasonable to expect that the consequence will not occur during this project though has occurred several times in industry	Exceptional conditions may allow consequences to occur within the project lifetime	Conditions may allow the consequence to occur during the project lifetime, or the event has occurred within similar projects	Consequence can reasonably be expected to occur in life the project

242 Therefore, "Risk" factor is derived from the following equation:

$$\text{Risk} = \text{Magnitude} \times \text{likelihood} \quad (1)$$

243 The score of 'Risk' ranges from 1 to 25. The score is classified in 3 classes. The explanation is given in

244 Table VI-3. The score matrix for risk assessment has been used to identify the priority environmental impact and their mitigation plan.

Table VI-3 Two-dimensional risk assessment matrix

			MAGNITUDE OF IMPACT				
			Incidental	Minor	Moderate	Major	Severe/cats.
			Score: 1	Score: 2	Score: 3	Score: 4	Score: 5
LIKELIHOOD	Rare	Score: 1	1	2	3	4	5
	Unlikely	Score: 2	2	4	6	8	10
	Seldom	Score: 3	3	6	9	12	15
	Occasional	Score: 4	4	8	12	16	20
	likely	Score: 5	5	10	15	20	25

(b) Identification of activities and receptors

245 Analysis is shaped by an understanding of impacts as a function of two factors: (i) the nature of project activities; and (ii) the characteristics of impact receptors, i.e., the people and ecosystems that experience the effects of a project activity. The significance of a particular impact is determined by both. Impact significance has been weighed for each of the project's infrastructure components based on information about the planned facilities and their likely modes of construction and operation, as well as knowledge of the human and environmental receptors in the vicinity of each site.

(c) Objectives of mitigative measures

246 The central goal of impact assessment is to determine how best to mitigate (make less serious, severe, or damaging) potential negative effects before they arise. As outlined in the SPS, proactive measures to mitigate impacts fall into three categories: (i) measures aimed at preventing an impact from developing at all; (ii) measures to reduce the occurrence or minimize the severity of impacts that cannot be fully prevented; and (iii) measures to compensate for damage caused by impacts that cannot be prevented or minimized to acceptable levels. This prevent-minimize-compensate framework is understood as a hierarchy, with impact prevention being the most desirable mode of mitigation, and compensation being considered as a last resort and only in the case of impacts that cannot be adequately addressed through design changes or application of effective minimization.

C. Risk assessment

247 **Subprojects setting:** As discussed earlier, the both IWMF will be located beside the planned existing ones or in the vicinity of the existing one. In such cases, where existing facilities are to be expanded, the ADB SPS (2009) stipulates the following:

“When the project involves existing activities or facilities, relevant external experts will perform environmental audits to determine the existence of any areas where the project may cause or is causing environmental risks or impacts. If the project does not foresee any new major expansion, the audit constitutes the environmental assessment for the project. A typical environmental audit report includes the following major elements: (i) executive summary; (ii) facilities description, including both past and current activities; (iii) summary of national, local, and any other applicable environmental laws, regulations, and standards; (iv) audit and site investigation procedure; (v) findings and areas of concern; and (vi) corrective action plan that provides the appropriate corrective actions for each area of concern, including costs and schedule.”

248 Since several subprojects have been implemented under the first phase of EAP in the surrounding vicinity of the proposed subproject areas, the following documents have been consulted as ‘audit reports’: (i) Emergency Assistance Project: Palongkhali Substations (Package EAP/BREB/W2) Initial Environmental Examination (URL: <https://www.adb.org/projects/documents/ban-52174-001-iee-0>); (ii) Subprojects setting: As discussed earlier, the cyclone shelters proposed for construction will be constructed within the GPS boundaries. However, whether the existing buildings needed to be demolished or the facilities will be constructed away from the existing facilities are yet to know. In such cases, where existing facilities are to be expanded, the ADB SPS (2009) stipulates the following:

249 Since several subprojects have been implemented under the first phase of EAP in the surrounding vicinity of the proposed subproject areas, the following documents have been consulted as ‘audit reports’: (i) Emergency Assistance Project: Teknaf School-cum-Cyclone Shelter (Package EAP/BREB/W9) Initial Environmental Examination (URL: <https://www.adb.org/projects/documents/ban-52174-001-iee-3>); (ii) Emergency Assistance Project: Ecological Assessment Report (URL: <https://www.adb.org/projects/documents/ban-52174-001-emr-3>); (iii) Emergency Assistance Project: Teknaf and Ukhia Sub-districts Initial Environmental Examination (URL: <https://www.adb.org/projects/documents/ban-52174-001-iee-5>). All these reports are published on ADB website. The ecological report was prepared as an primary assessment of the local ecology and the projects impact which has been used as the base of the ecological assessment in the IEE.

250 Following the method given in Methodology (Chapter VI, Section B) an impact matrix was developed for the subproject as shown in Table VI-4 and Table VI-5 Risk Matrix of evaluation of

Identified Environmental Impacts and Risks of the proposed subproject at Chandrakilla SWTP below. This matrix serves the basis of the impact assessment and Environmental management plan (EMP).

Table VI-4 Risk Matrix of evaluation of Identified Environmental Impacts and Risks of the proposed subproject at Palongkhali SWTP

Potential Impacts	Impact Sign (beneficial = +ve Detrimental = -ve)	Magnitude	Likelihood	Risk Score	Impact size	Impact type	Mitigation possible? (y/n)	Residual impact*
Environmental Impacts During Planning phase (if not well planned)								
Permits, clearances, no objection certificate etc.	-	5	1	5	L	D	Y	N
Impacts of Extreme climatic event	-	3	3	9	L	D	Y	N
Protection of Asian elephant	-	5	1	5	R	I	Y	N
Failure to consider site specific hydrological system	-	5	1	5	L	D	Y	N
Loss of structures and existing utilities	-	5	3	15	L	D	Y	N
Sources of materials	-	3	2	6	L	D	Y	N
EMP implementation training	-	4	4	16	L	D	Y	M
Environmental Impacts During Construction Phase								
Damage to physical and Cultural Heritage	-	1	1	1	L	D	Y	N
Removal of forest area/vegetated area	-	3	5	15	L	D	Y	M
Blockage of streams/change hydrological regime	-	4	1	4	L	D	Y	N
Construction work camps and pollute local waterbody/soils	-	3	3	9	L	D	Y	M
Excavations and soil disturbance	-	3	2	6	L	D	Y	N
Access road construction and disturbance local ecology	-	3	5	15	L	D	Y	N
Pile driving generated noise, vibration and soil/water pollution	-	3	5	15	L	D	Y	N
Waste pollution	-	3	4	12	L	D	Y	N
Water quality	-	3	4	12	L	D	Y	N
Air Quality	-	3	4	12	L	D	Y	N
Noise Level	-	2	5	10	L	D	Y	N
Hampering biodiversity protection in the region	-	3	2	6	L	D	Y	N
Socio-economic disturbance	-	2	2	4	L	D	Y	N
Lack of worker facilities	-	5	5	25	L	D	Y	N
Worker health and safety	-	5	5	25	L	D	Y	N
Community health and safety (including school going children)	-	5	5	25	L	D	Y	N
Site reinstatement	-	4	1	4	L	D	Y	N
Employment Generation and Increase in income	+							

Potential Impacts	Impact Sign (beneficial = +ve Detrimental = -ve)	Magnitude	Likelihood	Risk Score	Impact size ^a	Impact type ^b	Mitigation possible? (y/n)	Residual impact*
Enhancement of Community Development Service	+							
Skill Enhancement	+							
Environmental Impacts During O&M Phase								
Hill/soil erosion and downhill siltation	-	3	1	3	L	I	Y	N
Site integrity and security risk (i.e. landslide)	+							
Water contamination from water usage	+							
Sludge management	+							
Biodiversity protection	+							
Occupational health and safety	+							
Waterlogging conditions reduced or non-existent	+							
Reduction of risk of vector borne diseases	+							
Clean water and easy access to the drinking water	+							
Strengthen of bank areas reducing erosion	+							
Safer establishments on the banks of the canal	+							
^a Impact Size: L = Local; R = Regional ^b Impact type: D = Direct; I = Indirect *Residual impact: H = High; M = Medium, L = Low, N = None								

Table VI-5 Risk Matrix of evaluation of Identified Environmental Impacts and Risks of the proposed subproject at Chandrakilla SWTP

Potential Impacts	Impact Sign (beneficial = +ve Detrimental = -ve)	Magnitude	Likelihood	Risk Score	Impact size ^a	Impact type ^b	Mitigation possible? (y/n)	Residual impact*
Environmental Impacts During Planning phase (if not well planned)								
Permits, clearances, no objection certificate etc.	-	5	5	25	L	D	Y	N
Impacts of Extreme climatic event	-	5	5	25	L	D	Y	N
Protection of Asian elephant	-	5	5	25	R	I	Y	N
Failure to consider site specific hydrological system	-	5	1	5	L	D	Y	N
Loss of structures and existing utilities	-	5	5	25	L	D	Y	N
Sources of materials	-	3	2	6	L	D	Y	N
EMP implementation training	-	4	4	16	L	D	Y	M

Potential Impacts	Impact Sign (beneficial = +ve Detrimental = -ve)	Magnitude	Likelihood	Risk Score	Impact size	Impact type	Mitigation possible? (y/n)	Residual impact*
Environmental Impacts During Construction Phase								
Damage to physical and Cultural Heritage	-	1	1	1	L	D	Y	N
Removal of forest area/vegetated area	-	5	5	25	L	D	Y	M
Blockage of streams/change hydrological regime	-	4	1	4	L	D	Y	N
Construction work camps and pollute local waterbody/soils	-	3	3	9	L	D	Y	M
Excavations and soil disturbance	-	3	2	6	L	D	Y	N
Access road construction and disturbance local ecology	-	3	5	15	L	D	Y	N
Pile driving generated noise, vibration and soil/water pollution	-	3	5	15	L	D	Y	N
Waste pollution	-	3	4	12	L	D	Y	N
Water quality	-	3	4	12	L	D	Y	N
Air Quality	-	3	4	12	L	D	Y	N
Noise Level	-	2	5	10	L	D	Y	N
Hampering biodiversity protection in the region	-	3	2	6	L	D	Y	N
Socio-economic disturbance	-	2	2	4	L	D	Y	N
Lack of worker facilities	-	5	5	25	L	D	Y	N
Worker health and safety	-	5	5	25	L	D	Y	N
Community health and safety (including school going children)	-	5	5	25	L	D	Y	N
Site reinstatement	-	4	1	4	L	D	Y	N
Employment Generation and Increase in income	+							
Enhancement of Community Development Service	+							
Skill Enhancement	+							
Environmental Impacts During O&M Phase								
Hill/soil erosion and downhill siltation	-	3	1	3	L	I	Y	M
Site integrity and security risk (i.e. landslide)	+							
Water contamination from water usage	+							
Sludge management	+							
Biodiversity protection	+							
Occupational health and safety	+							
Waterlogging conditions reduced or non-existent	+							
Reduction of risk of vector borne diseases	+							
Clean water and easy access to the drinking water	+							

Potential Impacts	Impact Sign (beneficial = +ve Detrimental = -ve)	Magnitude	Likelihood	Risk Score	Impact size ^a	Impact type ^b	Mitigation possible? (y/n)	Residual impact ^c
Strengthen of bank areas reducing erosion	+							
Safer establishments on the banks of the canal	+							
^a Impact Size: L = Local; R = Regional ^b Impact type: D = Direct; I = Indirect ^c Residual impact: H = High; M = Medium, L = Low, N = None								

D. Positive impacts

- Easy access of drinking water for the camp inhabitants and host communities nearby.
- Erosion protective measures taken on the hilly areas actually improve landslide threats.

E. Discussions of potential impacts and suggested mitigation measures

251 Discussions made in the following paragraphs are based on the risk matrix evaluated and presented in Table VI-4 and Table VI-5 Risk Matrix of evaluation of Identified Environmental Impacts and Risks of the proposed subproject at Chandrakilla SWTP.

1. Impacts during Planning Phase

(a) Site clearance

252 **Potential impacts:** Failure to obtain necessary consents, permits, NOC's can result in design revisions and/or stoppage of the works, even stop the construction project. In this case, most of the proposed areas for site are under forest and therefore under the jurisdiction of forest department. Obtaining a NOC from forest department is a requirement before starting of the construction. Permission of land needs to be obtained from the DC of Cox's Bazar while NOCs from local Upazila parishad is also required.

253 **Mitigation measures:** (i) Obtain Environmental Clearance Certificate (ECC) from Department of Environment and NOC from DC, FD and Upazila parishad; (ii) acknowledge in writing and provide report on compliance all obtained permits, clearance, NOCs, etc.

(b) Impact of extreme climatic events

254 **Potential impacts:** Teknaf site is located in the hillock areas and prone to landslides/mudslides and erosion. The region is also vulnerable to flash floods during heavy rainfall events. Poor drainage and unplanned development also contribute to the added vulnerability of structures to extreme climatic events. Failure to address the extreme rainfall events and associated vulnerability/hazards in the designs may lead to damage to the structure and pose threat of nuisance in the locality which may include hydrological hazard, poor structure life etc.

255 **Mitigation measures:** (i) Ensure adequate water passage under the structure and shape the associated landscape so that water can be drained quickly from the site; (ii) ensure selection of latest weather coated painting and construction materials so that the structures can withstand heavy rainfall and flooding damage; (iii) ensure flood return period and local waterlogging information being considered in the

design phase; (iv) include solar panels and energy saving lights in design; (v) lighting arrester to be considered in the design of SWTP and elevated reservoir.

(c) Asian elephants

256 **Potential impacts:** Evidence of elephants were observed during field visit in Taknaf (Chndrakilla). The elephants mainly visit the area for food, especially banana. Also, the elephants drink water from the narrow streams that run to the likely reservoir site. According to the ecological study conducted by the project earlier in 2019, The “Asian Elephant frequently visits the waterbody at night in order to drink and bathe, which was confirmed by the sightings of footprints and interviewing the local people. Elephants commonly visit at night in order to avoid confrontation with people. Elephants (a group of six and a solitary animal) were seen in the forested hills not very far from Rohingya camps. Water is scarce in the hilly area, so this waterbody with plenty of freshwater throughout the year is crucial for the local people as well as the local wildlife and plants” (Khan 2019⁴⁹).

257 **Mitigation measures:** The following measures are essential in planning the SWTP in Taknaf (Chandrakilla): (i) The waterbody should be developed in a way so that minimum artificial structures (e.g. concrete and metallic structures) are used. The structures should be restricted to any one side (e.g. dyke side), leaving other sides natural, so that animals do not hesitate to visit the waterbodies and plants can grow along the banks. (ii) Any structure must be durable and as low as possible so that the structure is less visible to elephants and other wildlife. Visible structures can be destroyed by elephants. (iii) The supply line should be placed underground with some markings on the surface so that people know the existence of underground supply line. (iv) If the water pumps are to be installed, these must be set sufficiently far from the waterbodies so that these remain safe from elephants and there is no noise pollution in and around the waterbodies. Notably, noise pollution might scare the wild animals off from the waterbodies. (v) A watchtower can be established near the waterbody, with volunteer watchers watching by rotation, in order to warn the residents if there is any movement of elephants towards the camp. (vi) Indigenous trees should be planted in the catchment areas and hills around the waterbody in order to sustain the natural water supply and water quality in the long-term. Some recommended trees for plantation are Freshwater Mangrove (*Barringtonia acutangula*), fig (*Ficus* spp.), cotton tree (*Bombax* spp.), Monkey Jack (*Artocarpus chama*), Black Berry (*Syzygium cumini*), Sea Apple (*Syzygium grande*) and Champa (*Magnolia champaca*). Rohingyas and local host communities should not be allowed to enter the hilly areas around the camp in order to collect the firewood. This severely affects the regeneration of vegetation, disturbs the wildlife, and increases the human-wildlife conflict. Moreover, illegal hunting of wildlife, especially in and around the waterbody, must be controlled. (vii) Movements of elephants and other wildlife in and around the waterbody should be regularly monitored and adaptive measures should be taken as necessary. (viii) planting of native species, specially used as elephant food (Banana, Black Berry (*Syzygium cumini*), Sea Apple (*Syzygium grande*) etc.) around the reservoir may prevent the elephants visiting the plant site. A well drafted plantation programme with the assistance of an ecological specialist needs to be adopted during detail design phase. The plantation programme should be launched as soon as the construction starts so that before construction reaches to its end, the plants grow big enough to lure the elephants away from the reservoir site.

⁴⁹ Khan, MMH (2015) Ecological Assessment of Some Selected Sites in Ukhiya And Teknaf, Cox's Bazar, Bangladesh, Final Report. TA-9546 BAN: Emergency Assistance Project, Asian Development Bank (ADB)

(d) Failure to consider local hydrological system

258 **Potential impacts:** Teknaf region is hilly and landslide/erosion prone. Reservoirs are to be located at the end points of the hilly stream. It will take large area with massive weight of water. Failure to account the geology, morphology and hydrological scheme of the area may lead to reservoir instability and cause landslide. Moreover, during flash floods or extreme rainfall events, flood and landslide in the region can be detrimental. Even such hazard may occur during construction when local topography and hydrological system is tampered with.

259 **Mitigation measures:** (i) detail assessment of the microhydrology and topography of the project site; (ii) design according to the sloping of the project area; (iii) avoid conventional raised plinth design that blocks water runoff, rather design should prioritize structure built on raised columns that can allow water to pass through; (iv) design can learn and adopt from the local traditional structures on the hill sides; (v) design needs to consider additional drainage facilities and water storage.

(e) Material sourcing

260 **Potential impacts:** The region is vulnerable to hill erosion and sedimentation. There are a few illegal sand quarries in Ukhiya which has left the entire hills vulnerable to landslides and sedimentation. Moreover, the Department of Environment (DoE) is struggling to stop illegal hill cutting in the region. Several landslides occurred in the region in the recent 5 years claiming human lives which are believed to be caused by illegal hill cutting and sand quarrying triggered by heavy rainfall. Therefore, if sand/silt material used for the construction should not source its materials from this hilly region.

261 **Mitigation measures:** The bid documents should put clause on material sourcing that forbids the contractor to source construction materials like sand/silt from local hills and rivers/canals.

(f) Chemical use

262 **Potential impacts:** Chemical usage (Sodium hypochlorite and citric acid) as disinfectant at WTP and chemical handling & application risk – health & safety risk to workers aquatic species.

263 **Mitigation measures:** Provide the following measure at the chemical dosing unit: (i) Proper ventilation, lighting, entry and exit facilities; (ii) facility for isolation in the event of major chemical leakage (if needed); (iii) personal protection and safety equipment for the operators in the chemical dosing unit; (iv) provide training to the staff in safe handling and application of chemical; this shall be included in the contract of Chemical supplier; (v) supplier of chemical dosing equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs; preferably these shall be provided both in English and Bangla Languages.

(g) Existing utilities/services relocation

264 **Potential impacts:** Relocation of utility lines along transmission and distribution mains will disrupt services.

265 **Mitigation measures:** (i) Provision in the design and budget for the relocation of the existing utility infrastructures, wherever required; (ii) identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; (iii) identify and include locations of water pipes, power/telephone lines and any other infrastructure on the way of pipe line and redesign pipe layout to avoid any damage on such infrastructure; (iv) require construction contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services; (v) utilities will only be removed and relocated with proper agency approvals and permission;

(vi) informing all hospitals, schools, places of worship, and affected communities well in advance; (vii) if utilities are damaged during construction, it will be reported to the Consultants and utility authority and repairs will be arranged immediately at the contractor's expense; and (viii) utility relocation will be completed at the shortest practicable time before construction commences.

(h) Preparation for road cutting work

266 **Potential impacts:** Traffic congestion, road accident and dropping of pedestrian in open trenches etc. may result in during pipe laying along the busy road. Moreover, project progress might be impeded if road cutting permission is not obtained from the relevant authorities (RHD, LGED, Pourashova etc.) well before the construction phase.

267 **Mitigation measures:** (i) No temporary or permanent works proceed before the design and drawings are approved by the Project Director and road cutting permission obtained from relevant authorities (LGED, RHD etc.) by PMU; (ii) unnecessary road cutting should be avoided; (iii) road cutting plan necessary for the application for road cutting permission from the authorities must be prepared by the contractor. (iv) contractor has to take all necessary safeguards to avoid accidents at site, prevent loss/damage to all existing utilities like pipelines, telephone/electric cables, poles etc. and any government or private property during the contract period. (v) contractor shall prepare a traffic management scheme (road closure program or diversions) and incorporate detail of traffic diversions and pedestrian routes, all traffic signs (for the regulation and for information) and road markings shall be ensured prior to start of road cutting.

(i) EMP implementation training

268 **Potential impacts:** 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.

269 **Mitigation measures:** (i) conduct daylong EMP training with the engineers and workers for each project site; (ii) follow up with toolbox trainings and environmental management specific trainings; (iii) arrange regional training for contractors and implementing DPHE engineers.

(j) Community awareness program

270 **Potential impacts:** Without proper interaction with local communities and or with stakeholders may lead to confusion and agitation and non-cooperation of local people.

271 **Mitigation measures:** Before start of the project, the local population should be well aware of the upcoming project. There should be regular interaction with the local population and make them understand the project activities.

2. Impacts and mitigation measures during Construction Phase

(a) Impacts from inadequate construction planning

272 **Potential impacts:** Inadequate construction planning may lead to local disasters. For example, ignoring local hydrological system during construction may create waterlogging, spread diseases and mudslides. The entire region is hilly with loose sand. Improper cutting elevated lands for labeling may cause landslides and associated accidents. Therefore, if the implementation of site-specific mitigation measures

is not properly planned - including the clear and agreed assignment of responsibility - then it is probable that little appropriate action will be taken by construction contractors to prevent and minimize the environmental impacts of their activities.

273 **Mitigation measures:** (i) This is of utmost importance to note that this IEE is for both proposed sites and is not site specific since the detail design has not been on board. This IEE actually indicative of what needs to be considered during design and planning phase. Therefore, the Environmental Management Plan (EMP) stipulated in this EMP needs to take as advice for design and to avoid environmental consequence; (ii) To effectively prevent and minimize impacts that could arise during construction, mitigation measures specified in the EMP need to be incorporated in bid documents and contracts, and each contractor must be required to develop a Contractor Environmental Management Plan (CEMP) for each site reflecting all measures relevant to the contracted work, for approval before construction begins. CEMPs should include measures and sub-plans dedicated to waste management, soil protection, traffic management, wastewater management, environmental health and safety, and emergency response (relating to both accidents and spills). Additionally, CEMP should also include a plan for removal and disposal of existing waste tanks/demolished garbage (if any); including management of contaminated soil around them (which will be identified by pre-construction surveys conducted by the IAs). The contractors should also be required to produce a site-specific Environmental Health and Safety Plan (EHSP) for each of the sites under their control. Well before construction begins, each contractor should designate an Environmental Health and Safety Officer (EHSO) to manage implementation of the CEMP and EHSP.

274 Before construction can begin, each site must undergo a Site-specific Environmental Impact Assessment (SEIA) to be conducted by the IA/EA. Construction planning must address any conditions stipulated in the SEIA report. The construction should start after the SEIA is approved by the DoE.

275 **Training:** Prior to the start of construction, training should be provided to relevant staff of contractors (including EHSOs) and IAs on the rationale for and implementation of the EMP, CEMPs, EHSPs and specific mitigation measures, to enhance general understanding and clarify responsibilities with regard to implementation, including monitoring and reporting.

(b) Provision for security in the camp

276 **Potential impacts:** Construction works may hamper due to criminal activities at work sites specially in the Rohingya camps. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.

277 **Mitigation measures:** (i) Provide, install and maintain suitable barriers and/or fences to protect the facilities, constructions camp, storage yard, existing facilities and construction and installation operations and to remove same when no longer required by DPHE or at completion of the project. (ii) be responsible for guarding all utilities, plants equipment, material, etc. delivered on sites and for ensuring that all sign, lights, fences, etc. are in their proper place; (iii) follow all necessary occupational health and safety measures during construction.

(c) Handling of flash flood, heavy downpour etc.

278 **Potential impacts:** Inundation of worksite will damage the machineries and equipment may disrupt the construction works.

279 **Mitigation measures:** (i) Protect the working area including impounding reservoir area, pits, trenches, materials, machineries and equipment from any damage due to inundation by downpour; (ii) ensure not to make any congestion in the open drains or natural or artificial channels; (iii) take necessary

measure to bring the site to the condition prevailing before the downpour without delay; (iv) necessary measure has to be taken so that storm water does not get into the newly installed pipelines. (v) be particular in keeping updated weather forecast and maintain a record book at site in which weather condition is recorded.

(d) Topsoil loss followed by soil erosion

280 **Potential impacts:** For the proposed facilities, four parameters have been considered for screening of environmental/ecological impacts during construction phase; these include access road, felling of trees, clearing of vegetation, and impact on aquatic (water) habitat. Teknaf site is located on slope with several undulations. Significant excavation, cut and fill is expected. The cut and fill will lead to severe soil loss, and if not properly managed, can cause localized landslide. Without a proper management system, soil and water pollution is also expected.

281 **Mitigation measures:** (i) At the sloped sites, temporary slope protection measures such as swales and berms should be used to slow overland flows, promote infiltration, and direct runoff away from active work areas. Protective ground coverings, such as mulch, can also be used to protect areas of exposed soil from heavy rainfall and runoff; (ii) adequate water runoff passages should be considered by the design; structures, at not condition, should block the water passage; (iii) Any borrow pits established by contractors near any of the sites should be rehabilitated promptly once the required materials have been extracted, with slopes reshaped and revegetated to prevent the development of erosion problems; (iv) To prevent soil contamination, contractors should maintain equipment to a high standard and regularly monitor for leaks. Contractors must also adopt proper procedures for spill prevention during equipment refueling and servicing, including using impermeable mats under working areas to catch and contain drips and spills, and storing fuels, lubricants, coolants and other fluids only in designated areas with spill containment structures with free capacity at least 110% of the volume of the largest stored container. If the contractors establish any borrow pits, the same precautions should be taken there as well.

(e) Impact on air pollution

282 **Potential impacts:** The potential for dust generation during construction is significant for all project sites, given that the amount of rainfall is less in Cox's Bazar (annual average ~1000mm) compared to the national average (annual average ~2155mm) and brown sandy erosion prone soils. Additionally, possible air pollution from activities involved in waste management facilities construction is likely to be significant since it is close to sensitive receptor like nearby inhabitants including children. The impact of air pollution is expected to be localized since the vehicles and other machineries are expected to be involved in construction on the roadside. If construction equipment is poorly maintained, excessive emissions of pollutants could also be a factor. As such, dust and emissions are significant potential issues in relation to construction at waste management facilities. Significant amounts of dust may also arise from the roads that materials haulers are likely to use to access the site.

283 **Mitigation measures:** (i) The first task of the contractors to devise the CEMP as instructed earlier and approved by the Environmental specialist from IA and EHSO (DSC) in charge. They will only approve the CEMP when satisfied with safety measures planned for the sites to protect the children and teachers from air pollution ; (ii) contractors should first demarcate the construction site with high plastic/tin made fence so that heavy dust cannot escape from the site; (iii) contractors should suppress dust at the sites and along any unpaved haul road in the vicinity of the construction site by lightly spraying the road surface with water as needed. The water spraying needs to be frequent so that no dust is visible outside the construction site access roads; (iii) haul truck loads should be tightly covered with tarpaulins and wetted prior to departure; (iv) to prevent undue emissions impacts, contractors should maintain haul trucks and other equipment to a

high standard; (v) any borrow pits used by contractors should be well away from the busy roads/refugee homesteads, residential areas or individual residences; (vi) construction equipment, burrow pits, sharp object, harmful chemicals etc. should be put away safely so that children of the camps may not reach the equipment or enter inside the project boundary.

(f) Impact on surface water quality

284 **Potential impacts:** Both proposed reservoir site is connected to streams. Ukhiya reservoir is connected to the Naf river and Plaongkhali khal. The Teknaf reservoir will be connected to downstream. Both sites are vulnerable to water pollution or contamination from stockpile materials and construction waste. Construction of structures and putting construction materials on the path of the streams may block the flow and cause flooding and waterlogging. Moreover, hill runoffs may also bring eroded materials and cause sedimentation problem. As most of the sites are gently sloped towards nearby surface waterbody, any poorly managed site, specially where construction materials not kept safely under Tripoline and silt-curtains, may cause surface water pollution. 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. Mismanagement of sediments/silts may lead to surface water pollution in the entire drainage network. Hammering during sit preparation on the hillside roads can lead to localized landslide or accelerate erosion. At hillside Sections there is a potential of erosion due to rainfall-runoff. Earthwork activities during construction at this point may result in drainage congestion. The effects may be short term severe, but manageable by close monitoring and mitigation measures.

285 **Mitigation measures:** Implement eco-friendly waste management system: practice waste minimization, reuse and segregation; provide adequate waste bins, enforce onsite rule of throwing waste into bins; provide separate storage area for solid waste and hazardous waste to contain spill area; and implement measures to mitigate sedimentation/siltation. In all sites follow a Removed Soil Management Plan linked to the Excavation Segmentation/Management Plan, specifying, e.g., separate areas for stockpiling "reusable soils" & "unsuitable & excess soils" appropriate stockpiling areas, on flat grounds & away from or not obstructing main surface drainage routes disposal of unsuitable & excess soils as soon as possible hauling trucks to be required appropriate cover & min 2 ft freeboard employ any combination of the following measures to prevent stockpiled soils & fine aggregates from being eroded or carried away by wind and rain: silt fences, sediment traps, sandbags, barrier nets, earth bunds, speed stilling humps along surface drainage routes, limiting stockpile to a maximum height of 2 m, &/or diversion drains to reroute surface runoff away from stockpiles, whichever would be appropriate for the site & site conditions. Monitor immediate low areas or valleys for drainage congestion. If drainage congestion seems eminent, excavate or clear excess sediment/wash materials to clear congestion. Install silt protection curtain/steel nets alongside hill side roads. All other effluents not to be disposed of directly into natural waters, but via settling basins to allow suspended sediment to settle out. All earthworks must to be conducted during dry season/dry spell to maximum extent possible to avoid the difficult working conditions that prevail during monsoon season such as problems from runoff. Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in low-lying areas. Garbage disposal service to be provided, Concrete refuse reused or disposed of without habitat loss.

(g) Impact on groundwater resources

286 **Potential impact:** The area starves in groundwater level. Work camps are likely to sink tube well in the area and contribute to decrease of local groundwater level and increase drawdown. The potential exists for drinking water sources to be contaminated by the seepage of wastes from workers camps through

the soil profile into the GW aquifer (particularly if wells access the shallow aquifer). There are small hilly streams on the RoW potentially be contaminated seepage wastes from workers camp and stockpile materials. The effects are short term, minor and reversible by mitigation measure.

287 **Mitigation measures:** (i) Work camps and labour shed should be constructed outside of the camp area; (ii) please follow the same mitigation measures advised for surface water contamination.

(h) Impact on noise

288 **Potential impacts:** The parameters considered for screening of noise impacts during construction phase of the waste management facility include intensity of involvement of heavy machineries, type of heavy machineries, type of activities and proximity of the work area to the nearby inhabitants. Construction of the waste management facility involves use of equipment/machines producing significant noise (e.g., generators, pile driver). However, none of the site are located within busy premises. Therefore, noise pollution would not be significant (in the absence of mitigation measures). Use of stone crushers, excavation works, and movement of vehicle would generate air pollution. Involve the community in planning the work program so that any particularly noisy or otherwise invasive activities can be scheduled to avoid sensitive times.

289 **Mitigation measures:** Conduct noise generating activities during day time; Minimize noise from construction equipment (by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor; Maintain maximum sound level not exceeding 80 decibels (DBA) when measured at a distance of 10 m or more from the vehicle/s. Consult local communities in advance to avoid working at sensitive times, such as religious and cultural festivals; Conduct noise quality monitoring as per EMP.

(i) Impact on Vegetation and hill erosion

290 **Potential impacts:** Both proposed sites are vegetated. The amount of vegetation to be removed in Ukhiya site is likely to be less as the proposed site is partly barren. However, the Teknaf site vegetation is dense and as mentioned earlier, elephants are attracted to the vegetation for their food. Therefore, vegetation removal will likely to be impacting the elephant as well as due to the site's elevated nature, vegetation removal is likely to trigger hill erosion.

291 **Mitigation measures:** Follow mitigation measures proposed in paragraph 257 for vegetation removal. Additional mitigation measures are: (i) Site location needs to carefully chosen so that the least amount of vegetation have to be removed; (ii) in case of absolute necessity, a plan for replantation with native hill grown species needs to be prepared in advance of vegetation removal, which has to be approved by the environmental specialist of IA and EHSO from the contractor; (iii) in case of slope vegetation removal, a protection plan must be devised in advance in combination with steel net, geo-cell, bush planting, RCC toes, organic matter reinforcement etc.; (iv) devise site-specific plantation plans before the construction starts and update this EMP, identify how many trees are to be planted along with bushes and grass to project hill sides; chose only native species.

(j) Road excavation for pipe laying works

292 **Potential impacts:** Potential erosion, dust generation, traffic congestion, road accident, dropping pedestrians in open trench etc. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.

293 **Mitigation measures:** (i) All excavations shall be done to the minimum dimension as required for safety and working facility; (ii) the excavation shall be executed in such manner, that the contractor does not damage or interfere with existing services or structures. If damage or interference is so caused the contractor shall make arrangements with the supply and/or building owner to execute the repairs at the contractor's own cost; (iii) all trench and pit excavations and other work shall be carried out during night time at busy road section; (iv) road drains and channels shall be kept free from obstructions at all times; (v) in case of excavation in large roads, the trenches and pits maybe need to be covered by steel plates to allow traffic to pass during non-working periods; (vi) contractor must liaise with the DPHE and the responsible police to familiarize themselves and adhere to such rules; (vii) trench excavation along roads be located in footpaths or adjacent to the road; (viii) trench excavation shall wherever practicable be carried out in such a way that every part of the excavation is at least 0.5m clear of existing edges of the carriage way; (ix) contractor shall have particular regard to the safety of pedestrian, livestock, and shall ensure that all open excavation, access routes and steep or loose slopes arising from the contractor's operations are adequately fenced and protected.

(k) Drainage congestion

294 **Potential impact:** Construction material getting into surface run off or uncontrolled disposal may cause temporary drainage congestion.

295 **Mitigation measures:** (i) Prepare a program for prevent/avoid standing waters, which Consultant will verify in advance and confirm during implementation; (ii) provide alternative drainage for rainwater if the construction works/earth-fillings cut the established drainage line; (iii) regularly inspect and maintain all drainage channels to assess and alleviate any drainage congestion problem. (iv) establish local drainage line with appropriate silt collector and silt screen for rainwater or wastewater connecting to the existing established drainage lines already there; (v) wastes and construction debris will not be disposed in a manner that these would end up in drainage canals. (vi) onstruct wide drains instead of deep drains to avoid sand deposition in the drains that require frequent cleaning.

(l) Pollution from solid waste and sewage effluent

296 **Potential impacts:** Untreated sewage from the pit latrines could have the potential to enter surface water if not adequately designed and positioned to reflect the local hydrological and hydrogeological patterns. Periods of high rainfall could lead to the overflow of the pit and overland flow, or rapid through-flow of the effluent to surface water prior to its full digestion in the soil. Raw sewage can potentially impact surface water quality by promoting the growth of algae and delivering pathogens may be harmful to human and ecological receptors. Use of toxic materials such as solvents and vehicle maintenance fluid (oil, coolant) and diesel fuel may contaminate surface and groundwater if these are disposed of directly into the ground or washed into the streams. Human waste from construction workers may also contaminate surface water and groundwater if there are no adequate sanitary facilities.

297 The waste stream during construction at most project sites can be expected to consist of (i) process water; (ii) excavated material not used in backfilling; (iii) packaging and containers; (iv) solid waste generated by workers (food and food packaging); (v) sewage from any temporary on-site toilets; and (vi) grey water from any temporary on-site kitchens and wash-up facilities. Based on the limited scale of the proposed buildings and absence of plans for any batch plants, process water is likely to be quite limited. Construction waste should also be quite limited, due to the relatively small footprint of planned buildings and the sandy local soils, which is likely to be appropriate for backfilling.

298 Similarly, waste management facilities, if improperly managed, may result in potential impacts to surface water by the introduction of harmful substances during runoff events. Of particular importance are

the potential impacts from chlorides, nutrients such as nitrates and phosphates, and pathogens such as E. coli or Typhoid, all of which are present in typical domestic waste. Chlorides can have acute effects on aquatic biodiversity, as well as longer-term effects such as inhibition of plant growth and interruption of invertebrate reproductive cycles. Nutrients such as phosphates or nitrates can also be immediately toxic to aquatic fauna but may also result in algal blooms (also known as eutrophication) or excessive growth of undesirable plant species. The proposed site does not have proper disposal site or facilities to dump solid waste; rather the solid waste is dumped in nearby lowlands. It would be important to establish formal solid waste management strategy to properly handle solid waste generated in these sites.

299 **Mitigation measures:** Receptacles for solid waste should be provided for the use of workers, and their contents should be disposed of in officially sanctioned local landfills. Construction waste should also be disposed of in legal local landfills. Clean construction waste such as excess soil or rubble should be used in landscaping on site or given to landowners and developers seeking fill material. As rudimentary standards prevail at local landfills, the contractors should take every opportunity to reduce the amounts of waste generated, and also collect recyclable material for processing by local operators. Grey water from temporary on-site kitchens and wash-up facilities should be directed to a settling basin, which should be filled in upon site closure. With regards to sewage, connections to local sewerage (or septic system in the case of worker camp) should be installed as the first step in the construction process, and temporary toilets connected to it.

(m) Disturbance in wildlife

300 **Potential impacts:** Clearing of existing vegetation may result in loss of associated ecological habitats and their fauna. Noise, vibrations, and intrusive activities related to construction works may scare away animals remaining onsite after vegetation clearance. Elephant-human conflicts may arise if elephant movement pathways are disrupted. Such conflicts may arise in Teknaf site.

301 **Mitigation measures:** Follow paragraph 257 for mitigation measures.

(n) Protection of fish and aquatic diversity

302 **Potential impacts:** Construction activities could lead to negative environmental disturbances to fish and aquatic diversity. Disturbance from the visual impacts, vehicles and construction equipment may cause disruption of sensitive species activity such as breeding and/or feeding;

303 **Mitigation measures:** (i) Setting up and implementation code of conducts to workers, including no catching or hunting fish and wildlife, (ii) design of the water intake will be carried out to avoid impacts on the aquatic species found in Naf river requiring protection. (iii) intake screen can be considered for the protection of aquatic species; (iv) movements of wildlife in and around the waterbody should be regularly monitored and adaptive measures need to be taken. (v) minimize the release of oil, oil wastes or any other substances harmful to aquatic species to any waters. (vi) new and good condition machinery with minimum noise will be used in construction; (vii) provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching.

(o) Pollution from construction camps

304 **Potential impacts:** Poor siting and improper management of construction camps may lead to several adverse impacts on environment: (i) loss of vegetation due to use of wood as fuel source for cooking, (ii) deterioration of nearby surface water quality, (iii) compaction and contamination of soil due to uncontrolled disposal of solid waste, (iv) increase in generation of domestic solid waste; (v) temporary air and noise pollution from machine operation; and (vi) poor sanitation resulting to transmission of

communicable diseases. In the subproject area, construction camp is suggested to be establish outside of the camp area to avoid the predicted impacts.

305 **Mitigation measures:** Please follow the mitigation measures stipulated in para. 285 and 299.

(p) Impact of traffic

306 **Potential impacts:** During construction, traffic volume will increase which may disrupt the traffic on the main roads.

307 **Mitigation measures:** Detailed Traffic Management Plans will be prepared before taking up any construction work and submitted to the Engineer for approval, 5 days prior to commencement of work on any section of road. A sample TMP has been attached with this IEE as Annex C. Contractor should inform the traffic police authority before starting road cutting/excavation. Provide, erect and maintain barricades, signs, markings, flags, lights and flagmen as may be required for the information and protection of traffic. The flagmen shall be equipped with red and green flags and lanterns/lights. Construction would seriously hamper the traffic movement specially at the intersection points, thus trenching should be done at night in busy road sections. Construction equipment and materials shall be removed from the busy roads at the end of night shift. Where ramps, temporary carriageways and walkways are required, they shall be provided and maintained to a standard suitable in all respects for the class or classes of traffic or pedestrians. These must be kept usable by women, children, patients and disables. Emergency response plan must be prepared for any traffic accident during construction.

(q) Occupational, Health, and Safety Risks

308 **Potential impacts:** Occupational hazards may arise if not properly managed (risk of fall and electrocution, etc). Increase in dust may cause health problems to workers. Insufficient supply and improper use of personal protective equipment (PPE) and lack of safety procedures may cause injuries or fatal accidents. Close contact with persons afflicted with diseases and lack of sanitation in workers camps may also pose health risks. Outbreaks of diseases like diphtheria and measles can be avoided by observing proper sanitation facilities and observing good personal hygiene habits.

309 Given the recent COVID-19 outbreak, it has been a new concern for the work site workers to keep safe health. It is expected that, on peak time there will be 30-40 workers at a time on each site, which can easily trigger COVID-19 human transfers. Such a situation can become disastrous and claim human life. There is also a risk of transmitting COVID-19 to the local residents.

310 **Mitigation measures:** There is invariably a safety risk when construction works such as excavation and earthmoving are conducted in populous areas. Workers need to be mindful of the occupational hazards, which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. The generic measures suggested are as followed: Comply with requirements of Government of Bangladesh Labour Law of 2006 (amended in 2013) and all applicable laws and standards on workers' health and safety (H&S). Ensure that all site personnel have a basic level of environmental awareness training. If necessary, the environmental management specialist and/or a translator shall be called to the sites to further explain aspects of environmental or social behavior that are unclear. Produce and implement a site H&S plan which include measures as: (i) excluding the public from worksites; (ii) ensuring all workers are provided with and required to use personal protective equipment (reflectorized vests, footwear, gloves, goggles and masks) at all times; (iii) providing H&S training for all site personnel; (iv) documenting procedures to be followed for all site activities; and (v) maintaining accident reports and records.

311 Responding to the COVID-19 situation in Bangladesh Government has opened an online platform for all COVID-19 information and guidelines applicable in Bangladesh. The website can be accessed at <https://corona.gov.bd/>. The website also contains a national Guide to combat COVID-19 and a special guideline in Bengali language on preparing worksite in response to COVID-19. The Bengali guideline is attached with this IEE as Annex D. A graphical guideline specially prepared for ADB funded project has been prepared in English language and attached with this IEE as Annex E. Text version of the guideline (in English) is also attached as Annex F. Sample Emergency Team formation at worksites, sample health and safety monitoring plan and sample signboards has also been prepared and attached to this IEE as Annex G, Annex H and Annex I as a response to COVID-19.

(r) Community Health and Safety Hazards

312 **Potential impacts:** Community hazards may arise during construction (dust, air quality, noise, electrocution etc.). Traffic accidents and vehicle collision with pedestrians during material and waste transportation may occur if no proper signage is placed. Also, in case of recently threatening COVID-19, if worksite staff and workers are not restricted from going outside in the local communities, there is a serious threat of spreading the virus among the locals that may claim human lives. The health risk is very high within the camps due to high density population and unhygienic living conditions.

313 **Mitigation measures:** Arrange Contractor's activities and movement of staff will be restricted to designated construction areas. Consult with the Local Authority on the designated areas for stockpiling of, soils, gravel, and other construction materials. If the contractor chooses to locate the work camp/storage area on private land, he must get prior permission from the environment management specialist and landowner. Under no circumstances may open areas or the surrounding bushes be used as a toilet facility. Recycling and the provision of separate waste receptacles for different types of waste shall be encouraged. Interested and affected parties need to be made aware of the existence of the complaints book and the methods of communication available to them.

314 The contractor must address queries and complaints by: (i) documenting details of such communications; (ii) submitting these for inclusion in complaints register; (iii) bringing issues to the environment management specialist's attention immediately; and (iv) taking remedial action as per environment management specialist's instruction; (v) contractor shall immediately take the necessary remedial action on any complaint/grievance received by him and forward the details of the grievance along with the action taken to the environment management specialist within 48 hours of receipt of such complaint/grievance.

315 Create traffic regulation and diversion zones during construction work. The proposed site is on the main road, and it is expected that heavy vehicle movements can cause traffic nuisance. Therefore, traffic regulation and diversion will be important to avoid traffic nuisance.

316 Responding to COVID-19 guidelines for worksite has already been prepared for ADB funded projects and attached with this IEE. Restricting workers within the worksite and labour camp and stricting following the guideline provided by Bangladesh Government and ADB is the key to combat COVID-19 at worksites. Please follow the instructions made in para. 311 for details.

3. Impacts and mitigation measures during Operation Phase

(a) Catchment erosion and reservoir siltation

317 **Potential impacts:** Siltation causes decrease in reservoir storage capacity, turbidity water in the reservoir area.

318 **Mitigation measures:** To reduce siltation, silt traps should be constructed to ensure deposition occurs before reaching the water dam. Desilting should be done to remove the sediment from the reservoir and the material removed from desilting shall not be deposited within a watercourse or floodplain of a watercourse; Buffer zones will be created and unnecessary tree cutting will not be permitted as this may lead to erosion enhancing sedimentation.

(b) Risk of long-term nutrient build-up and reservoir eutrophication

319 **Potential impact:** Nutrient build-up in the reservoir could lead to problems of eutrophication which will cause: Reduction in water clarity and increase the WTP costs; Frequent anoxia leading to loss of some benthic lifeforms; Appearance of toxic algae and bio toxins.

320 **Mitigation measures:** Stick to good practices of dam operation rules of ensuring minimum flows in times of low flow to avoid high nutrient/pollutant load. Ensure protection of water reservoir; any entry of wastewater into the stream site should be prevented. Ensure prior clearance of all deadwood/vegetation prior to dam filling. Avoid discharge of any waste effluent into the dam. Strong awareness program will be arranged to stop pollution of the waterbody.

(c) Reservoir integrity and security risks

321 **Potential impacts:** Risk of dam failure; Risk of under- ground leakage; Sabotage.

322 **Mitigation measures:** Ensure real-time monitoring of reservoir levels and/or spillway releases in combination with predefined thresholds that trigger the emergence of an alert or alarm situation; Ensure operation of the dam in accordance with the operating rules set out in the Dam Design; Ensure regular monitoring of water level change in the water reservoir; The proponent will ensure proper security measures including serious security surveillance.

(d) Check and repair for leaks and pipe bursts

323 **Potential impacts:** Loss of water, increased demand and inconvenience to consumers.

324 **Mitigation measures:** Regularly check the pipeline system and promptly repair any problems. Ensure leak detection and restoration time is minimized to the extent possible. Effective leak detection and water auditing to reduce the water losses.

(e) Water quality

325 **Potential impacts:** Loss Contamination of the raw water due to waste water from surrounding area. Raw water contamination at source and treated water during transmission. Impacts on public health.

326 **Mitigation measures:** Contamination of treated water during transmission should be prevented by quickly identifying, isolating and repairing the leak section. Develop a system of leak detection and rectification. Arrange warning signs at water collection locations and some key points along the water pipeline system. Strong awareness program among the staff and the community will be arranged to stop pollution of the waterbody. Conduct regular monitoring of raw water and treated water including biological contamination and ensure that water supplied at all times meets the DOE drinking water standards.

(f) Occupational health and safety

327 **Potential impacts:** Health, social and economic impacts on the workers.

328 **Mitigation measures:** Workers must be trained to recognize potential hazards, use proper work practices and procedures, recognize adverse health effects, understand the physical signs and reactions related to exposures, and are familiar with appropriate emergency evacuation procedures. They must also be trained to select and use the appropriate PPE. Provide all the personal protective equipment like gum boots, ear plug, mask, gloves etc. for the protection of workers. The workplace will be equipped with fire detectors, alarm systems and fire-fighting equipment. The equipment will be periodically inspected and maintained in good working condition. Providing adequate personnel facilities, including washing areas and areas to change clothes before and after work. Medical check-up will be conducted on regular basis and the health conditions will be monitored. First aid facilities required to attend immediately for meeting emergency situations will be made available at the facility. Maintaining good housekeeping in waste processing and storage areas. Install railing around impounding reservoir. Require use of a life line and personal flotation device (PFD) when workers are inside the railing, and ensure rescue buoys and throw bags are readily available; Implement a confined spaces entry program that is consistent with applicable national requirements and internationally accepted standards. Use fall protection equipment when working at heights; Maintain work areas to minimize slipping and tripping. Use proper techniques for trenching and shoring. Install safety showers and eye wash stations where hazardous chemicals are stored or used; Prohibit eating, smoking, and drinking except in designated areas.

(g) Human elephant conflict

329 **Potential impacts:** If vegetation cover is not kept intact which are used as food for elephants, the elephants can be agitated. Moreover, during operation, elephants can be lured to the structures and water reservoir.

330 **Mitigation measures:** Make sure the plantation programme is 100% successful. Continuous monitoring of survival of the planted trees and density of the planted trees. If density of the plants begins to thin out, replant. Always ensure that the structures get covered with greeneries so that elephants don't see them. Include budget for plantation and monitoring for every year of operation.

VII. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

A. Purpose of this EMP

331 This environmental management plan (EMP) has been prepared for the ADB- supported Regional Upgrades of Sanitary and Phytosanitary Measures for Trade Project, in accordance with the ADB's Safeguard Policy Statement 2009. Specific measures are developed in relation to the design, construction and operation of each project component, to address the physical, biological, cultural and socio-economic impacts identified and discussed in the chapter on Anticipated Impacts and Mitigation Measures of the Initial Environment Examination (IEE) report.

332 The EMP for the project defines mitigation and monitoring measures and identifies the institutions, responsibilities and mechanisms that will ensure their implementation. Such institutions and mechanisms will seek to ensure continuous improvement of environmental protection activities during the pre-construction, construction, and operation phases of the project, in order to manage adverse impacts.

333 The objective of this Environmental Management Plan (EMP) is to formulate measures, which will:

- Mitigate adverse impacts on various environmental components, which have been identified during observation;
- Protect environmental resources where possible;
- Enhance the value of environmental and social components where possible.

334 The EMP also includes a monitoring plan to enable evaluation of the success or failure of environmental management measures, and to carry out reorientation of the plan if found necessary. It is emphasized that many of the protective and enhancement measures can be implemented by adopting suitable planning and design criteria for construction of the project. This EMP is also made site specific with guidelines for the contractors to be able to operate according to the Bangladesh Government and ADB requirements to comply with their relevant policies.

B. Institutional Responsibilities

1. Oversight Body

335 The Office Refugee Relief and Repatriation Commissioner (RRRC) is acting as the coordinator on behalf the government to execute all interventions. RRRC and ADB are conducting regular coordination meetings involving all EA/IAs, relevant stakeholders including deputy commissioner (DC), Cox's Bazar, other development partners and agencies. ADB has established extended mission office in Cox's Bazar for close coordination, facilitation of sub-projects development and implementation.

336 A steering committee comprising higher officials from relevant ministries coordinated by ERD is formed to provide necessary guidance to expedite the sub-project development and implementation. An organogram of the institutional arrangements is presented in Figure VII-1.

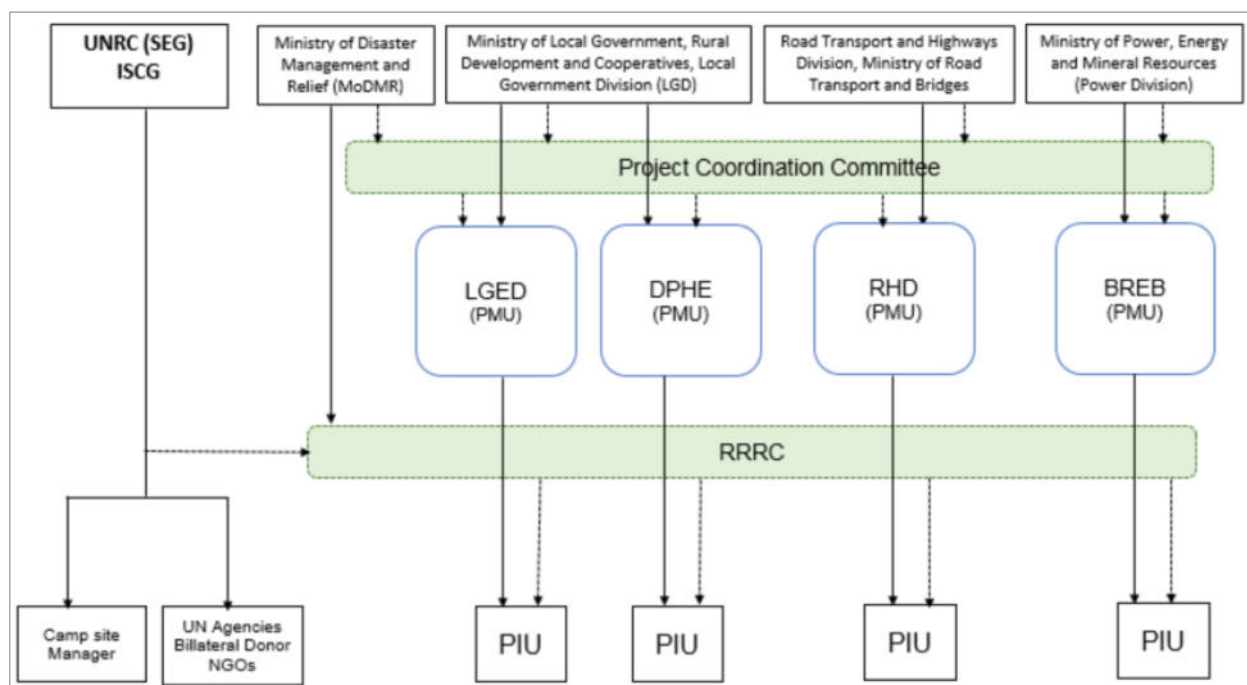


Figure VII-1 Project Organization Structure

2. Executing Agency / Implementing Agency

337 The Department of Public Health Engineering (DPHE) is the EA/IA for the Project. The EA/IA will coordinate environment safeguards planning and implementation and ensure that the environmental assessment and review framework is followed during subproject implementation. There is a safeguards focal person in the EA/IA. The EA/IA is assisted by PMCs. Consultants include an Environment Specialist engaged during project implementation.

3. Project Implementing Unit (PIU)

338 PIU is formed in DPHE, with a dedicated safeguards focal person. PIU is assisted by DSC. Consultants include Environment Specialists engaged during project implementation.

4. Design and Supervision Consultants (DSC)

339 Once hired through bid processing, 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.

340 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 contractors

341 Contractors performing work on project components will be required to formulate contractor EMPs (CEMPs) with management systems for adverse impacts, e.g., dust control, noise control and traffic management, meeting the prescriptions of this EMP at a minimum. The CEMPs will be renewed on a yearly basis, submitted to the PMU for review, and to ADB for approval. Each civil works contractor will appoint an environment, health and safety officer (EHSO) to coordinate CEMP implementation. To ensure that the contractors comply with the EMP provisions, the PMU, with the help and technical support of the ADB (environmental consultant), will prepare and provide the following specification clauses for incorporation into the bidding procedures: (i) a list of environmental management requirements to be budgeted by the bidders in their proposals and (ii) environmental clauses for contractual terms and conditions. The contractors will also be expected to cooperate fully with local DoE inspectors. Contractors will submit monthly CEMP implementation reports to the PMU, and provide information including reports, monitoring results or other information relating to EMP implementation as requested by the PMU.

C. Monitoring and Reporting

342 The PIUs, will monitor and measure the progress of EMP implementation. The monitoring activities will be corresponding with the project's risks and impacts and will be identified in the IEEs. Appendix 10 provides a content outline for monitoring reports. In addition to recording information of the work, deviation of work components from original scope, the PIUs will undertake site inspections and document review to verify compliance with the EMP and progress toward the final outcome.

343 DSCs will submit monthly monitoring and implementation reports to the PIUs, who will take follow-up actions, if necessary. PIUs will submit the quarterly monitoring and implementation reports to the EAs/IAs. The EAs/IAs will submit semi-annual monitoring reports to ADB. Project budgets will reflect the costs of monitoring and reporting requirements. Monitoring reports will be posted in a location accessible to the public.

344 The EAs/IAs will document monitoring results, identify the necessary corrective actions, and reflect them in a corrective action plan. The EAs/IAs, in each quarter, will study the compliance with the action plan developed in the previous quarter. Compliance with grant covenants will be screened by the executing agency.

345 ADB will review project performance against the executing agency'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 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 impacts;
- (ii) review the periodic monitoring reports submitted by the executing agency to ensure that adverse impacts and risks are mitigated as planned and as agreed with ADB;

- (iii) work with executing agency 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
- (iv) 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.

346 The following table (Table VII-1) summarizes the environmental responsibilities of the parties identified for each stage in the project's development:

Table VII-1 Summary of environmental responsibilities during project development

Phase	Responsible Agencies	Environmental Responsibilities
Project Preparation	EA	Submit IEE and request local DoE to issue general permits Conduct IEE in accordance with ADB SPS 2009. Also collect permissions from local authorities (Zilla Parishad) and District Commissioner (DC) of Cox's bazar.
	ADB	Review and approve IEE, including EMP. Disclose on ADB website
Conceptual and Detailed Design	Design firms	Incorporation of environmental mitigation measures in detailed designs and bidding documents
	PMU, IAs	Update EMP based on approved detailed design, if necessary
	ADB	Approve updated EMP, if necessary
Tendering	PMU, IAs, design firms	Incorporate mitigation measures and the EMP clauses in tendering documents, civil contracts and contractors' construction management plans
	ADB	Review tendering documents, confirm project's readiness
Construction	EA, IAs	Advise on implementation of mitigation measures
	Contractors, EHSOs	Implementation of mitigation measures and conduct internal monitoring, supervision
	PMU	Coordinate grievance redress mechanism; supervise EMP implementation; conduct regular site inspections; conduct training; support PIU in preparing annual environmental progress report
	Licensed laboratory	Conduct quarterly environmental monitoring, prepare monitoring reports
	Local DoE	Advise on mitigation measures; provide comprehensive technical support to PMU, EA and IAs for environmental management; conduct training; conduct annual EMP compliance review
	ADB	Conduct review missions; review and approve annual environmental progress reports, including disclosure
O & M	PMU	Conduct EMP compliance review, instruct IA on environmental management requirements; prepare annual environmental progress report for first year of operation
	IAs	Implementation of mitigation measures as defined in EMP; conduct environmental monitoring following approved monitoring plan
	ADB	Review and approve environmental progress report, disclose on ADB project website

D. Assessment of project readiness

347 Before construction, the PIU will assess the project's readiness in terms of environmental management based on a set of indicators (Table VII-2) and report it to the ADB and the PMU. This assessment will verify that environmental commitments are being carried out and environmental management systems are in place before construction starts, or if this is not the case, propose corrective actions to ensure that all requirements are met.

Table VII-2 Indicators of project readiness in relation to environmental management

Indicator	Criteria	Assessment	
DoE approval	<ul style="list-style-type: none"> DoE approves the IEE and ECC is being obtained 	Yes	No
EMP update	<ul style="list-style-type: none"> The EMP is updated after detailed designs are approved, and approved by ADB and DoE 	Yes	No
Compliance with loan covenants	<ul style="list-style-type: none"> The borrower complies with loan covenants related to project design and environmental management planning 	Yes	No
Public involvement effectiveness	<ul style="list-style-type: none"> Meaningful consultation completed GRM established at entry point 	Yes	No
Environmental supervision in place	<ul style="list-style-type: none"> PIU supervision in place 	Yes	No
Bidding documents and contracts with environmental safeguards	<ul style="list-style-type: none"> Bidding documents and contracts incorporating the environmental activities and safeguards listed as loan assurances Bidding documents and contracts incorporating the impact mitigation and environmental management provisions of the EMP 	Yes	No
Contractor readiness	<ul style="list-style-type: none"> Contractor EMPs (CEMPs) have been prepared and approved by PIU and PMU Environmental, Health and Safety Management Plans (EHSMP) established for construction sites Environment, Health and Safety Officers appointed Assessment of potential disruption to utilities services conducted Stakeholder interviews conducted to confirm issues if services are disrupted 	Yes	No
EMP financial support	<ul style="list-style-type: none"> Required funds have been set aside to support the EMP implementation according to the financial plan 	Yes	No

E. Environmental Management Plan (EMP)

348 The EMP is necessary on the grounds that it will manage the environment by offsetting the negative impacts with possible mitigation measures and enhancing the positive impacts within the allocated fund from the project. Thus, the main objectives of the EMP for the construction of the access road project are:

- Define the responsibilities of the project proponents in accordance with the three project phases (design, construction and operation);
- Facilitate the implementation of the mitigation measures by providing the technical details of each project impact, and proposing an implementation schedule of the proposed mitigation measures;
- Define a monitoring mechanism and identify monitoring parameters to ensure that all proposed mitigation measures are completely and effectively implemented;
- Identify training requirements at various levels and provide a plan for the implementation of training sessions;
- Identify the resources required to implement the EMP and outline corresponding financing arrangements; and Providing a cost estimate for all proposed EMP actions

349 The Environmental Management Plan (EMP) presented in Table VII-3. Only the prioritized risks are presented in the EMP for specific measures.

Table VII-3 Environmental Management Plan (EMP) for the Subproject

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
1. Project preparation and IEE development							
1.1	Impact screening	<ul style="list-style-type: none"> Negative impacts from project infrastructure development 	All	<ul style="list-style-type: none"> Prepare applications for impact assessment for all project locations and submit to DoE environment authorities for review Include special conditions, if any, in IEE update 	EA	PMU, PIU	Approval of DoE; Approval of ADB
1.2	Due diligence	<ul style="list-style-type: none"> Impacts associated with existing facilities 		<ul style="list-style-type: none"> Sites all visited during IEE preparation and detailed Rapid Environmental Assessments completed 	ADB project preparatory mission	EA, ADB	ADB approval of IEE
1.3	Legal verification	<ul style="list-style-type: none"> Delays due to ownership conflict or unclear legal status 	All	<ul style="list-style-type: none"> Provide verification of land ownership for project component projects 	EA	PMU	ADB approval of IEE
1.4	Consultation	<ul style="list-style-type: none"> Potential conflict due to misinformation and inadequate project communication 	All	<ul style="list-style-type: none"> Conduct consultations in relation to all project components 	ADB project preparatory mission	EA, ADB	ADB approval of IEE
1.5	Grievance redress mechanism	<ul style="list-style-type: none"> Potential conflict and delays due to unhappy project affected people 	All	<ul style="list-style-type: none"> Define and establish GRM 	EA, PMU	EA, ADB	ADB approval of IEE
2. Design phase							
2.1	IEE updating	<ul style="list-style-type: none"> IEE and EMP out of date due to changing conditions or plans 	All	<ul style="list-style-type: none"> Mitigation measures defined in this EMP will be reviewed, updated (if necessary) and incorporated into detailed designs to minimize adverse environmental impacts. 	PMU, PIU	EA, ADB	ADB approval of updated IEE
2.2	Bidding documents and contractors	<ul style="list-style-type: none"> Inclusion of mitigative action in legally binding documents to ensure implementation 	All	<ul style="list-style-type: none"> Include environmental provisions as cited in the EMP in the RFPs Include environmental clauses 	PMU, PIU	EA, ADB	EHS provisions in bid documents and contracts
2.3	Provisions for	<ul style="list-style-type: none"> Potential for unplanned construction activity 	All	<ul style="list-style-type: none"> Confirm location, capacity, functionality and connection readiness of water, sewerage, electricity, heating and legal 	PIU, PMU	PMU	Precise locations and planned

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
	connection to service infrastructure			landfills to avoid wastewater dumping, ad-hoc connection arrangements, or inappropriate waste disposal in construction phase			connection dates confirmed and documented
2.4	Integration of climate change considerations in design	<ul style="list-style-type: none"> Environmental and safety impacts from lack of climate-proofing, production of avoidable GHG emissions 	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> Review of flash flood and hydrological regime in the region and plan structures accordingly Review extreme rainfall events and adopt technical and ecological solution for the sustainability of the structure 	PMU	PIU	Climate-proofing measures evident in detailed designs Energy efficiency features evident in detailed designs
2.5	No objection from local authorities	<ul style="list-style-type: none"> Failure to obtain necessary consents, permits, NOC's can result in design revisions and/or stoppage of the works, even stop the construction project. In this case, most of the proposed areas for site are under forest and therefore under the jurisdiction of forest department. Obtaining a NOC from forest department is a requirement before starting of the construction. Permission of land needs to be obtained from the DC of Cox's Bazar while NOCs from local Upazila parishad is also required. 	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> (i) Obtain Environmental Clearance Certificate (ECC) from Department of Environment and NOC DC, FD and Upazila parishad; (ii) acknowledge in writing and provide report on compliance all obtained permits, clearance, NOCs, etc. 	PIU, PMU	PIU	NOCs collected from FD, DC Cox's bazar, Upazila parishad
2.6	Existing utilities	<ul style="list-style-type: none"> Disruption of services 	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> Survey for existing utilities Provision in the design and budget for the relocation of the existing utility infrastructures, wherever required; Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; Identify and include locations of water pipes, power/telephone lines and any other infrastructure on the way of pipe line and redesign pipe layout to avoid any damage on such infrastructure; 	PIU, PMU	PMU	Survey report submitted by of existing utilities by PIU and other independent survey team, reviewed by ADB and approved by PMU.

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
				<ul style="list-style-type: none"> Require construction contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services; Utilities will only be removed and relocated with proper agency approvals and permission; Informing all hospitals, schools, places of worship, and affected communities well in advance; If utilities are damaged during construction, it will be reported to the Consultants and utility authority and repairs will be arranged immediately at the contractor's expense; and Reconnection of utilities will be completed at the shortest practicable time before construction commences. 			
2.7	Road cutting	<ul style="list-style-type: none"> Traffic congestion, road accident and dropping of pedestrian in open trenches etc. 	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> Unnecessary road cutting should be avoided. No temporary or permanent works proceed before the design and drawings are approved by the Project Director and road cutting permission obtained from relevant authorities (LGED, RHD etc.) by PMU. Road cutting plan necessary for the application for road cutting permission from the authorities must be prepared by the contractor. The contractor has to take all necessary safeguards to avoid accidents at site, prevent loss/damage to all existing utilities like pipelines, telephone/electric cables, poles etc. and any government or private property during the contract period. The contractor shall prepare a traffic management scheme (road closure program or diversions) and incorporate detail of traffic diversions and pedestrian routes, all traffic signs (for the regulation and for information) and road markings shall be ensured prior to start of road cutting. 			<ul style="list-style-type: none"> Road category along transmission pipe alignments; Budget allocation for pavement restoration; Road cutting plan; Road cutting permission from relevant authorities (RHD, LGED etc.)
2.8	Impact of extreme climatic events	<ul style="list-style-type: none"> Teknaf site is located in the hillock areas and prone to landslides/mudslides and erosion. The region is also vulnerable to flash floods during heavy rainfall events. Poor drainage and unplanned development also contribute to the added vulnerability of structures to extreme climatic events. Failure to address the extreme rainfall events 	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> (i) Ensure adequate water passage under the structure and shape the associated landscape so that water can be drained quickly from the site; (ii) ensure selection of latest weather coated painting and construction materials so that the structures can withstand heavy rainfall and flooding damage; (iii) ensure flood return period and local waterlogging information being considered in the design phase; (iv) ensure that heavy rainfall events can be converted into safe pathogen free water storage for long-term use considering the modern Rain Water Harvesting 	PIU, PMU	PMU	Noise reduction plan formulated by the design consultants and submitted to PMU Plan reviewed and approved by PMU and ADB

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
		and associated vulnerability/hazards in the designs may lead to damage to the structure and pose threat of nuisance in the locality which may include hydrological hazard, poor structure life etc.		(RWH) technologies; (v) include solar panels and energy saving lights in design.			
2.9	EMP Implementation Training:	<ul style="list-style-type: none"> If the contractors and construction supervision engineers are not aware about the implementation of this EMP, the project may not proceed and comply with ADB and GoB environmental policies. 	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> Project manager and all key workers will be required to undergo EMP implementation including spoils management, Standard operating procedures (SOP) for construction works; health and safety (H&S), core labour laws, and applicable environmental laws. 	PMU	ADB	One two-day EMP implementation training held in Cox's bazar.
2.10	Failure to consider local hydrological system	<ul style="list-style-type: none"> Teknaf region is hilly and landslide/erosion prone. Reservoirs are to be located at the end points of the hilly stream. It will take large area with massive weight of water. Failure to account the geology, morphology and hydrological scheme of the area may lead to reservoir instability and cause landslide. Moreover, during flash floods or extreme rainfall events, flood and landslide in the region can be detrimental. Even such hazard may occur during construction when local topography and hydrological system is tampered with. 	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> (i) detail assessment of the microhydrology and topography of the project site; (ii) design according to the sloping of the project area; (iii) avoid conventional raised plinth design that blocks water runoff, rather design should prioritize structure built on raised columns that can allow water to pass through; (iv) design can learn and adopt from the local traditional structures on the hill sides; (v) design needs to consider additional drainage facilities and water storage. 	PMU	PMU, ADB	Hydrological survey and impact analysis report done and submitted to PMU; PMU approves report.
2.11	Material sourcing	<ul style="list-style-type: none"> The region is vulnerable to hill erosion and sedimentation. There are a few illegal sand quarries in Ukhiya which has left the entire hills vulnerable to landslides and sedimentation. Moreover, the Department of Environment (DoE) is struggling to stop illegal hill cutting in 	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> The bid documents should put clause on material sourcing that forbids the contractor to source construction materials like sand/silt from local hills and rivers/canals. 	PMU	PMU	Location specific EMP done and submitted to PMU; PMU approves the EMP

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
		the region. Several landslides occurred in the region in the recent 5 years claiming human lives which are believed to be caused by illegal hill cutting and sand quarrying triggered by heavy rainfall. Therefore, if sand/silt material used for the construction should not source its materials from this hilly region.					
2.12	Chemical use	<ul style="list-style-type: none"> Chemical usage (Sodium hypochlorite and citric acid) as disinfectant at WTP and chemical handling & application risk – health & safety risk to workers aquatic species. 	All	<ul style="list-style-type: none"> Provide the following measure at the chemical dosing unit: (i) Proper ventilation, lighting, entry and exit facilities; (ii) facility for isolation in the event of major chemical leakage (if needed); (iii) personal protection and safety equipment for the operators in the chemical dosing unit; (iv) provide training to the staff in safe handling and application of chemical; this shall be included in the contract of Chemical supplier; (v) supplier of chemical dosing equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs; preferably these shall be provided both in English and Bangla Languages. 	PMU	PMU	Location specific EMP done and submitted to PMU; PMU approves the EMP
2.13	Asian elephants	<ul style="list-style-type: none"> Evidence of elephants were observed during field visit in Taknaf (Chndrakilla). The elephants mainly visit the area for food, especially banana. Also, the elephants drink water from the narrow streams that run to the likely reservoir site. According to the ecological study conducted by the project earlier in 2019, The “Asian Elephant frequently visits the waterbody at night in order to drink and bathe, which was confirmed by the sightings of footprints and interviewing the local people. Elephants commonly 	Teknaf	<ul style="list-style-type: none"> The following measures are essential in planning the SWTP in Taknaf (Chandrakilla): (i) The waterbody should be developed in a way so that minimum artificial structures (e.g. concrete and metallic structures) are used. The structures should be restricted to any one side (e.g. dyke side), leaving other sides natural, so that animals do not hesitate to visit the waterbodies and plants can grow along the banks. (ii) Any structure must be durable and as low as possible so that the structure is less visible to elephants and other wildlife. Visible structures can be destroyed by elephants. (iii) The supply line should be placed underground with some markings on the surface so that people know the existence of underground supply line. (iv) If the water pumps are to be installed, these must be set sufficiently far from the waterbodies so that these remain safe from elephants and 	PMU	PMU	Location specific EMP and plantation programme by Ecological specialist done and submitted to PMU; PMU and ADB approves the EMP and plantation programme.

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
		visit at night in order to avoid confrontation with people. Elephants (a group of six and a solitary animal) were seen in the forested hills not very far from Rohingya camps. Water is scarce in the hilly area, so this waterbody with plenty of freshwater throughout the year is crucial for the local people as well as the local wildlife and plants" (Khan 2019).		there is no noise pollution in and around the waterbodies. Notably, noise pollution might scare the wild animals off from the waterbodies. (v) A watchtower can be established near the waterbody, with volunteer watchers watching by rotation, in order to warn the residents if there is any movement of elephants towards the camp. (vi) Indigenous trees should be planted in the catchment areas and hills around the waterbody in order to sustain the natural water supply and water quality in the long-term. Some recommended trees for plantation are Freshwater Mangrove (<i>Barringtonia acutangula</i>), fig (<i>Ficus</i> spp.), cotton tree (<i>Bombax</i> spp.), Monkey Jack (<i>Artocarpus chama</i>), Black Berry (<i>Syzygium cumini</i>), Sea Apple (<i>Syzygium grande</i>) and Champa (<i>Magnolia champaca</i>). Rohingyas and local host communities should not be allowed to enter the hilly areas around the camp in order to collect the firewood. This severely affects the regeneration of vegetation, disturbs the wildlife, and increases the human-wildlife conflict. Moreover, illegal hunting of wildlife, especially in and around the waterbody, must be controlled. (vii) Movements of elephants and other wildlife in and around the waterbody should be regularly monitored and adaptive measures should be taken as necessary. (viii) there are a few shanties of Rohingyas in the southeast side of the waterbody, which should be shifted far southwest from the waterbodies. This is because the waterbody will lure the elephants and the houses in the southeast side are in the possible route of elephants, so those are vulnerable to elephant attack. As observed in the field, the expansion of shanties in the surrounding areas is not well-controlled. (viii) planting of native species, specially used as elephant food (Banana, Black Berry (<i>Syzygium cumini</i>), Sea Apple (<i>Syzygium grande</i>) etc.) around the reservoir may prevent the elephants visiting the plant site. An well drafted planation prgormmae with the assistance of an ecological specialist needs to be adopted during detail design phase. The plantation programme should be launched as soon as the			

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
				construction starts so that before construction reaches to its end, the plants grow big enough to lure the elephants away from the reservoir site.			
2.14	Community awareness program	Without proper interaction with local communities and or with stakeholders may lead to confusion and agitation and non-cooperation of local people.	All	<ul style="list-style-type: none"> Before start of the project, the local population should be well aware of the upcoming project. There should be regular interaction with the local population and make them understand the project activities. 	Contract or	PIU, PMU	Record of attendees list; Photo log.
3. Construction phase							
3.1	Contractors EMP (CEMP)	<ul style="list-style-type: none"> Occurrence of impacts due to lack of contractor action and weak oversight 	All	<ul style="list-style-type: none"> Review and approve CEMP prepared by each selected contractor, ensuring that all EHS provisions mentioned in bid documents and contracts are adequately addressed (i) This is of utmost importance to note that this IEE is for both proposed sites and is not site specific since the detail design has not been on board. This IEE actually indicative of what needs to be considered during design and planning phase. Therefore, the Environmental Management Plan (EMP) stipulated in this EMP needs to take as advice for design and to avoid environmental consequence; (ii) To effectively prevent and minimize impacts that could arise during construction, mitigation measures specified in the EMP need to be incorporated in bid documents and contracts, and each contractor must be required to develop a Contractor Environmental Management Plan (CEMP) for each cyclone shelter site reflecting all measures relevant to the contracted work, for approval before construction begins. CEMPs should include measures and sub-plans dedicated to waste management, soil protection, traffic management, wastewater management, environmental health and safety, and emergency response (relating to both accidents and spills). Additionally, CEMP should also include a plan for removal and disposal of existing waste tanks/demolished garbage (if any); including management of contaminated soil around them (which will be identified by pre-construction surveys conducted by the IAs). The contractors should also be required to produce a site-specific Environmental Health and Safety Plan (EHSP) for 	Contractor	PIU, PMU	CEMP done and approved by PMU and ADB for each site

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
				each of the sites under their control. Well before construction begins, each contractor should designate an Environmental Health and Safety Officer (EHSO) to manage implementation of the CEMP and EHSP.			
3.2	Provision for security of the sites	<ul style="list-style-type: none"> Construction works may hamper due to criminal activities at work sites specially in the Rohingya camps. 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"> Be responsible for guarding all utilities, plants equipment, material, etc. delivered on sites and for ensuring that all sign, lights, fences, etc. are in their proper place. Provide, install and maintain suitable barriers and/or fences to protect the facilities, constructions camp, storage yard, existing facilities and construction and installation operations and to remove same when no longer required by DPHE or at completion of the project. Follow all necessary occupational health and safety measures during construction. 	Contractor	PIU, PMU	Program of Performance; Signs and barriers; Security measures in place.
3.3	Handling of flash flood, heavy downpour etc.	<ul style="list-style-type: none"> Inundation of worksite will damage the machineries and equipment may disrupt the construction works. 		<ul style="list-style-type: none"> Protect the working area including impounding reservoir area, pits, trenches, materials, machineries and equipment from any damage due to inundation by downpour. Ensure not to make any congestion in the open drains or natural or artificial channels. Take necessary measure to bring the site to the condition prevailing before the downpour without delay. Necessary measure has to be taken so that storm water does not get into the newly installed pipelines. Be particular in keeping updated weather forecast and maintain a record book at site in which weather condition is recorded. 	Contractor	PIU, PMU	Program of performance; On-site record book.
3.4	Topsoil loss followed by soil erosion	<ul style="list-style-type: none"> For the proposed facilities, four parameters have been considered for screening of environmental/ecological impacts during construction phase; these include access road, felling of trees, clearing of vegetation, and impact on aquatic (water) habitat. Teknaf site is located on slope with several undulations. Significant excavation, cut and fill is expected. The cut and 	All	<ul style="list-style-type: none"> (i) At the sloped sites, temporary slope protection measures such as swales and berms should be used to slow overland flows, promote infiltration, and direct runoff away from active work areas. Protective ground coverings, such as mulch, can also be used to protect areas of exposed soil from heavy rainfall and runoff; (ii) adequate water runoff passages should be considered by the design; structures, at not condition, should block the water passage; (iii) Any borrow pits established by contractors near any of the sites should be rehabilitated promptly once the required materials have been extracted, with slopes reshaped and revegetated to 	Contractor	PIU, PMU	Constructions of swales and berms at sloped sites; slopes reshaped and revegetated; equipment quality check; no drainage congestion in site; Measures implemented

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
		fill will lead to severe soil loss, and if not properly managed, can cause localized landslide. Without a proper management system, soil and water population is also expected.		prevent the development of erosion problems; (iv) To prevent soil contamination, contractors should maintain equipment to a high standard and regularly monitor for leaks. Contractors must also adopt proper procedures for spill prevention during equipment refueling and servicing, including using impermeable mats under working areas to catch and contain drips and spills, and storing fuels, lubricants, coolants and other fluids only in designated areas with spill containment structures with free capacity at least 110% of the volume of the largest stored container. If the contractors establish any borrow pits, the same precautions should be taken there as well.			as prescribed; Absence of erosion, spill marks, litter on ground
3.5	Noise Impacts	<ul style="list-style-type: none"> The parameters considered for screening of noise impacts during construction phase of the waste management facility include intensity of involvement of heavy machineries, type of heavy machineries, type of activities and proximity of the work area to the nearby inhabitants. Construction of the waste management facility involves use of equipment/machines producing significant noise (e.g., generators, pile driver). However, none of the site are located within busy premises. Therefore, noise pollution would not be significant (in the absence of mitigation measures). Use of stone crushers, excavation works, and movement of vehicle would generate air pollution. Involve the community in planning the work program so that any particularly noisy or otherwise 	All	<ul style="list-style-type: none"> Conduct noise generating activities during day time; Minimize noise from construction equipment (by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor; Maintain maximum sound level not exceeding 80 decibels (DBA) when measured at a distance of 10 m or more from the vehicle/s. Consult local communities in advance to avoid working at sensitive times, such as religious and cultural festivals; Conduct noise quality monitoring as per EMP. 	Contractor	PIU, PMU	Measures implemented as prescribed; DoE prescribed noise limit maintained

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
3.6	Water Pollution	<p>invasive activities can be scheduled to avoid sensitive times.</p> <ul style="list-style-type: none"> Both proposed reservoir site is connected to streams. Ukhiya reservoir is connected to the Naf river and Plaongkhali khal. The Teknaf reservoir will be connected to downstream. Both sites are vulnerable to water pollution or contamination from stockpile materials and construction waste. Construction of structures and putting construction materials on the path of the streams may block the flow and cause flooding and waterlogging. Moreover, hill runoffs may also bring eroded materials and cause sedimentation problem. As most of the sites are gently sloped towards nearby surface waterbody, any poorly managed site, specially where construction materials not kept safely under Tripoline and silt-curtains, may cause surface water pollution. 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. Mismanagement of sediments/silts 	All	<ul style="list-style-type: none"> Implement eco-friendly waste management system: practice waste minimization, reuse and segregation; provide adequate waste bins, enforce onsite rule of throwing waste into bins; provide separate storage area for solid waste and hazardous waste to contain spill area; and implement measures to mitigate sedimentation/siltation. In all sites follow a Removed Soil Management Plan linked to the Excavation Segmentation/Management Plan, specifying, e.g., separate areas for stockpiling "reusable soils" & "unsuitable & excess soils" appropriate stockpiling areas, on flat grounds & away from or not obstructing main surface drainage routes disposal of unsuitable & excess soils as soon as possible hauling trucks to be required appropriate cover & min 2 ft freeboard employ any combination of the following measures to prevent stockpiled soils & fine aggregates from being eroded or carried away by wind and rain: silt fences, sediment traps, sandbags, barrier nets, earth bunds, speed stilling humps along surface drainage routes, limiting stockpile to a maximum height of 2 m, &/or diversion drains to reroute surface runoff away from stockpiles, whichever would be appropriate for the site & site conditions. Monitor immediate low areas or valleys for drainage congestion. If drainage congestion seems eminent, excavate or clear excess sediment/wash materials to clear congestion. Install silt protection curtain/steel nets alongside hill side roads. All other effluents not to be disposed of directly into natural waters, but via settling basins to allow suspended sediment to settle out. All earthworks must to be conducted during dry season/dry spell to maximum extent possible to avoid the difficult working conditions that prevail during monsoon season such as problems from runoff. Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in low-lying areas. Garbage disposal service to 	Contactor	PIU, PMU	<p>Settling ponds in use; Measures implemented as prescribed; Absence of erosion, spill marks, litter on ground; installation and use of containment structure on site; absence of fluid leaks on construction equipment; drip mats used in refueling and servicing; absence of spill marks on ground surface</p>

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
		<p>may lead to surface water pollution in the entire drainage network. Hammering during sit preparation on the hillside roads can lead to localized landslide or accelerate erosion. At hillside Sections there is a potential of erosion due to rainfall-runoff. Earthwork activities during construction at this point may result in drainage congestion. The effects may be short term severe, but manageable by close monitoring and mitigation measures.</p> <ul style="list-style-type: none"> The area starves in groundwater level. Work camps are likely to sink tube well in the area and contribute to decrease of local groundwater level and increase drawdown. The potential exists for drinking water sources to be contaminated by the seepage of wastes from workers camps through the soil profile into the GW aquifer (particularly if wells access the shallow aquifer). There are small hilly streams on the RoW potentially be contaminated seepage wastes from workers camp and stockpile materials. The effects are short term, minor and reversible by mitigation measure. 		be provided, Concrete refuse reused or disposed of without habitat loss.			
3.7	Air Quality	<ul style="list-style-type: none"> The potential for dust generation during construction is significant for all project sites, given that the amount of rainfall is less in Cox's Bazar (annual average ~1000mm) compared to the national average 	All	<ul style="list-style-type: none"> (i) The first task of the contractors to devise the CEMP as instructed earlier and approved by the Environmental specialist from IA and EHSO (contractor) in charge. They will only approve the CEMP when satisfied with safety measures planned for the sites to protect the children and teachers from air pollution ; (ii) contractors should fist demarcate the 	Contractor	PIU, PMU	<p>Absence of visible smoke from engine exhaust pipes; Equipment not left running when idle; Lack of evidence of</p>

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		(annual average ~2155mm) and brown sandy erosion prone soils. Additionally, possible air pollution from activities involved in waste management facilities construction is likely to be significant since it is close to sensitive receptor like nearby inhabitants including children. The impact of air pollution is expected to be localized since the vehicles and other machineries are expected to be involved in construction on the roadside. If construction equipment is poorly maintained, excessive emissions of pollutants could also be a factor. As such, dust and emissions are significant potential issues in relation to construction at waste management facilities. Significant amounts of dust may also will arise from the roads that materials haulers are likely to use to access the site.		construction site with high plastic/tin made fence so that heavy dust cannot escape from the site; (iii) contractors should suppress dust at the sites and along any unpaved haul road in the vicinity of the construction site by lightly spraying the road surface with water as needed. The water spraying needs to be frequent so that no dust is visible outside the construction site access roads; (iii) haul truck loads should be tightly covered with tarpaulins and wetted prior to departure; (iv) to prevent undue emissions impacts, contractors should maintain haul trucks and other equipment to a high standard; (v) any borrow pits used by contractors should be well away from the busy roads/refugee homesteads, residential areas or individual residences; (vi) construction equipment, burrow pits, sharp object, harmful chemicals etc. should be put away safely so that children of the camps may not reach the equipment or enter inside the project boundary.			waste burning; Levels of NO _x , SO ₂ ; Dust at acceptable levels at site boundaries and a long-haul road; Absence of complaints from nearby residents
3.8	Vegetation removal and hill erosion	<ul style="list-style-type: none"> Both proposed sites are vegetated. The amount of vegetation to be removed in Ukhiya site is likely to be less as the proposed site is partly barren. However, the Teknaf site vegetation is dense and as mentioned earlier, elephants are attracted to the vegetation for their food. Therefore, vegetation removal will likely to be impacting the elephant as well as due to the site's elevated nature, vegetation removal is likely to trigger hill erosion. 	Teknaf	<ul style="list-style-type: none"> Follow mitigation measures proposed in paragraph 257 for vegetation removal. Additional mitigation measures are: (i) Site location needs to carefully chosen so that the least amount of vegetation have to be removed; (ii) in case of absolute necessity, a plan for replantation with native hill grown species needs to be prepared in advance of vegetation removal, which has to be approved by the environmental specialist of IA and EHSO from the contractor; (iii) in case of slope vegetation removal, a protection plan must be devised in advance in combination with steel net, geo-cell, bush planting, RCC toes, organic matter reinforcement etc.; (iv) devise site-specific plantation plans before the construction starts and update this EMP, 	Contractor	PIU, PMU	Plantation plan devised and approved; plantation properly done and at least 80% of the plants survive for 2 years from plantation date; no erosion observed during construction period

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				identify how many trees are to be planted along with bushes and grass to project hill sides; chose only native species.			
3.9	Protection of fish and aquatic diversity	<ul style="list-style-type: none"> Construction activities could lead to negative environmental disturbances to fish and aquatic diversity. Disturbance from the visual impacts, vehicles and construction equipment may cause disruption of sensitive wildlife activity such as breeding and/or feeding; 	•	<ul style="list-style-type: none"> Setting up and implementation code of conducts to workers, including no catching or hunting fish and wildlife, and no consumption of wildlife products. Design of the water intake will be carried out to avoid impacts on the aquatic species found in Naf river requiring protection. The intake screen can be considered for the protection of aquatic species. Movements of wildlife in and around the waterbody should be regularly monitored and adaptive measures need to be taken. While clearing vegetation it must be ensured that no wildlife injure and/or die. Minimize the release of oil, oil wastes or any other substances harmful to aquatic species to any waters. New and good condition machinery with minimum noise will be used in construction; Provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching. 	Contractor	PIU, PMU	<ul style="list-style-type: none"> Yield and impacts on fish species; Number of complaints from stakeholders on disturbance of vegetation, poaching, fishing, etc.
3.10	Road excavation works	<ul style="list-style-type: none"> Potential erosion, dust generation, traffic congestion, road accident, dropping pedestrians in open trench etc. 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"> All excavations shall be done to the minimum dimension as required for safety and working facility. The excavation shall be executed in such manner, that the contractor does not damage or interfere with existing services or structures. If damage or interference is so caused the contractor shall make arrangements with the supply and/or building owner to execute the repairs at the contractor's own cost. All trench and pit excavations and other work shall be carried out during night time at busy road section. Road drains and channels shall be kept free from obstructions at all times. In case of excavation in large roads, the trenches and pits maybe need to be covered by steel plates to allow traffic to pass during non-working periods. The contractor must liaise with the DPHE and the responsible police to familiarize themselves and adhere to such rules. Trench excavation along roads be located in footpaths or adjacent to the road. Trench excavation shall wherever practicable be carried out in such 	Contractor	PIU, PMU	<ul style="list-style-type: none"> Contractor's safety and security program; Location of stockpiles; Number of complaints from stakeholders.

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				<p>a way that every part of the excavation is at least 0.5m clear of existing edges of the carriage way.</p> <ul style="list-style-type: none"> The contractor shall have particular regard to the safety of pedestrian, livestock, and shall ensure that all open excavation, access routes and steep or loose slopes arising from the contractor's operations are adequately fenced and protected. 			
3.11	Drainage congestion	<ul style="list-style-type: none"> Construction material getting into surface run off or uncontrolled disposal may cause temporary drainage congestion. 		<ul style="list-style-type: none"> Prepare a program for prevent/avoid standing waters, which Consultant will verify in advance and confirm during implementation; Provide alternative drainage for rainwater if the construction works/earth-fillings cut the established drainage line; Regularly inspect and maintain all drainage channels to assess and alleviate any drainage congestion problem. Establish local drainage line with appropriate silt collector and silt screen for rainwater or wastewater connecting to the existing established drainage lines already there; Wastes and construction debris will not be disposed in a manner that these would end up in drainage canals. Construct wide drains instead of deep drains to avoid sand deposition in the drains that require frequent cleaning. 	Contractor	PIU, PMU	<ul style="list-style-type: none"> Number of complaints; Status of debris and quarries, no of trenches, date of trenching and backfilling; Implementation of waste management plan
3.12	Pollution from solid waste and sewage effluent	<ul style="list-style-type: none"> Untreated sewage from the pit latrines could have the potential to enter surface water if not adequately designed and positioned to reflect the local hydrological and hydrogeological patterns. Periods of high rainfall could lead to the overflow of the pit and overland flow, or rapid through-flow of the effluent to surface water prior to its full digestion in the soil. Raw sewage can potentially impact surface water quality by promoting the growth of algae and delivering pathogens may be harmful to human and ecological receptors. Use of toxic materials such as solvents and vehicle maintenance 	All	<ul style="list-style-type: none"> Receptacles for solid waste should be provided for the use of workers, and their contents should be disposed of in officially sanctioned local landfills. Construction waste should also be disposed of in legal local landfills. Clean construction waste such as excess soil or rubble should be used in landscaping on site or given to landowners and developers seeking fill material. As rudimentary standards prevail at local landfills, the contractors should take every opportunity to reduce the amounts of waste generated, and also collect recyclable material for processing by local operators. Grey water from temporary on-site kitchens and wash-up facilities should be directed to a settling basin, which should be filled in upon site closure. With regards to sewage, connections to local sewerage (or septic system in the case of worker camp) should be installed as the first step in the construction process, and temporary toilets connected to it. 	Contractor	PIU, PMU	<p>Absence of litter and waste piles on site; Lack of evidence of waste burning; Implement site solid waste management plan as developed in CEMP, including education of workers and waste reduction, prompt collection, and disposal in licensed landfill; Enforce strict prohibition on burning of solid waste on site</p>

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		<p>fluid (oil, coolant) and diesel fuel may contaminate surface and groundwater if these are disposed of directly into the ground or washed into the streams.</p> <ul style="list-style-type: none"> Human waste from construction workers may also contaminate surface water and groundwater if there are no adequate sanitary facilities. 					
3.13	Community Health and Safety	<ul style="list-style-type: none"> Exposure to physical hazards from use of heavy equipment and cranes; trip and fall hazards; Exposure to dust and noise; falling objects; work in confined spaces; Exposure to hazardous materials; Exposure to electrical hazards from the use of tools and machinery. Construction works will impede the access of residents and businesses in limited cases. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures. Given the recent COVID-19 outbreak, it has been a new concern for the work site workers to keep safe health. It is expected that, on peak time there will be 30-40 workers at a time on each site, which can easily trigger COVID-19 human transfers. Such a situation can become disastrous and claim human life. 	All	<ul style="list-style-type: none"> The following Generic Mitigation measures are advised: Contractor's activities and movement of staff will be restricted to designated construction areas. Consult with the Local Authority on the designated areas for stockpiling of, soils, gravel, and other construction materials. If the contractor chooses to locate the work camp/storage area on private land, he must get prior permission from the environment management specialist and landowner. Use small mechanical excavators to attain faster excavation progress. For rock and concrete breaking, use non-explosive blasting chemicals, silent rock cracking chemicals, and concrete breaking chemicals.⁵⁰ Under no circumstances may open areas or the surrounding bushes be used as a toilet facility. Recycling and the provision of separate waste receptacles for different types of waste shall be encouraged. A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules: (i) no alcohol/drugs on site; (ii) prevent excessive noise; (iii) construction staff are to make use of the facilities provided for them, as opposed to ad hoc alternatives (e.g. fires for 	Contractor	PIU, PMU	<ul style="list-style-type: none"> Fencing and security in place Traffic management measures in use when needed Absence of speeding haul trucks Lack of complaints from public about construction traffic

⁵⁰ These products come in powder forms, and once mixed with water (being the catalyst) simply expand and crack the rock from hole to hole. This product is environmentally friendly and can be washed away after it has been used.

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		There is also a risk of transmitting COVID-19 to the local residents.		<p>cooking, the use of surrounding bushes as a toilet facility); (iv) no fires permitted on site except if needed for the construction works; (v) trespassing on private/commercial properties adjoining the site is forbidden; (vi) other than pre-approved security staff, no workers shall be permitted to live on the construction site; and (vii) no worker may be forced to do work that is potentially dangerous or that he/she is not trained to do.</p> <ul style="list-style-type: none"> Interested and affected parties need to be made aware of the existence of the complaints book and the methods of communication available to them. The contractor must address queries and complaints by: (i) documenting details of such communications; (ii) submitting these for inclusion in complaints register; (iii) bringing issues to the environment management specialist's attention immediately; and (iv) taking remedial action as per environment management specialist's instruction. The contractor shall immediately take the necessary remedial action on any complaint/grievance received by him and forward the details of the grievance along with the action taken to the environment management specialist within 48 hours of receipt of such complaint/grievance. Create traffic regulation and diversion zones during construction work. The proposed site is on the main road, and it is expected that heavy vehicle movements can cause traffic nuisance. Therefore, traffic regulation and diversion will be important to avoid traffic nuisance. Responding to the COVID-19 situation in Bangladesh Government has opened an online platform for all COVID-19 information and guidelines applicable in Bangladesh. The website can be accessed at https://corona.gov.bd/. The website also contains a national Guide to combat COVID-19 and a special guideline in Bengali language on preparing worksite in response to COVI-19. The Bengali guideline is attached with this IEE as Annex. A graphical guideline specially prepared for ADB funded project has been 			

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
				prepared in English language and attached with this IEE as Annex. Text version of the guideline (in English) is also attached as Annex. Sample Emergency Team formation at worksites, sample health and safety monitoring plan and sample signboards has also been prepared and attached to this IEE as Annex, Annex and Annex as a response to COVID-19.			
3.14	Worker's health and safety	<ul style="list-style-type: none"> There is invariably a safety risk when construction works such as excavation and earthmoving are conducted in populous areas. Workers need to be mindful of the occupational hazards, which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. 	All	<ul style="list-style-type: none"> The following Generic Mitigation measures are advised: Comply with requirements of Government of Bangladesh Labour Law of 2006 (amended in 2013) and all applicable laws and standards on workers' health and safety (H&S). Ensure that all site personnel have a basic level of environmental awareness training. If necessary, the environmental management specialist and/or a translator shall be called to the sites to further explain aspects of environmental or social behavior that are unclear. Produce and implement a site H&S plan which include measures as: (i) excluding the public from worksites; (ii) ensuring all workers are provided with and required to use personal protective equipment (reflectorized vests, footwear, gloves, goggles and masks) at all times; (iii) providing H&S training 51 for all site personnel; (iv) documenting procedures to be followed for all site activities; and (v) maintaining accident reports and records. Arrange for readily available first aid unit including an adequate supply of sterilized dressing materials and appliances Maintain necessary living accommodation and ancillary facilities in functional and hygienic manner in work camps. Ensure (i) uncontaminated water for drinking, cooking and washing, (ii) clean eating areas where workers are not exposed to hazardous or noxious substances; and (iii) sanitation facilities are available at all times. 	Contractor	PIU, PMU	<ul style="list-style-type: none"> Workers using personal protective equipment as appropriate to tasks Sites well stocked with emergency supplies Toilets, kitchens and eating areas sanitary COVID-19 guidelines by GoB and ADB being strictly followed

⁵¹ Key areas that are to be covered during training shall be in compliance with the Health and Safety Manual according to site specific requirements and shall be conducted by the Supervision consultants

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				<ul style="list-style-type: none"> • Provide medical insurance coverage for workers; • Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; • Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; • Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; • Ensure moving equipment is outfitted with audible back-up alarms; • Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and - Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. • Responding to the COVID-19 situation in Bangladesh Government has opened an online platform for all COVID-19 information and guidelines applicable in Bangladesh. The website can be accessed at https://corona.gov.bd/. The website also contains a national Guide to combat COVID-19 and a special guideline in Bengali language on preparing worksite in response to COVI-19. The Bengali guideline is attached with this IEE as Annex. A graphical guideline specially prepared for ADB funded project has been prepared in English language and attached with this IEE as Annex. Text version of the guideline (in English) is also attached as Annex. Sample Emergency Team formation at 			

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				worksites, sample health and safety monitoring plan and sample signboards has also been prepared and attached to this IEE as Annex, Annex and Annex as a response to COVID-19.			
3.15	Physical and cultural heritage	<ul style="list-style-type: none"> The construction will take place on built-up area; however, the opportunity of chance find is quite low. 	All	<ul style="list-style-type: none"> All fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest discovered on the site shall be the property of the government. Prevent workers or any other persons from removing and damaging any fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest. Stop work immediately to allow further investigation if any finds are suspected. Chances are limited but need to be careful about any finding in the site. 	Contractor	PIU, PMU	Documentation of any unearthed artifacts and use of chance find procedure; Monthly report submitted
3.16	Pollution from construction camps	<ul style="list-style-type: none"> Poor siting and improper management of construction camps may lead to several adverse impacts on environment: (i) loss of vegetation due to use of wood as fuel source for cooking, (ii) deterioration of nearby surface water quality, (iii) compaction and contamination of soil due to uncontrolled disposal of solid waste, (iv) increase in generation of domestic solid waste; (v) temporary air and noise pollution from machine operation; and (vi) poor sanitation resulting to transmission of communicable diseases. In the subproject area, construction camp is suggested to be established outside of the camp area to avoid the predicted impacts. 	All	<ul style="list-style-type: none"> Please follow section 3.6 	Contractor	PIU, PMU	Absence of litter and waste piles on site; Lack of evidence of waste burning; Implement site solid waste management plan as developed in CEMP, including education of workers and waste reduction, prompt collection, and disposal in licensed landfill; Enforce strict prohibition on burning of solid waste on site
3.17	Traffic disruption	<ul style="list-style-type: none"> During construction, traffic volume will increase which may disrupt the traffic on the main roads. 	All	<ul style="list-style-type: none"> Detailed Traffic Management Plans will be prepared before taking up any construction work and submitted to the Engineer for approval, 5 days prior to commencement of work on any section of road. Contractor should inform the traffic police authority before starting road cutting/excavation. 	Contractor	PIU, PMU	TMP devised and approved by PMU and local authorities;

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				<ul style="list-style-type: none"> Provide, erect and maintain barricades, signs, markings, flags, lights and flagmen as may be required for the information and protection of traffic. The flagmen shall be equipped with red and green flags and lanterns/lights. Construction would seriously hamper the traffic movement specially at the intersection points, thus trenching should be done at night in busy road sections. Construction equipment and materials shall be removed from the busy roads at the end of night shift. Where ramps, temporary carriageways and walkways are required, they shall be provided and maintained to a standard suitable in all respects for the class or classes of traffic or pedestrians. These must be kept usable by women, children, patients and disables. Emergency response plan must be prepared for any traffic accident during construction. 			warning signs are properly placed
3.18	Post-construction clean-up	<ul style="list-style-type: none"> Damage due to debris, spoils, excess construction materials. 	All	<ul style="list-style-type: none"> The following generic measures should be taken: Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; All excavated roads shall be reinstated to original condition; All disrupted utilities restored; All affected structures rehabilitated/compensated; The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up; All hardened surfaces within the construction camp area shall be ripped; All imported materials removed, and the area shall be top soiled and regressed using guidelines set out in the revegetation specification that forms part of this document; The contractor must arrange the cancellation of all temporary services; Request PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work. 	Contractor	PIU, PMU	Site reinstated and the PMU and ADB is satisfied.
3.19	Reporting	<ul style="list-style-type: none"> Submission of EMP implementation Report: Unsatisfactory compliance to EMP 	<ul style="list-style-type: none"> All 	<ul style="list-style-type: none"> Appointment of Supervisor to ensure EMP implementation; Timely submission of monitoring reports including pictures. 	Contractor,	PIU, PMU	Monthly Report submitted by contractor;

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					PIU, PMU		semiannual report submitted by PMU
3.20	Testing of environmental quality (Air, noise, surface & groundwater quality)	<ul style="list-style-type: none"> To generate baseline for environmental quality monitoring To monitor environmental quality during construction 	All	<ul style="list-style-type: none"> Undertake baseline quality tests of air, noise, water in the subproject site to serve as benchmark for subsequent monitoring. 	Contractor	PIU, PMU	Air quality- PM10, PM2.5, COx, NOx, SOx. Noise level in Leq (dB). Surface water quality Test Report (pH, EC, TSS, DO, BOD, COD, Total N, Total P, TC, FC). Groundwater quality Test Report (pH, TDS, Chloride, As, Fe, Mn, S, TC, FC) Quarterly monitoring report send to PMU One testing before start of the construction and one testing after construction
4. Operation and management phase							
4.1	Catchment erosion and reservoir siltation	<ul style="list-style-type: none"> Siltation causes decrease in reservoir storage capacity, turbidity water in the reservoir area. 	All	<ul style="list-style-type: none"> To reduce siltation, silt traps should be constructed to ensure deposition occurs before reaching the water dam. Desilting should be done to remove the sediment from the reservoir and the material removed from desilting shall not be deposited within a watercourse or floodplain of a watercourse; Buffer zones will be created and unnecessary tree cutting will not be permitted as this may lead to erosion enhancing sedimentation. 	PIU	PMU	Periodical inspections report and remedies applied, six monthly report to PMU.
4.2	Risk of long-term nutrient build-up and reservoir	<ul style="list-style-type: none"> Nutrient build-up in the reservoir could lead to problems of eutrophication which will cause: 	All	<ul style="list-style-type: none"> Stick to good practices of dam operation rules of ensuring minimum flows in times of low flow to avoid high nutrient/pollutant load. Ensure protection of water reservoir; 	PIU	PMU	Periodical inspections report and remedies

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	eutrophication	Reduction in water clarity and increase the WTP costs; Frequent anoxia leading to loss of some benthic lifeforms; Appearance of toxic algae and bio toxins.		any entry of wastewater into the stream site should be prevented. Ensure prior clearance of all deadwood/vegetation prior to dam filling. Avoid discharge of any waste effluent into the dam. Strong awareness program will be arranged to stop pollution of the waterbody.			applied, six monthly report to PMU.
4.3	Reservoir integrity and security risks	<ul style="list-style-type: none"> Risk of dam failure; Risk of underground leakage; Sabotage. 	All	<ul style="list-style-type: none"> Ensure real-time monitoring of reservoir levels and/or spillway releases in combination with predefined thresholds that trigger the emergence of an alert or alarm situation; Ensure operation of the dam in accordance with the operating rules set out in the Dam Design; Ensure regular monitoring of water level change in the water reservoir; The proponent will ensure proper security measures including serious security surveillance. 	PIU	PMU	Periodical inspections report and remedies applied, six monthly report to PMU.
4.4	Check and repair for leaks and pipe bursts	<ul style="list-style-type: none"> Loss of water, increased demand and inconvenience to consumers. 	All	<ul style="list-style-type: none"> Regularly check the pipeline system and promptly repair any problems. Ensure leak detection and restoration time is minimized to the extent possible. Effective leak detection and water auditing to reduce the water losses. 	PIU	PMU	<ul style="list-style-type: none"> Record of inspection and checking of the transmission pipelines; Record of repairing activity. Number of reported leaks.
4.5	Water quality	<ul style="list-style-type: none"> Contamination of the raw water due to waste water from surrounding area. Raw water contamination at source and treated water during transmission. Impacts on public health. 	All	<ul style="list-style-type: none"> Contamination of treated water during transmission should be prevented by quickly identifying, isolating and repairing the leak section. Develop a system of leak detection and rectification. Arrange warning signs at water collection locations and some key points along the water pipeline system. Strong awareness program among the staff and the community will be arranged to stop pollution of the waterbody. Conduct regular monitoring of raw water and treated water including biological contamination and ensure that water supplied at all times meets the DOE drinking water standards. 	PIU	PMU	<ul style="list-style-type: none"> Visible degradation of the water body; Records of water quality inspection Raw and treated water quality: pH, Turbidity, EC, Salinity, Total Hardness, Total Alkalinity, TSS, DO, BOD, COD, Sulphate, Total N, Total P, Cl, TC, FC
4.6	Management of waste and sludge at SWTP	<ul style="list-style-type: none"> Land and water pollution. Impacts on health and environment. 	All	<ul style="list-style-type: none"> Operation of a waste collection system to handle solid wastes, and lube oil filters in a leak proof container that can be stored and disposed of at the landfill site, will ensure effective management of solid wastes at the treatment plant site. 	PIU	PMU	<ul style="list-style-type: none"> Complaints from community; Regular inspection of waste management activity;

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
				<ul style="list-style-type: none"> • Proper elimination of flocculants according to WHO standards to reduce sludge. • Contractor along with DPHE will ensure regular maintenance of sludge drying beds at the SWTP, and take efforts towards disposal of dried sludge at landfill. • Conduct monitoring of sludge quality before disposal. 			<ul style="list-style-type: none"> • Waste disposal record. • Analysis for concentration of heavy metals (pH, As, Cd, Cr, Pb, Hg, Cu, Zn, Ni)
4.7	Occupational health and safety	<ul style="list-style-type: none"> • Health, social and economic impacts on the workers. 	All	<ul style="list-style-type: none"> • Workers must be trained to recognize potential hazards, use proper work practices and procedures, recognize adverse health effects, understand the physical signs and reactions related to exposures, and are familiar with appropriate emergency evacuation procedures. They must also be trained to select and use the appropriate PPE. • Provide all the personal protective equipment like gum boots, ear plug, mask, gloves etc. for the protection of workers. • The workplace will be equipped with fire detectors, alarm systems and fire-fighting equipment. The equipment will be periodically inspected and maintained in good working condition. • Providing adequate personnel facilities, including washing areas and areas to change clothes before and after work. • Medical check-up will be conducted on regular basis and the health conditions will be monitored. • First aid facilities required to attend immediately for meeting emergency situations will be made available at the facility. • Maintaining good housekeeping in waste processing and storage areas. • Install railing around impounding reservoir. Require use of a life line and personal flotation device (PFD) when workers are inside the railing, and ensure rescue buoys and throw bags are readily available; • Implement a confined spaces entry program that is consistent with applicable national requirements and internationally accepted standards. • Use fall protection equipment when working at heights; • Maintain work areas to minimize slipping and tripping. • Use proper techniques for trenching and shoring. • Install safety showers and eye wash stations where hazardous chemicals are stored or used; • Prohibit eating, smoking, and drinking except in designated areas. 	PIU	PMU	Periodical inspections report and remedies applied, six monthly report to PMU.
4.8	Human elephant conflict	<ul style="list-style-type: none"> • If vegetation cover is not kept intact which are used as food for 		<ul style="list-style-type: none"> • Make sure the plantation programme is 100% successful. Continuous monitoring of survival of the planted trees and 	PIU	PMU	Periodical inspections report

Ref. No.	Parameter	Potential Impacts and/or Issues	Locations	Mitigation measures	Implementation Agency	Supervision Responsibilities	Monitoring Indicators
		elephants, the elephants can be agitated. Moreover, during operation, elephants can be lured to the structures and water reservoir.		density of the planted trees. If density of the plants begins to thin out, replant. Always ensure that the structures get covered with greeneries so that elephants don't see them. Include budget for plantation and monitoring for every year of operation			and remedies applied, six monthly report to PMU.

VIII. ENVIRONMENTAL MONITORING PLAN

A. Environmental Monitoring

350 Environmental monitoring and inspection will consist of: (i) environmental impact monitoring; and (ii) EMP performance verification (compliance monitoring). Environmental impact monitoring will assess the degree to which the project environmental management and mitigation measures are successful in avoiding impacts to the biophysical environment (soils, air quality, water quality) and the socio-economic environment (livelihoods, quality of life, occupational health and safety, public health and safety) during the project's construction and operation phases. The PMU will engage an environmental specialist for monitoring and reporting. EMP performance verification will assess the performance of design consultants, contractors, facility operators and PMU in complying with, or adhering to, the EMP and CEMPs, beginning with documentary checks, clearances, and specialized implementation plans that must be obtained or developed before construction can begin. Performance verification monitoring will continue through the construction and operation phases. The PMU will conduct performance verification during the pre-construction and construction phases, after which this will become the responsibility of the IAs. Details of the monitoring requirements and tasks covering all sites and all three project implementation phases are compiled in an Environmental Monitoring Table (EMoT), presented in Table VIII-1.

Table VIII-1 Environmental Monitoring Table (EMoT)

Environmental Criterion	Method, Location, Parameters	Responsibility & Frequency
Pre-Construction Phase		
Project readiness	<ul style="list-style-type: none"> Method: Review of PMU's and contractors' readiness to implement all component projects based on assessment of project readiness indicators Parameters: Readiness indicators (as per Table VII-3) 	<ul style="list-style-type: none"> ADB – once before construction
Detailed designs	<ul style="list-style-type: none"> Method: Review detailed designs for each project facility and discuss with design firms as needed for clarification as per Table VII-3 Parameters: Monitoring indicators listed for each design item 	<ul style="list-style-type: none"> ADB and PMU - once before approval of detailed designs
Plans	<ul style="list-style-type: none"> Method: Review specialized plans prescribed in as per Table VII-3 Parameters: Preparation of each plan item listed in Table VII-3 	<ul style="list-style-type: none"> PMU/ADB - once before approval of each prescribed plan
Construction Phase		
Soil erosion and contamination	<ul style="list-style-type: none"> Method: Visual inspection Location: All project construction sites, including borrow pits and access roads as applicable Parameters: (i) adequacy of soil erosion prevention measures; (ii) adequacy of soil contamination prevention techniques; (iii) evidence of excessive soil erosion or soil contamination 	<ul style="list-style-type: none"> EHSOs - daily during construction phase PIU – quarterly
Surface and ground water	<ul style="list-style-type: none"> Method: Visual inspection; worker interviews as needed Location: All project construction sites, including borrow pits and access roads as applicable Parameters: (i) adequacy of spill and leak prevention measures, including storage of chemicals, fuels, lubricants; (ii) worker awareness of spill response plan; (iii) evidence of spills and leaks on ground surface; (iv) appropriate use of settling basins for process water; (v) appropriate connections to sewers and septic tanks 	<ul style="list-style-type: none"> EHSOs - daily during construction phase PIU – quarterly

Environmental Criterion	Method, Location, Parameters	Responsibility & Frequency
Air quality	<ul style="list-style-type: none"> Method: Observation; interviews with local people Location: At construction site perimeters nearest to residences; by side of access and haul roads as applicable; at borrow pits as applicable Parameters: Airborne dust level, appearance of machinery exhaust 	<ul style="list-style-type: none"> EHSOs - daily during construction phase PIU – monthly
Livelihoods	<ul style="list-style-type: none"> Method: Interviews with workers and site managers Location: At all project construction sites Parameters: Percentage of local workers on site 	<ul style="list-style-type: none"> PIU - quarterly
Noise	<ul style="list-style-type: none"> Method: Observation; interviews with local residents Location: At perimeter of all sites nearest to residences Parameters: (i) adherence to prohibition on noisy site activity between dusk and dawn; (ii) presence of functional mufflers on motorized equipment; (iii) complaints of local residents 	<ul style="list-style-type: none"> EHSOs - daily during construction phase PIU - quarterly
Worker health and safety	<ul style="list-style-type: none"> Method: Visual inspection; and interviews with workers Location: At all project construction sites Parameters: (i) worker use of personal protective equipment; (ii) adherence to the approved Health and Safety Management Plan (HSMP); (iii) performance of the EHSO; (iv) worker complaints and concerns 	<ul style="list-style-type: none"> EHSOs - daily during construction phase PIU - quarterly
Public health and safety	<ul style="list-style-type: none"> Method: Observation; interviews with nearby residents, interviews with local police Location: In the vicinity of all project construction sites Parameters: (i) adherence to approved temporary traffic management plan; (ii) adequacy of construction site signage, fencing and security presence; (iv) accidents involving public and workers; (v) emergencies and responses; (v) public complaints 	<ul style="list-style-type: none"> EHSOs - daily during construction phase PIU - quarterly
Solid waste management	<ul style="list-style-type: none"> Method: Visual inspection Location: All project sites Parameters: (i) adequacy of solid waste collection, storage, containment and disposal system; (ii) absence of solid waste dumps or evidence of waste burning; (iii) proper disposal of construction waste in legal landfill 	<ul style="list-style-type: none"> EHSOs - daily during construction phase PIU - quarterly
EMP Compliance	<ul style="list-style-type: none"> Method: Review of (i) monitoring reports and data; (ii) documentation of corrective action; (iii) overall contractor compliance with terms of CEMPs; (iv) project's overall adherence to EMP and loan covenants Location: all sites Parameters: Contractor performance relative to CEMPs and contracts; project performance relative to stipulations of EMP 	<ul style="list-style-type: none"> PMU, PIU - yearly
Construction Completion and Operation Phase		
Post-construction site inspection	<ul style="list-style-type: none"> Method: Visual inspection Location: All completed project facilities Parameters: (i) general site environmental conditions; (ii) all equipment and waste removed from site; (iii) all site components, including landscaping and parking, complete 	<ul style="list-style-type: none"> Environmental inspection and report twice: one week before completion, once after completion
Consultation with project-affected people	<ul style="list-style-type: none"> Method: Interviews with local residents, facility staff and others in community Location: In vicinity of all project facility sites Parameters: (i) overall satisfaction with project outputs; (ii) concerns and complaints. 	<ul style="list-style-type: none"> EA - twice during first year of operation
Soil erosion and contamination	<ul style="list-style-type: none"> Method: Visual inspection Location: All completed sites Parameters: (i) adequacy of soil contamination prevention techniques, including storage of chemicals, fuels and lubricants; (ii) vegetative cover well maintained; (iii) site drainage structures well maintained 	<ul style="list-style-type: none"> EHSOs - Monthly EA - Quarterly
Surface and ground water	<ul style="list-style-type: none"> Method: Visual inspection Location: All project facilities 	<ul style="list-style-type: none"> EHSOs - Monthly EA - Quarterly

Environmental Criterion	Method, Location, Parameters	Responsibility & Frequency
	<ul style="list-style-type: none"> Parameters: (i) adequacy of spill and leak prevention measures, including storage of chemicals, fuels, and lubricants; (ii) worker awareness of spill response plan; (iii) evidence of spills and leaks on ground surface 	
Air quality	<ul style="list-style-type: none"> Method: Observation; interviews with local people Location: At site perimeters nearest to residences Parameters: (i) airborne dust level; (ii) appearance of machinery exhaust, if applicable 	<ul style="list-style-type: none"> EHSOs - Monthly EA - Quarterly
Flora and fauna, agricultural livelihoods	<ul style="list-style-type: none"> Method: Observation of operations; Interviews with facility staff; local stakeholders; review of local news Location: Laboratory and fumigation/quarantine facilities Parameters: (i) proper implementation of biosecurity protocols; (ii) absence of pathogen and pest outbreaks linked to facility operations 	<ul style="list-style-type: none"> EHSOs - Quarterly EA - Annually
Worker health and safety	<ul style="list-style-type: none"> Method: Visual inspection; and interviews with workers Location: At all project construction sites Parameters: (i) worker use of personal protective equipment; (ii) adherence to the approved Health and Safety Management Plan (HSMP); (iii) performance of the EHSO; (iv) worker complaints and concerns 	<ul style="list-style-type: none"> EHSOs - weekly EA - Quarterly
Public health and safety	<ul style="list-style-type: none"> Method: Observation; interviews with nearby residents, interviews with local traffic police Location: In the vicinity of all project construction sites Parameters: (i) adherence to approved temporary traffic management plan; (ii) adequacy of construction site signage, fencing and security presence; (iv) accidents involving public and workers; (v) emergencies and responses; (v) public complaints 	<ul style="list-style-type: none"> EHSOs - Monthly EA - Quarterly
Solid waste management	<ul style="list-style-type: none"> Method: Visual inspection Location: All project facilities Parameters: (i) adequacy of solid waste collection, storage, containment and disposal system; (ii) absence of solid waste dumps or evidence of waste burning; (iii) proper disposal of solid waste in legal landfill 	<ul style="list-style-type: none"> EHSOs - Monthly EA – Quarterly
Air, water, noise, soil quality monitoring	<ul style="list-style-type: none"> Method: laboratory test results Location: all sites Parameters: <ul style="list-style-type: none"> (a) Quarterly Air quality monitoring (ECR 1997 Schedule 2): Parameters: 1.PM2.5; 2.PM10; 3. SO₂; 4. NO_x and 5.CO (b) Quarterly Surface Water quality monitoring (ECR 1997 Schedule 3) Parameters: 1. pH; 2. Turbidity; 3. Total Coliform (TC), Fecal Coliform (FC); 4. Arsenic (As); 5. Salinity; 6. Total Suspended Solids (TSS); 7. Dissolve Oxygen (DO); 8. Biochemical Oxygen Demand (BOD); 9. Chemical Oxygen Demand (COD) (c) Groundwater quality monitoring (pH, TDS, Chloride, As, Fe, Mn, S, TC, FC) (d) Quarterly Noise Levels (ECR 1997 Schedule 4): Day (1 hr. average) (e) Soil quality monitoring (ECR 1997 Schedule 10): 1. Organic matter (OM); 2. Lead (Pb); 3. Iron (Fe) 	<ul style="list-style-type: none"> EHSOs, (once before construction + 6 times during construction + once after completion)
Operation and maintenance		
Biodiversity	<ul style="list-style-type: none"> Method: visual observation Location: all sites Parameters: vegetation cover, human-elephant conflicts 	<ul style="list-style-type: none"> Contractor, during 1st and 2nd year of operation, PIU during operation
Raw and treated water quality and noise, soil and sludge quality	<ul style="list-style-type: none"> Method: laboratory test results Location: all sites Parameters: <ul style="list-style-type: none"> (a) Raw water quality: pH, Turbidity, EC, Salinity, Total Hardness, Total Alkalinity, TSS, DO, BOD, COD, Sulphate, Total N, Total P, Cl, TC, FC 	<ul style="list-style-type: none"> Contractor, during operation; Twice/yr in 1st year and Once/yr in 2nd year

Environmental Criterion	Method, Location, Parameters	Responsibility & Frequency
	(b) Treated water quality monitoring: pH, Turbidity, EC, Salinity, Total Hardness, Total Alkalinity, TSS, DO, BOD, COD, Sulphate, Total N, Total P, Cl, TC, FC	
	(c) Heavy metals in the sludge: pH, As, Cd, Cr, Pb, Hg, Cu, Zn, Ni	

B. Environmental reporting

1. Quarterly reports

351 Concise quarterly environmental monitoring reports will be composed by the PMU, based on (i) monthly progress reports submitted by the contractors, which will include monitoring data collected by the site EHSOs; (ii) quarterly impact monitoring reports prepared PMU appointed independent environmental specialist; and (iii) its own performance verification activity. The environmental monitoring reports will reference national standards where appropriate (such as for air quality and noise), as well as benchmarks for project compliance and progress.

2. Semi-annual environmental monitoring reports

352 To ensure proper and timely implementation of the EMP and adherence to the agreed environmental covenants, the PMU will submit to ADB semi-annual environmental monitoring reports, based on quarterly progress reports of the PMU. The reports should confirm the project's compliance with the EMP and identify any environment-related implementation issues and necessary corrective actions and reflect these in a corrective action plan. The performance of the contractors will also be reported on with respect to environmental protection and impact mitigation. The operation and performance of the project GRM, as well as environmental institutional strengthening and training, will be included in the annual environmental progress report as well. Table VIII-2 summarizes the project's environmental reporting requirements and responsibilities.

Table VIII-2 Environmental reporting requirements and responsibilities

Report	Frequency	Purpose	From	To
Contractor's Progress Report	Monthly	Satisfy EMP	Contractor	PMU
Environmental Monitoring Report	Quarterly	Monitoring of environmental effects	PMU Environmental Specialist	PMU
Semiannual monitoring report	Six-monthly	Adherence to environmental covenants and EMP	PMU	ADB

3. Mechanism for Feedback and Adjustment

353 Based on environmental monitoring results, the PMU will assess whether further mitigation measures are required as corrective action, or if any other improvement in environmental management practices is called for. If the PMU identifies a substantial deviation from the EMP, or if any changes are made to the project scope that may cause significant adverse environmental impacts or increase the number of affected people, then the PMU shall immediately consult with the ADB to identify appropriate adjustments to the EMP.

4. Institutional Strengthening and Training

354 It has been acknowledged in the course of the project's preparation that expertise in the area of environmental safeguards application, and the capacity of institutions to implement safeguards programs, are well adopted in Bangladesh, although implementation process often get neglected. Training and institutional strengthening, aimed at personnel responsible for implementing and supervising various aspects of the project EMP on behalf of the EA, IAs, PMU and contractors, have been included in the project's outputs for that reason. All parties involved in implementing and supervising the EMP must have an understanding of the goals, methods, and practices of project environmental management.

355 **Institutional strengthening:** The capacities of the EA and PMU to coordinate environmental management has been strengthened through engagement of national environmental consultants appointed by both PMU and ADB under the grant implementation consultancy. The PMU will lead the implementation of the EMP assisted by the consultants, with responsibility for such key tasks as ensuring project readiness; reviewing and approving designs and plans; ensuring that environmental information in bid documents and environmental clauses in construction contracts are on target; providing training on environmental mitigation measures; supervising and directing environmental monitoring; and providing guidance on environmental matters whenever needed. The work and leadership of the environmental consultants will strengthen environmental management and supervision capacity of the EA, IAs, PMU and contractors, and ensure the project's full compliance with the ADB's SPS.

356 In addition to the activity of the environmental consultants, the project's environmental management and supervision will be enhanced by engagement of a licensed laboratory to undertake quarterly site monitoring, including quantitative measurement of air quality and noise levels at all active construction sites; this importation of technical monitoring expertise will ensure adherence to DoE standards. Finally, all contractors will be required to hire an Environment, Health and Safety Officer (EHSO) for each site under their control and empower that officer to manage the implementation of an Environment, Health and Safety Management Plan (EHSMP) for the site. With the guidance, support and supervision of the environmental consultants, the EHSOs will play a key role in ensuring sound implementation of environmental mitigation measures prescribed by the EMP. It is believed that these institutional strengthening measures will enable competent and efficient environmental management of the project. The institutional strengthening plan is summarized in Table VIII-3.

Table VIII-3 Institutional Strengthening Measures

Target Agencies	Institutional strengthening measures	Timing
EA, IAs	<ul style="list-style-type: none"> Define institutional arrangements for environmental management, monitoring and supervision Define positions and responsibilities 	During project preparation
PMU	<ul style="list-style-type: none"> Recruit and contract one national environmental consultant for environmental management, environmental training, EMP compliance review, and reporting 	At start of pre-construction phase
PMU	<ul style="list-style-type: none"> Recruit and contract licensed laboratory for quarterly environmental monitoring before and during construction phase 	Prior to start of construction
Contractors	<ul style="list-style-type: none"> Hire Environment, Health and Safety Officers for each construction site 	Prior to start of construction

357 **Training:** Selected personnel of the EA, PMU, IAs and contractors will receive training in environmental management, environmental monitoring and supervision, mitigation planning, emergency

response, public consultation and use of the GRM, occupational and community health and safety, and other environmental management topics. The topics, methods, and estimated costs of the training are outlined in Table VIII-4. Training sessions will use a workshop format. Training will be developed and provided by the environmental consultants with support of other experts engaged under the grant implementation consultant services.

Table VIII-4 Training Program and implementation cost

Training Topic	Targeted Agencies	Timing	Duration, Costs
EMP Implementation: Roles and Responsibilities, Monitoring, Supervision and Reporting Procedures Grievance Redress Mechanism: Roles and Responsibilities, Procedures, Occupational and Community Health and Safety, Emergency Preparedness and Response, Pollution Control and Environmental Monitoring, Inspection and Reporting, Public Consultation Contractor Engagement and Management, including EMP Enforcement, Operation-Phase Environmental Management and Monitoring	IAs (local, regional, national), PMU, Contractors EHSOs	Prior to construction phase	2-day training BDT 100,000

C. EMP Implementation cost

358 Cost estimates for mitigation measures, environmental monitoring, public consultations, and capacity building are summarized in Table VIII-5 EMP implantation cost. Contractors will bear the direct costs of all mitigation measures during construction, which will be included in the tender and contract documents; this includes features built into facility designs in order to prevent environmental impacts from arising. The IAs will bear the costs related to mitigation measures during operation. Costs related to environmental supervision during construction will be borne by the IA/EA (for hiring a licensed laboratory to conduct quarterly monitoring), the PMU (for the activities of the environmental consultants) and by the contractors (for monitoring work carried out by the EHSOs). During the operation phase and monitoring costs will be borne by the IAs (for regular monitoring activity of their site EHSOs).

Table VIII-5 EMP implantation cost

Sl. No	Description of activity	Unit cost (BDT)	Calculation	Cost (BDT)
1	Recruit and appoint EHSOs for each of 2 packages for 18 months (estimated construction period)	BDT 35,000 per month	BDT 35,000 x 2 packages x 18 months	1,260,000
2	Soil erosion and drainage congestion monitoring at every working sections of the road during construction. Especial attention should be paid at the Camp site also. Soil erosion and drainage congestion should be monitored using visual inspection and will be judged by the supervision environmental officer/engineer	lump sum for communicating among sites	Included in EHSOs remuneration	0
2	Tree plantation at each site and maintenance for 2 years as required and as per direction of the E.I.C. Plantation should be following the suggestion in the EMP table. The payment is to be made only when trees are fully grown). Trees must be of species as per direction of the EMP table	BDT 500 per sapling (sapling, fencing, mulching, watering etc)	Teknaf 1 site x 1000 trees x BDT 500 + Ukhiya 1 site x 500 trees x BDT 500	750,000
3	Debris disposal and waste management on camp site. Temporary camp site waste disposal facility improvement 2 nos (1 no of organic waste and 1 no of inorganic waste disposal facility) Site cleaning, Removal and disposal activities	lump sum	2 sites x 2x BDT 50,000	200,000
4	Traffic management during construction, equipment for traffic management, employ 02 workers at each site for traffic management	lump sum	2 sites x 2x BDT 50,000	200,000

Sl. No	Description of activity	Unit cost (BDT)	Calculation	Cost (BDT)
5	Slope and hill edge Protection: Grass turfing and native bush planting around the unstable edges of reservoir complex. Turfing on embankment top and slope, building compound with good quality turf supplied by the contractor of not less than 225mm square in dimension including placing and watering till grass is fully grown, etc. all complete as per direction of the E-I-C (payment to be made only when grass is fully grown).	lump sum	To be estimated during detain design. Once estimated, this EMP cost to be updated. Teknaf site 10000m x BDT 50	500,000
6	Medical supplies (First Aid box), other medical requirements, note, equipment, kits, dress etc.	lump sum	2 packages x BDT 50,000	100,000
7	Waste collection facilities with collection bins, scheduled disposal, carry to designated places, waste separation process etc	lump sum	Included in item no. 3	0
8	Health safety warning signs and log maintenance, COVID-19 response as identified in the EMP	lump sum	2 sites x BDT 30,000	60,000
9	Personal Protection equipment, EMP implementation training including COVID response	lump sum	2 sites x BDT 70,000	140,000
10	Safe Drinking water facilities for campsites	lump sum	2 sites x BDT 100,000	200,000
11	Separate male female toilet facilities for camp and work site, sanitary facilities, Response to COVID-19 as stipulated in the EMP	lump sum	2 sites x BDT 70,000	140,000
12	EMP training	Lumpsum	2 packages x BDT 100,000	200,000
13	(a) Quarterly Air quality monitoring (ECR 1997 Schedule 2): Parameters: 1.PM _{2.5} ; 2.PM ₁₀ ; 3. SO ₂ ; 4. NO _x and 5.CO (b) Quarterly Surface Water quality monitoring (ECR 1997 Schedule 3) Parameters: 1. pH; 2. Turbidity; 3. Total Coliform (TC), Fecal Coliform (FC); 4. Arsenic (As); 5. Salinity; 6. Total Suspended Solids (TSS); 7. Dissolve Oxygen (DO); 8. Biochemical Oxygen Demand (BOD); 9. Chemical Oxygen Demand (COD) (c) Quarterly Groundwater quality monitoring (pH, TDS, Chloride, As, Fe, Mn, S, TC, FC) (d) Quarterly Noise Levels (ECR 1997 Schedule 4): Day (1 hr. average) (e) Soil quality monitoring (ECR 1997 Schedule 10): 1. Organic matter (OM); 2. Lead (Pb); 3. Iron (Fe)	Lumpsum	2 sites x BDT 100,000 x 8 times (once before construction + 6 times during construction + once after completion)	1,600,000
14	During operation period: (a) Raw water quality: pH, Turbidity, EC, Salinity, Total Hardness, Total Alkalinity, TSS, DO, BOD, COD, Sulphate, Total N, Total P, Cl, TC, FC (b) Treated water quality monitoring: pH, Turbidity, EC, Salinity, Total Hardness, Total Alkalinity, TSS, DO, BOD, COD, Sulphate, Total N, Total P, Cl, TC, FC (c) Sludge quality: Heavy metals (pH, As, Cd, Cr, Pb, Hg, Cu, Zn, Ni)	Lumpsum	2 sites x Operation; Twice/yr in 1 st year and Once/yr in 2 nd year (2x1+1=3) x BDT 80,000 By contractor: Civil work Contractor for 1 st two years; DPHE as per ADB identified mechanism for operation for rest period	480,000
Total cost				58,30,000

IX. GRIEVANCE REDRESS MECHANISM

359 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

360 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

361 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

362 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.

363 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).

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

365 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).⁵² ADB's Accountability Mechanism, including information on how to file a complaint, will also be explained to affected households. The grievance redress mechanism and procedure are depicted in Figure IX-1.

⁵² Contact information on ADB's Bangladesh Mission is in <https://www.adb.org/countries/bangladesh/main>. Information on ADB's Accountability Mechanism is in www.adb.org/site/accountability-mechanism/main.

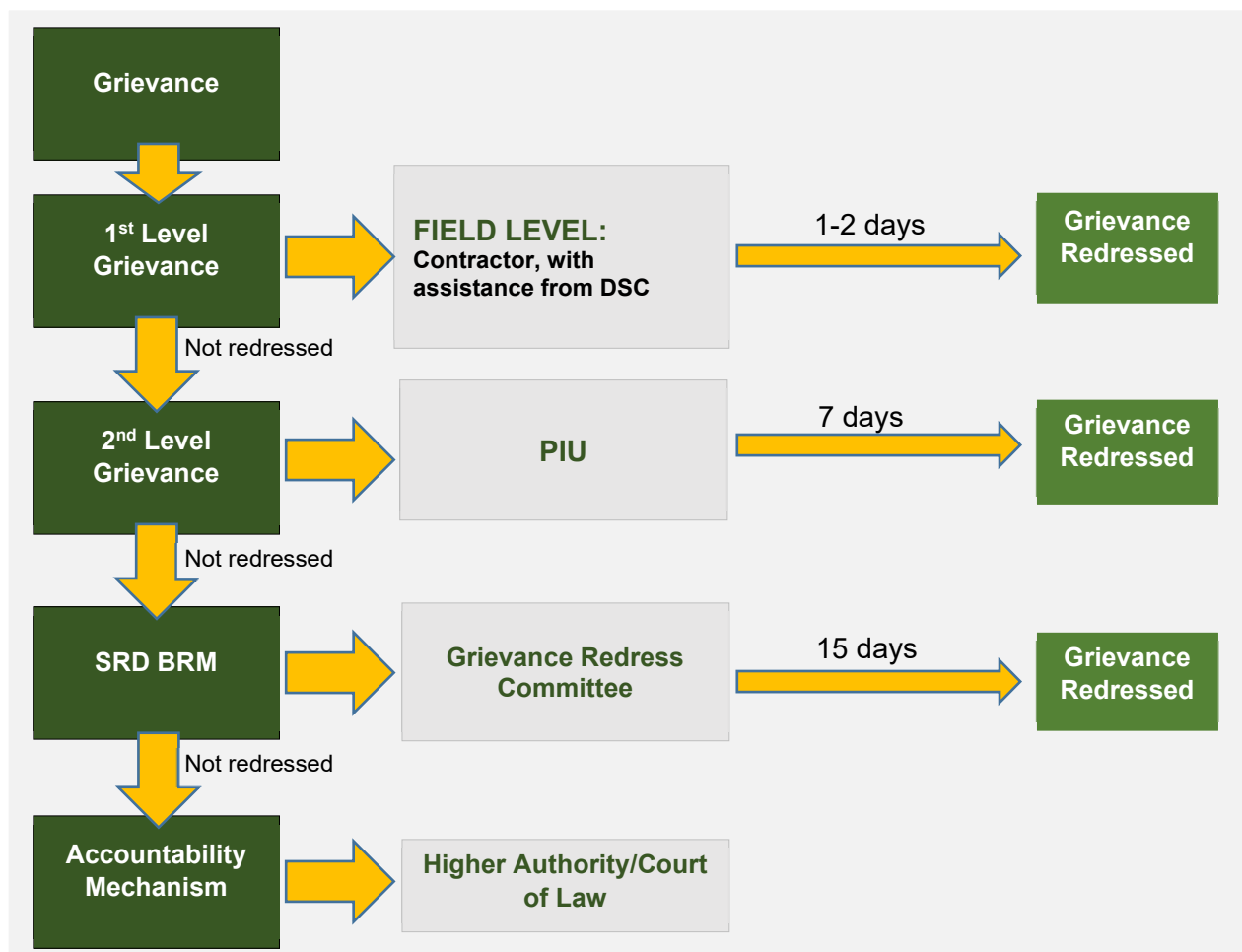


Figure IX-1 Grievance redress process

X. STAKEHOLDER CONSULTATION AND INFORMATION DISCLOSURE

A. Stakeholder Consultation

368 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.

369 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.

B. Stakeholder consultation Strategy for Emergency Assistance Project

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

C. Key target stakeholders

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

- (i) Beneficiaries;
- (ii) Elected representatives, community leaders and representatives of community-based organizations;
- (iii) Local non-government organizations (NGOs);
- (iv) 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;
- (v) Residents, shopkeepers, businesspeople, and farmers who live and work alongside transport and education/district infrastructure which will be rehabilitated;
- (vi) Executing agency, implementing agency, PIU, staff and consultants; and
- (vii) ADB and Government.

D. Public Consultation History

372 Initial Public consultation has been carried out in the project area with the objectives of minimizing probable adverse impacts of the project and to achieve speedy implementation of the project through bringing in awareness among the community on the benefits of the project. As part of the project consultations, efforts were made to consult with the public as well as a number of local authorities, to

determine their thoughts, opinions and feedback on the impact of the proposed facilities in their respective locations. Information and comments collected from the public early in the study process were of use.

373 Different stakeholders were consulted to give them the opportunity to express their views and concerns. As part of the process, they were also provided with relevant and sufficient information on the project prior to its start-up. These stakeholders include the central and local authorities, as well as the local population to determine their thoughts, opinions and feedback on the impact of the project. Attendees in the consultation meeting were apprised of the processes through which the project was to proceed toward implementation and the environmental impacts to arise out of such processes along with the steps to be taken toward mitigating the impacts. They were told about the impacts all of which could be easily mitigated. The audience expressed satisfaction of such mitigation measures (Figure X-1). The public consultation was held during field visit of 19 August 2020. Representatives of DPHE PMU, PIU were also present in the consultation. Some informal discussion was held with the local people during site visit.



Figure X-1 Public consultation at Teknaf (top panel) and Ukhiya (bottom panel)

E. Findings of the Public Consultation

1. Public consultation at Teknaf

Location: Puran Pollanpara, Ward No. 2, Teknaf.

Date and Time: 19 August 2020, 01:20 PM

Information Disclosed during Consultation:

- Need for the Project
- Description of the Project
- Construction Work
- Probable Impacts due to the Project (before, after and during construction)
 - Dust pollution
 - Noise pollution
 - Water pollution
 - Waste generation
 - Drainage congestion
 - Road excavation
 - Tree cutting
 - Traffic safety
 - Community health and safety
 - Worker health and safety
- Grievance Redress Mechanism

Public Query Answered by:

- Md. Shahid Zaman, Environmental Specialist (Consultant), Asian Development Bank
- Mr. Mayen Uddin Tazim, Social Safeguard Specialist (Consultant), Asian Development Bank

374 Summary of Public Consultation Issues and Response is presented in Table X-1.

Table X-1 Summary of Public Consultation Issues and Response in Teknaf (Chndrakilla) site

SL.	Individual	Comments
1.	Md. Javed Driver	<ul style="list-style-type: none"> • Appreciated initiation of the water supply project by the government. • He expressed optimism for proper compensation if any properties are affected due to construction. • Concerned about the presence of elephant near SWTP site and opined that watch tower might be a solution to deter the elephant. • The existing earthen road should be widened and paved for easy access to the SWTP site. Also mentioned that proper road safety must be ensured for the local residents during construction. • Stream water is polluted due to lack of sanitation facility in the household located on the bank of the canal, thus, opined for appropriate measures to be taken during operation period of the SWTP.

SL.	Individual	Comments
2.	Khairul Boshor Labor	<ul style="list-style-type: none"> • Thanked to consultant for arranging the consultation meeting. • Proper compensation to be paid to the affected persons. • Opined for recruitment of workers from the locality during construction. • Proper drainage system should be implemented during construction period to prevent waterlogging problem.
3.	Md. Ismail Mason	<ul style="list-style-type: none"> • Welcomed the project for better water supply in his area. • Noise and dust pollution may affect the local people during the construction work. • Appropriate measures to be taken for hill slope protection. • Work sites should be confined to protect children.
4.	Mrs. Nasima Housewife	<ul style="list-style-type: none"> • Local people deserve proper compensation if they will relocate from the existing land. • Dust generated due to construction activity must be suppressed. • Flagman should be appointed at the road for the safety of children.
5.	Farid Ahmed Business	<ul style="list-style-type: none"> • Appreciated the water supply project and expected fast completion of this project. • He encouraged the people to assist this project by any means as the project will improve water supply facility to the people of Teknaf. • Opined for recruitment of workers from the locality during construction. • Concerned about traffic congestion during construction since the access road to the SWTP is narrow which should be improved under this project. • Mentioned that currently elephants are seen frequently at the locality due to lack of food in the forest, therefore, he suggested to plant trees on the hills as fodder for the mammals. • Construction activity should be carried out in dry season to avoid drainage congestion.

375 List of participants of public consultation is given in Figure X-2 and Figure X-3.

Public Consultation Meeting
Emergency Assistance Project

Venue: Pura Pollanpara, Date: 19.08.2020
Teknaf. (SWTP site)

Attendance Sheet

Sl. No.	Name	Occupation	Address	Phone No.	Signature
1	মুহাম্মদ আলী	কৃষক	পূর্ব পুরান পল্লনপাড়া		
2	মুহাম্মদ আলী	কৃষক	"		
3	মুহাম্মদ আলী	কৃষক	"		
4	মুহাম্মদ আলী	কৃষক	"		
5	মুহাম্মদ আলী	কৃষক	"	০১৮০২৭৭৭৭৭৭	
6	মুহাম্মদ আলী	কৃষক	"		
7	মুহাম্মদ আলী	"	"		
8	মুহাম্মদ আলী	"	"		
9	মুহাম্মদ আলী	"	"		
10	মুহাম্মদ আলী	"	"		
11	মুহাম্মদ আলী	কৃষক	"	০১৪০৭০৪৭৩০১	
12	মুহাম্মদ আলী	কৃষক	"	০১৪৬৪৭৩৭৬০	
13	মুহাম্মদ আলী	"	"	০১৭৩০৭২০৭৩২	
14	মুহাম্মদ আলী	কৃষক	"	০১৪৬৬৭৭৭৭৭৭	
15	মুহাম্মদ আলী	কৃষক	"	০১৪৬৭৭৭৭৭৭৭৭	
16	মুহাম্মদ আলী	কৃষক	"	০১৪৬৭৭৭৭৭৭৭৭	
17	মুহাম্মদ আলী	কৃষক	"	০১৪৬৭৭৭৭৭৭৭৭	
18	মুহাম্মদ আলী	কৃষক	"	০১৪৬৭৭৭৭৭৭৭৭	
19	মুহাম্মদ আলী	কৃষক	"	০১৪৬৭৭৭৭৭৭৭৭	
20	মুহাম্মদ আলী	"	"	০১৪০১১১১৩২০	

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Figure X-2 List of participants in the public consultation in Teknaf (part-1)

Public Consultation Meeting
Emergency Assistance Project

Venue: Param Palan Para, Teknaf, (SWTP site) Date: 19.08.2020

Attendance Sheet

Sl. No.	Name	Occupation	Address	Phone No.	Signature
২২	আবদুল মোমেন	শ্রমিক	পারাম পলান পরা, ২২:৩৩		
২২	আবদুল মোমেন	"	"		
২৬	আবদুল মোমেন	"	"		
২৪	আবদুল মোমেন	"	"		
২৪	আবদুল মোমেন	"	"		
২৫	আবদুল মোমেন	"	"		
২৬	আবদুল মোমেন	"	"		
২৭	আবদুল মোমেন	"	"		
২৮	আবদুল মোমেন	"	"		
২৯	আবদুল মোমেন	"	"		
৩০	আবদুল মোমেন	"	"		
৩১	আবদুল মোমেন	"	"		
৩২	আবদুল মোমেন	"	"		
৩৩	আবদুল মোমেন	"	"		
৩৪	আবদুল মোমেন	"	"		
৩৫	আবদুল মোমেন	"	"		
৩৬	আবদুল মোমেন	"	"		
৩৭	আবদুল মোমেন	"	"		
৩৮	আবদুল মোমেন	"	"		
৩৯	আবদুল মোমেন	"	"		
৪০	আবদুল মোমেন	"	"		
৪১	আবদুল মোমেন	"	"		

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Figure X-3 List of participants in the public consultation in Teknaf (part-2)

2. Public consultation in Ukhiya

Location: Bottola Bazar, Anjumanpara, Palongkhali, Ukhiya.

Date and Time: 21 July 2020, 12:50 PM

Information Disclosed during Consultation:

- Need for the Project
- Description of the Project
- Construction Work
- Probable Impacts due to the Project (before, after and during construction)
 - Dust pollution
 - Noise pollution
 - Water pollution
 - Waste generation
 - Drainage congestion
 - Road excavation
 - Tree cutting
 - Traffic safety
 - Community health and safety
 - Worker health and safety
- Grievance Redress Mechanism

Public Query Answered by:

- Md. Shahid Zaman, Environmental Specialist (Consultant), Asian Development Bank

376 Summary of Public Consultation Issues and Response is presented in Table X-2.

Table X-2 Summary of Public Consultation Issues and Response in Ukhiya (Palongkhali) site

SL.	Individual	Comments
1.	Shamsul Alam	<ul style="list-style-type: none"> • Appreciated initiation of the water supply project by the government. • Worker should be recruited from the local area. • Proper drainage system should be implemented during construction period to prevent waterlogging problem. • Proper road safety must be ensured for the local residents during construction. • Access roads damaged due to construction activity should be repaired as early as possible.
2.	Arfatul Islam	<ul style="list-style-type: none"> • Thanked to consultant for arranging the consultation meeting. • Local people will lose their income due to construction activity in the seasonal shrimp farm, thus, he opined for recruitment of workers from the locality during construction and operation phase. • Tree cutting, diversity loss and other environmental issues must be carefully considered. • Community health and safety must be considered.

SL.	Individual	Comments
3.	Harun Roshid	<ul style="list-style-type: none"> • Opined for procurement of construction material from local market. • Noise and dust pollution may affect the local people during the construction work. • Traffic safety during road excavation due to pipe laying in the busy area such as Bottola bazar must be addressed strictly. • Work sites should be confined using caution tape or bamboo fence.
4.	Shamim Mostofa	<ul style="list-style-type: none"> • Dust generated due to construction activity must be suppressed. • Concerned about traffic congestion during construction. • Alternate access should be provided to the shops, mosque and school etc. during road excavation. • A focal person should be appointed to mitigate community problems generated during construction period.
5.	Sayed Ahmed	<ul style="list-style-type: none"> • Appreciated the government for initiating this water supply project. • Waste generated during construction should be managed properly. • Opined for recruitment of workers from the locality during construction. • Stressed on provision of proper drainage system at the construction sites to prevent waterlogging problem. • Construction site should be confined to avoid accident. • Flagman should be appointed at the busy road section area for road safety for local community.

377 List of participants of public consultation is given in Figure X-4 and Figure X-5.

Public Consultation Meeting					
Emergency Assistance Project					
Venue: Bofla Bazar, Angunmanpara, Palougkhal, Ukhiya				Date: 25.07.2020	
Attendance Sheet					
Sl. No.	Name	Occupation	Address	Phone No	Signature
01	ଆବହାରିକ ସମାଜ		ଆବହାରିକ	01537469050	ଆବହାରିକ
02	ଆବହାରିକ ସମାଜ		ଆବହାରିକ	01585764425	ଆବହାରିକ
03	ଆବହାରିକ ସମାଜ			01407512272	ଆବହାରିକ
04	ଆବହାରିକ ସମାଜ		ଆବହାରିକ	01575161950	ଆବହାରିକ
05	ଆବହାରିକ ସମାଜ			01537448073	ଆବହାରିକ
06	ଆବହାରିକ ସମାଜ		ଆବହାରିକ	0158503460	ଆବହାରିକ
07	ଆବହାରିକ ସମାଜ			01537633729	ଆବହାରିକ
08	ଆବହାରିକ ସମାଜ			01575003250	ଆବହାରିକ
09	ଆବହାରିକ ସମାଜ		ଆବହାରିକ	01585034644	ଆବହାରିକ
10	ଆବହାରିକ ସମାଜ		ଆବହାରିକ	01059218646	ଆବହାରିକ
11	ଆବହାରିକ ସମାଜ			01575008002	ଆବହାରିକ
12	ଆବହାରିକ ସମାଜ			01537661837	ଆବହାରିକ
13	ଆବହାରିକ ସମାଜ			01585772302	ଆବହାରିକ
14	ଆବହାରିକ ସମାଜ			01585783461	ଆବହାରିକ
15	ଆବହାରିକ ସମାଜ			0157235070	ଆବହାରିକ
16	ଆବହାରିକ ସମାଜ			01580270083	ଆବହାରିକ

Figure X-4 List of participants in the public consultation in Ukhiya (part-1)

Public Consultation Meeting

Emergency Assistance Project

Venue: Bofda Bazar, Ayyuranpara, Palongkhali, Uthia. Date: 21.07.2020

Attendance Sheet

[illegible]

Figure X-5 List of participants in the public consultation in Ukhiya (part-2)

F. Information disclosure

378 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:

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

379 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.

XI. CONCLUSION AND RECOMMENDATION

A. Conclusion

380 The process described in this document has assessed the environmental impacts of all elements of construction and operation of Surface Water Treatment Plant (SWTP) in Ukhiya and Teknaf. All potential impacts were identified in relation to design, construction and operation phases.

381 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.

382 Some moderate negative impacts of the project will be felt during the construction phases which may involve hill erosion, water and waste pollution. The major significant impacts can come from disrupting the local biodiversity, upsetting human-elephant relationship, local hydrological system, hill erosion and waste pollution. Another major impact may be caused by the prevailing COVID-19 pandemic situation. Elevated noise and increase in traffic are expected to be within the existing level experienced by the local people. The contractor will be under specific orders for providing PPE to the workers engaged for the job. Strict site and labour camp health and safety regulation will be forced as per government and ADB guidelines. The IEE is indicative of the suggestions that should guide the topographic surveys, soil testing and detail designs. Site specific EMPs will be developed after detail design is developed and this IEE should be updated as well. Intensive plantation programme and keeping the structures invisible to the elephants has been suggested.

383 The environmental assessment process has highlighted the environmental issues and concerns of the proposed subproject. It has not identified any significant negative environmental impacts that cannot be mitigated. 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 excavation and earth movement. 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. The monitoring plan, if properly implemented during the pre-construction, construction and post-construction and operation phases will ensure taking corrective measures. The proposed project will have no residual adverse impact on the environment or the eco-system if mitigation measures are properly followed. DPHE is required to take clearance from the DoE for implementing the transmission line and other ancillary works. The IEE report has been prepared with this end in view.

384 The stakeholders are involved in developing the IEE through discussions on-site and public consultation, after which views expressed are incorporated into the IEE. The IEE will be made available at public locations in the camp 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.

385 A copy of the EMP shall be kept on-site during the construction period at all times. The EMP shall be made binding on the contractor 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.

386 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.

387 The IEE is indicative in nature due to the fact that sites are not finalized by DPHE. Therefore, site specific designs are not available. Site specific environmental study is also not possible at this stage. Once sites being selected, a detail environmental study is in order and the this IEE needs updating towards a more site-specific study.

B. Recommendations

388 The IEE study reveals that the construction of the SWTPs have some major negative impacts but will contribute to environmental development by improving the environmental conditions for local inhabitants. Local people will have employment opportunities during construction and operation phase. The contractor should be specifically instructed to employ local laborers as much as possible.

389 The major recommendations made in the IEE are as follows:

- Major negative impacts like disruption of local microhydrological systems, hill erosion, increasing noise level, air and water pollution at the pre-construction and construction phases should be taken care of by taking proper mitigation measures as suggested in the EMP section of this IEE.
- One major negative impact may occur from disrupting the human-elephant relationship. Intensive plantation programme has been suggested which will provide food for the elephants so that they do not enter in the site. Also, plantation programme needs to be arranged so that the site do not attract the elephants. Construction of watch towers to monitor elephant movement is also suggested.
- This IEE is indicative of suggestions to develop detail design. Once details design is done, the site specific EMPs must be developed and this IEE should be updated accordingly. The Site specific EMPs should be verified by the DPHE/ADB appointed Environmental Specialist.
- The EMP and EMP cost must be included in the bid documents prepared by DPHE.
- The contractor needs to prepare the site-specific CEMP prior construction works starts. The CEMP must be approved by PMU and ADB.
- DPHE should get clearance from DoE before start of the construction. This IEE is prepared in the view that this document belongs to DPHE and should be used for obtaining ECC from DoE. Any further instruction conveyed from DoE prior obtaining the ECC, DPHE is responsible to update this IEE accordingly. An Environmental Specialist should be appointed by DPHE prior construction works to develop and update the EMPs.

ANNEX A: List of wildlife 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 Common</i>	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
23	<i>Acrocephalus dumetorum</i>	Blyth's Reed-warbler	Acrocephalidae

SL	Scientific name	English name	Family
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

PLANTS:

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

SL	Scientific name	English name	Family
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
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

SL	Scientific name	English name	Family
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 B: 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;⁵³ (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:

Sector Division:

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 17432 per sq.km.
▪ HEAVY WITH DEVELOPMENT ACTIVITIES?		✓	
▪ ADJACENT TO OR WITHIN ANY ENVIRONMENTALLY SENSITIVE AREAS?			The project site located outside of the Teknaf Wildlife Sanctuary area and no impacts are envisaged.
• 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...			

⁵³ 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?		✓	The raw water reservoir is feed by a hilly stream where no cultivation and industrial establishment is located in the upstream.
• 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?		✓	The existing reservoir is planned to be developed for retaining more water to supply water to the camp dwellers and host community throughout the entire year.
• unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?	✓		Raw water will be treated by ultra-filtration process prior to distribution and will comply with the Bangladesh Standards for Drinking Water.
• delivery of unsafe water to distribution system?		✓	Treated water will be tested quarterly basis before delivering to the distribution networks.
• inadequate protection of intake works or wells, leading to pollution of water supply?		✓	The reservoir and WTP will be secured by barbed weir fencing and accessible to only authorized persons.
• over pumping of ground water, leading to salinization and ground subsidence?		✓	
• excessive algal growth in storage reservoir?	✓		Good practices of dam operation rules will be followed to ensure minimum flows in times of low flow to avoid high nutrient/pollutant load.
• increase in production of sewage beyond capabilities of community facilities?		✓	
• inadequate disposal of sludge from water treatment plants?	✓		Sludge generated from the WTP will be mixture of fine sand, silica, alum and byproduct of chlorine which will be treated in sludge pit and reuse / dispose safely as per the design.
• 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?		✓	Access will be provided by bridging trenches excavated for transmission main and earth materials will be stored outside of the trafficked areas which will be covered the materials to suppress dust with water.
• health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		✓	Design of facilities to integrate concerns of health hazards due to handling of chemicals. Occupational Health and Safety Plan to be worked out by DPHE during the operation of the facilities.

Screening Questions	Yes	No	Remarks
• 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 workers. Regular training will also be conducted to ensure that workers are aware of construction hazards and risks of chemicals during O&M.
• dislocation or involuntary resettlement of people?		✓	
• 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. Chlorine gas will not be used. Sodium hypochlorite will be used in the chlorination process.
• excessive abstraction of water affecting downstream water users?		✓	
• competing uses of water?		✓	
• 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. Use of chemical during O&M will be limited at WTP sites.

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> 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? 	✓		<p>On the basis of the nature of subprojects, it is likely that laborers will be from local areas. However, considering the prevailing pandemic situation constructions within the camps will hire labours from the camps to avoid large influx of labors from outside the camps. Only experts/skilled labours necessary for construction/supervision will be hired from population outside the camp/region. For constructions outside the camp, no labours from the camp will be allowed to avoid contamination. Considering the COVID-19 pandemic, special specific health conditions will be strictly enforced that will be stipulated in the IEEs.</p>

A Checklist for Preliminary Climate Risk Screening

Screening Questions		Score	Remarks ⁵⁴
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	Project needs to consider extreme rainfall events which is like to cause landslides in the camps area which is densely populated
	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	Extreme/excessive rainfall may cause landslides in the camp area.
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

Other Comments: _____

Prepared by: _____

⁵⁴ If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

ANNEX C: Generic Traffic Management Plan (TMP)

A. Principles

One of the prime objectives of the Contractor's **TMP** is to ensure the safety of all the road users along the work zone, and to address the following issues:

- (i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
- (ii) protection of work crews from hazards associated with moving traffic;
- (iii) mitigation of the adverse impact on road capacity and delays to the road users;
- (iv) maintenance of access to adjoining properties; and
- (v) Addressing issues that may delay the project.

B. Operating Policies for TMP

The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.

- 1) Make traffic safety and temporary traffic control an integral and high-priority element of every project from planning through design, construction, and maintenance.
- 2) Inhibit traffic movement as little as possible.
- 3) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
- 4) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
- 5) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
- 6) Train all persons that select, place, and maintain temporary traffic control devices.
- 7) Keep the public well informed.
- 8) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.

Figure A1 to Figure A6 illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

C. Analyze the Impact Due to Street Closure

Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

- a) Approval from the ULB/CMC/Public Works Department (PWD) to use the local streets as detours;
- b) consultation with businesses, community members, traffic police, PWD, etc, regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
- c) Determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
- d) Determining if additional traffic control or temporary improvements are needed along the detour route;
- e) Considering how access will be provided to the worksite;
- f) Contacting emergency service, and transit authorities to determine if there are impacts to their operations; and

- g) Developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

If full road-closure of certain roads within the area is not possible, due to inadequate capacity of the detour arrangements, the full closure can be restricted to weekends with the construction commencing on Thursday night and ending on Sunday morning prior to the morning peak period. The traffic management guidelines are as follows:

- Review construction schedule and methods;
- Identify initial traffic recirculation and control policy;
- Identify routes for traffic diversions;
- Analyze adverse impact & mitigation at the detours;
- Begin community consultation for consensus;
- Finalize or determine alternate detours;
- Identify temporary parking (on and off -street);
- Discuss with CMC, owner, community for use;
- Coordinate with the Traffic Police to enforce traffic and diversions;
- Install traffic control devices (traffic cones, signs, lightings, etc);
- Conduct campaigns, publicity, and notify public about street closure; and
- Develop a mechanism to address public grievances regarding disruptors of traffic, utilities, etc.

D. Public Awareness and Notifications

As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

The PIU will also conduct an awareness campaign to educate the public about the following issues:

- a) Traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
- b) defensive driving behavior along the work zones; and
- c) Reduced speeds enforced at the work zones and traffic diversions.

It may be necessary to conduct the awareness programs/campaigns on road safety during construction. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centers. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

- a) Explain why the brochure was prepared, along with a brief description of the project;
- b) Advise the public to expect the unexpected;
- c) Educate the public about the various traffic control devices and safety measures adopted at the work zones;
- d) Educate the public about the safe road user behavior to emulate at the work zones;
- e) Tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
- f) Indicate the office hours of relevant offices.

E. Install Traffic Control Devices at the Work Zones and Traffic Diversion Routes

The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:

- Signs
- Pavement Markings
- Channelizing Devices
- Arrow Panels
- Warning Lights

Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

Figure A1 to Figure A6 illustrate typical set-ups for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics. The Contractor would need to consider such Traffic Management situations for these typical arrangements and others that may occur during road construction works. The Contractor would need to coordinate closely with the road management and road police authorities and submit their Traffic Management proposals, with not less than a month's prior notice, to the PIU for obtaining prior approval, before any closure of roads are considered.

- Work on Shoulder or Parking Area;
- Work with Lane Closure: Low Traffic;
- Work on Lane Closure With Yield Sign on Two Lane: Low Volume;
- Work on Lane Closure With Single Flag Operator on Two Lane : Low Volume;
- Lane Closure: Two Flag Operators on Two Lane Road; and
- Street Closure with Detour.

The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

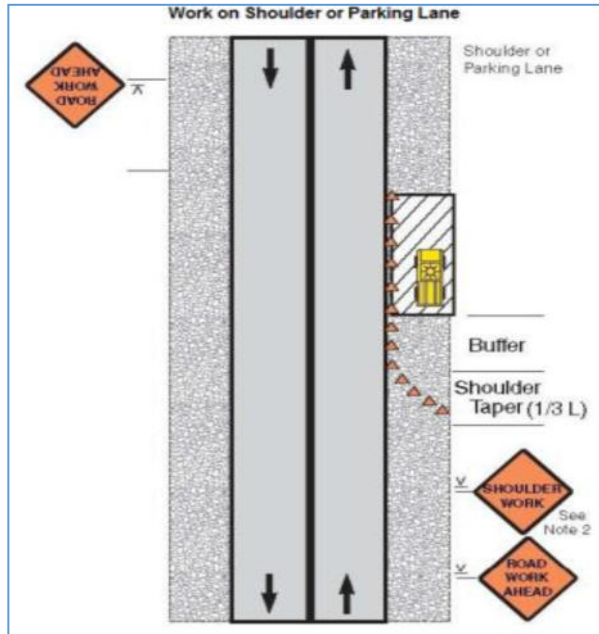


Figure A1 Work with shoulder or Parking area

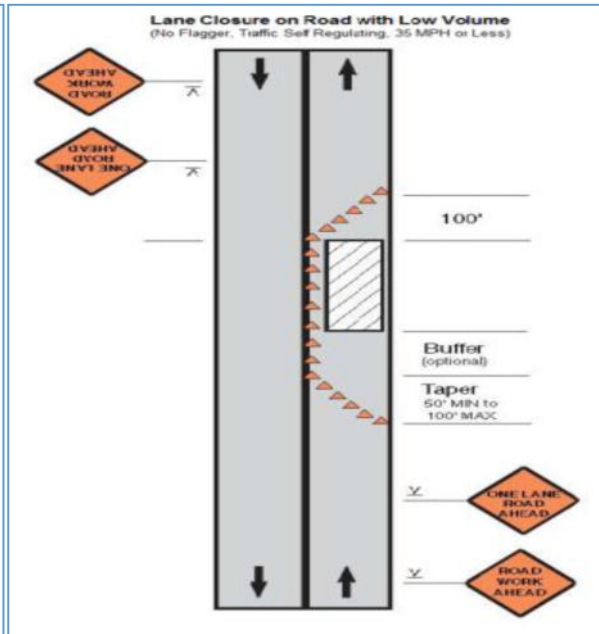


Figure A2 Work with lane closure: low traffic

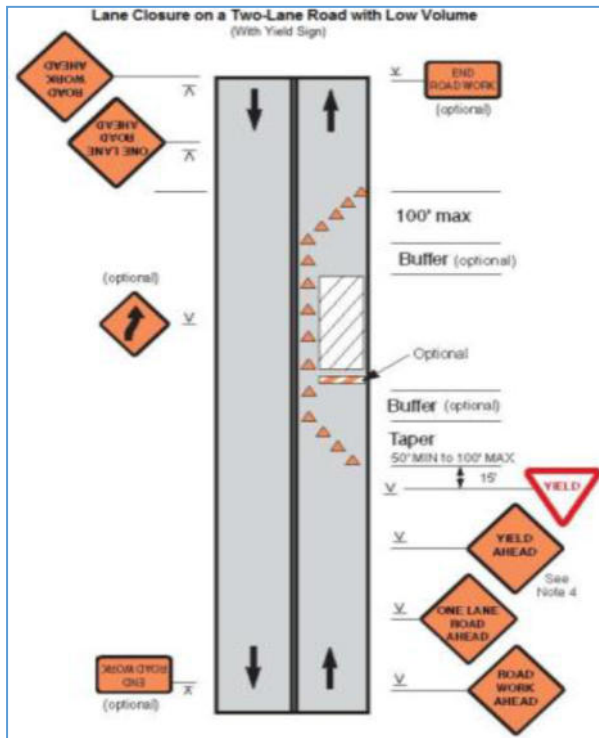


Figure A3 Work on Lane Closure with Yield Sign on Two Lane: Low Volume

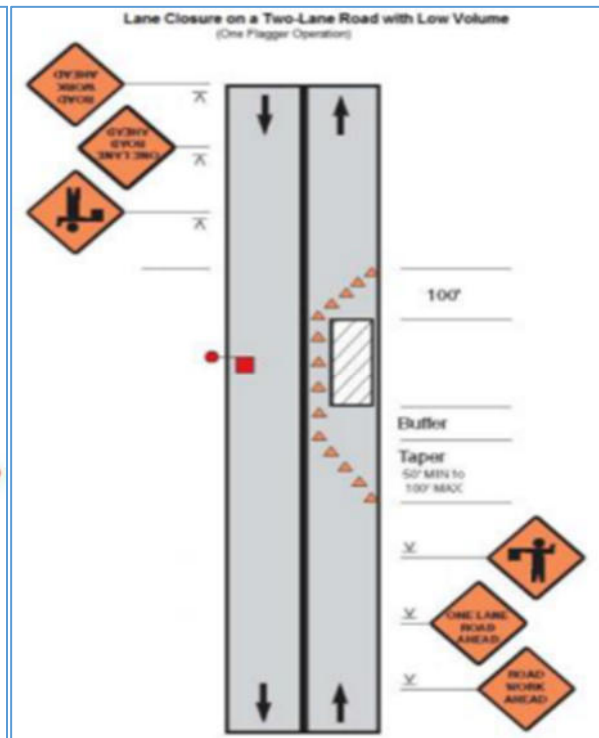


Figure A4 Work on Lane Closure With Single Flag Operator on Two Lane : Low Volume

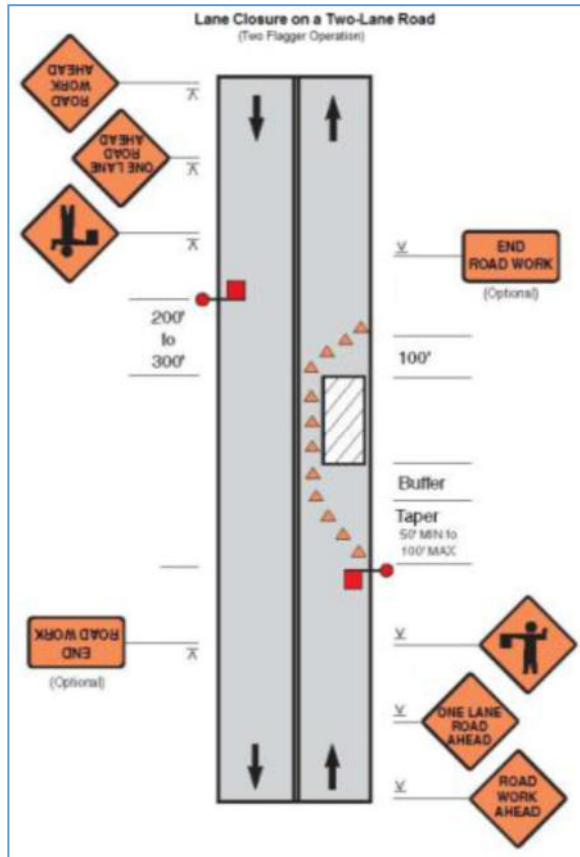


Figure A5 Lane Closure: Two Flag Operators on Two Lane Road

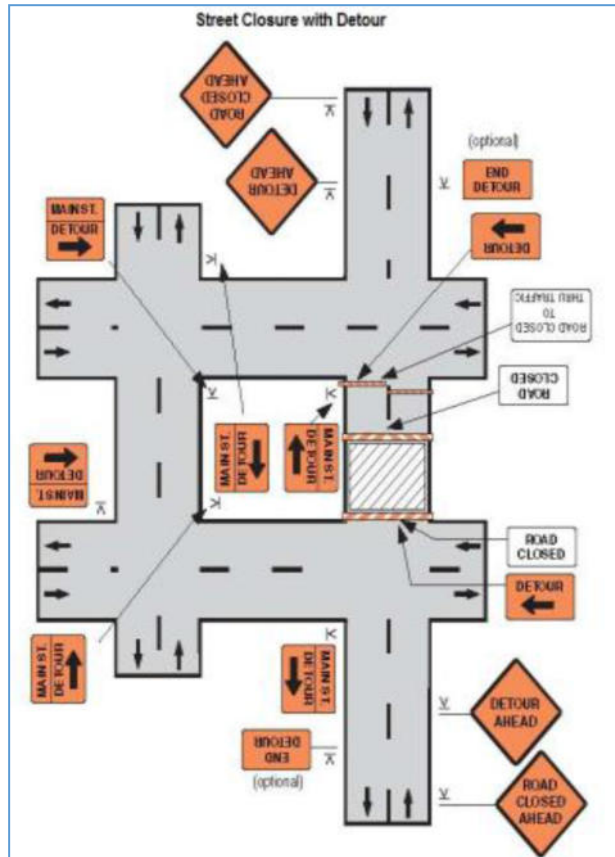
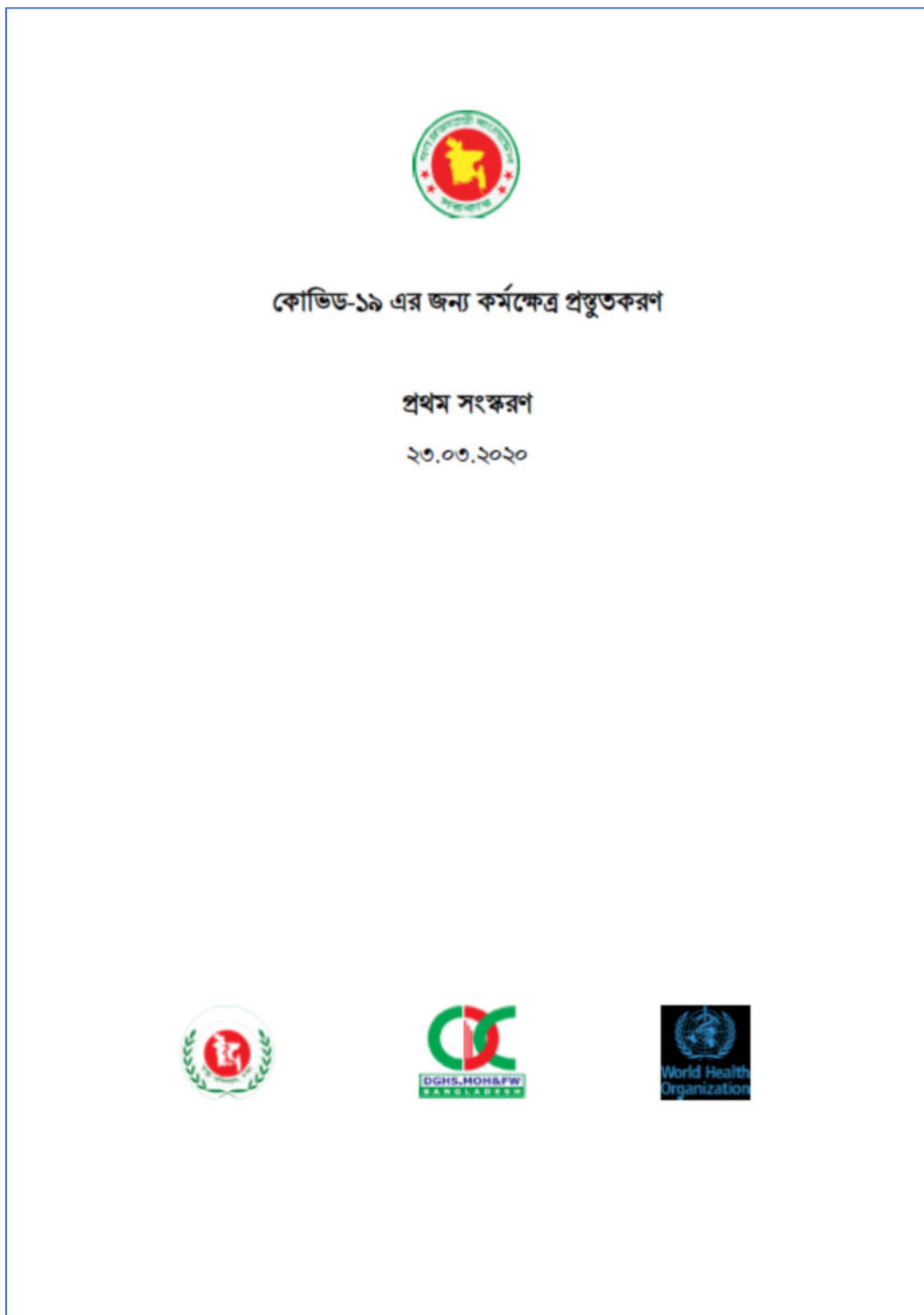


Figure A6 Street Closure with Detour

ANNEX D: Bangladesh Government guideline in response to COVID-19 in worksites



কোভিড-১৯ এর জন্য কর্মক্ষেত্র প্রস্তুতকরণ

২০২০ সালের জানুয়ারি মাসে বিশ্ব স্বাস্থ্য সংস্থা (WHO) একটি নতুন ধরনের করোনা ভাইরাস জনিত রোগের প্রাদুর্ভাব ঘোষণা করে, যার সূচনা হয় চীনের হবেই প্রদেশে। বিশ্ব স্বাস্থ্য সংস্থা (WHO) এর বিবৃতি অনুযায়ী করোনা ভাইরাস রোগটি (কোভিড-১৯) বিশ্বের অন্যান্য দেশে ছড়িয়ে পড়ার একটি উচ্চ ঝুঁকি রয়েছে।

বিশ্ব স্বাস্থ্য সংস্থা (WHO) এবং জনস্বাস্থ্য কর্তৃপক্ষ বিশ্বব্যাপী কোভিড-১৯ এর প্রাদুর্ভাব নিয়ন্ত্রণের জন্য কাজ করছে। তবে দীর্ঘমেয়াদী সাক্ষ্য এখন পর্যন্ত অর্জিত হয়নি। এই রোগের বিস্তার রোধ করতে হলে ব্যবসায়ী, চাকুরীজীবীসহ সমাজের সর্বস্তরের মানুষকে অবশ্যই কার্যকরী ভূমিকা পালন করতে হবে।

কোভিড-১৯ যেভাবে ছড়ায়

কোভিড-১৯ আক্রান্ত রোগীর হাঁচি, কাশির মাধ্যমে রোগটি সংক্রমিত হয়ে থাকে। হাঁচি, কাশির মাধ্যমে রোগটির জীবাণু নিকটবর্তী বস্তুর পৃষ্ঠতল - যেমন ডেস্ক, টেবিল বা টেলিফোন/ মোবাইল ইত্যাদির উপর পড়ে যা সহজেই মানুষের হাতের সংস্পর্শে আসে, পরবর্তীতে এই জীবাণু মুক্ত হাত দ্বারা চোখ, নাক বা মুখ স্পর্শ করার মাধ্যমে তারা আক্রান্ত হতে পারে। আবার যারা কোভিড-১৯ আক্রান্ত ব্যক্তির এক মিটারের মধ্যে অবস্থান করে, তারাও হাঁচি-কাশি হতে ডিটকে আসা ক্ষুদ্র কণার সাথে মিশ্রিত জীবাণু দ্বারা আক্রান্ত হতে পারে। কোভিড-১৯ এ সংক্রমিত হলে বেশিরভাগ ব্যক্তি হালকা/সাধারণ লক্ষণগুলি অনুভব করে এবং নিজ থেকেই সুস্থ হয়ে যায়। কিছু রোগীর ক্ষেত্রে গুরুতর অসুস্থতা লক্ষ্য করা যায় এবং হাসপাতালে নেওয়ার প্রয়োজন হতে পারে। সাধারণত ৪০ বা তদোর্ধ্ব বয়সী রোগী, রোগ প্রতিরোধ ক্ষমতা কম এমন ব্যক্তির (যেমন- ব্যালার, ডায়াবেটিস, হৃদরোগ এবং ফুসফুসের রোগে আক্রান্ত ব্যক্তি) ক্ষেত্রে ঝুঁকির মাত্রা বেশী।

আমরা এখানে যা জানব-

১. কর্মক্ষেত্রে কোভিড-১৯ এর বিস্তার রোধ করার সহজ উপায়।
২. সভা, সমাবেশ এবং জনসমাগমে কোভিড-১৯ এর ঝুঁকিগুলি এড়িয়ে চলার উপায়।
৩. কর্তৃপক্ষ ও কর্মীগণের ভ্রমণকালীন সময়ে সাবধানতা।
৪. কোভিড-১৯ ছড়িয়ে পড়লে কর্মক্ষেত্র প্রস্তুতকরণ।

১. কর্মক্ষেত্রে কোভিড-১৯ এর বিস্তার রোধ করার সহজ উপায়

যে সকল কর্মক্ষেত্রে কোভিড-১৯ এর সংক্রমণ ছড়িয়ে পড়েনি সেখানকার দায়িত্বপ্রাপ্ত কর্মকর্তাগণ তাদের নিজ কর্মক্ষেত্রে নিম্নোক্ত বিষয়গুলো নিশ্চিত করবেন-

- কর্মস্থল পরিষ্কার-পরিচ্ছন্ন এবং স্বাস্থ্যকর কিনা তা নিশ্চিতকরণঃ জীবাণুনাশক দিয়ে ডেস্ক ও টেবিলের পৃষ্ঠতল এবং নিত্য ব্যবহার্য বস্তু (যেমন- টেলিফোন, কীবোর্ড) নিয়মিত মুছতে হবে। কারন পৃষ্ঠতলে থাকা জীবাণু দ্বারা সহজে সংক্রমণের সম্ভাবনা থাকে।
- কর্মচারী, গ্রাহকদের এবং গ্রাহকদের নিয়মিত এবং যথাযথভাবে হাত ধোয়ার অভ্যাস করানোঃ সাবান-পানি দিয়ে হাত ধোয়া, কেননা সাবান দিয়ে হাত পরিষ্কার করলে ভাইরাস ধ্বংস হয় এবং কোভিড-১৯ এর বিস্তারে বাধা সৃষ্টি হয়।

- কর্মক্ষেত্রের প্রবেশপথে বা আশেপাশে সহজে দৃষ্টিগোচর হয় এমন স্থানে হ্যান্ড স্যানিটাইজার রাখার ব্যবস্থা করা।
- সঠিকভাবে হাত ধোয়ার নির্দেশনা সম্বলিত পোস্টার দৃষ্টিগোচর স্থানে প্রদর্শন করা এবং স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষের সাহায্য নিন।
- হাত ধোয়ার ব্যাপারে উৎসাহিত করার জন্য পেশাদার জনস্বাস্থ্য কর্মকর্তার দিকনির্দেশনা, বিভিন্ন সভায় প্রদত্ত সচেতনতামূলক বার্তা এবং ইন্টারনেটে ব্যবহৃত গ্রহনযোগ্য এবং বিশ্বাসযোগ্য তথ্যাদি ব্যবহার করা।
- কর্মী, ঠিকাদার এবং গ্রাহকদের সাবান ও পানি দিয়ে হাত ধোয়ার ব্যবস্থা নিশ্চিত করা।
- কর্মক্ষেত্রে শ্বাস-প্রশ্বাস জনিত স্বাস্থ্যবিধি প্রচার করা-
 - ✓ শ্বাস প্রশ্বাসজনিত পরিচ্ছন্নতার ব্যাপারে পোস্টার প্রদর্শন। কেননা, শ্বাস প্রশ্বাসের পরিচ্ছন্নতা কোভিড-১৯ সংক্রমণ রোধ করে।
 - ✓ শ্বাস প্রশ্বাসজনিত পরিচ্ছন্নতায় উৎসাহিত করার জন্য কর্মক্ষেত্রে পেশাদার জনস্বাস্থ্য কর্মকর্তার দিকনির্দেশনা, বিভিন্ন সভায় প্রদত্ত সচেতনতামূলক বার্তা এবং ইন্টারনেটে ব্যবহৃত গ্রহনযোগ্য এবং বিশ্বাসযোগ্য তথ্যাদি ব্যবহার করা।
 - ✓ কর্মস্থলে কর্মচারীদের বিশেষ করে যাদের সর্দি বা কাশি আছে তাদের জন্য ফেস মাস্ক/কাগজের টিস্যু/বুমাল সংজ্ঞালতা করা ও তাদের ব্যবহৃত ফেস মাস্ক/কাগজের টিস্যু/বুমালের যথাযথ ব্যবস্থাপনা এবং ধ্বংস করা নিশ্চিত করা।
- জরুরী পেশাদারী কাজে ভ্রমণে যাওয়ার আগে কর্মচারী এবং ঠিকাদারদের “ভ্রমণ সম্পর্কিত জাতীয় নির্দেশনা” জেনে নেওয়ার পরামর্শ দেয়া।
- কর্মচারী, ঠিকাদার এবং সেবা গ্রহণকারীদের এই মর্মে অবহিত করা যে, যদি কোনভাবে কোভিড-১৯ তাদের নিজ নিজ এলাকায় ছড়িয়ে পড়তে শুরু করে (হালকা কাশি বা জ্বর জ্বর ৯৯ ডিগ্রি ফারেনহাইট বা তার সামান্য বেশি হয়) তাহলে তাদেরকে বাড়িতেই থাকতে হবে বা বাড়িতে থেকেই কাজ করতে হবে। এসময় চিকিৎসকের পরামর্শ অনুযায়ী সাধারণ ঔষধ যেমন প্যারাসিটামল, আইবুপ্রোফেন বা অ্যাসপিরিন ইত্যাদি ঔষধগুলি গ্রহণ করা যেতে পারে।
- যদি কারো কোভিড-১৯ এর খুব সাধারণ লক্ষণও দেখা দেয় তাহলে তাকে অবশ্যই সার্বক্ষণিক ঘরের মধ্যে থাকতে হবে। একথা দৃঢ়ভাবে প্রচার করতে হবে।
- কর্মস্থলে উপরোক্ত বার্তা সম্বলিত পোস্টার প্রদর্শন করুন এবং অন্যান্য মাধ্যমে যেমন স্থানীয় যোগাযোগের চ্যানেলগুলিতে (ক্যাবল অপারেটর/কমিউনিটি রেডিও) প্রচার করুন।
- স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষ কর্তৃক অনুমোদিত এবং প্রত্বতকৃত বার্তা প্রচারের সামগ্রীসমূহের ব্যবহার নিশ্চিত করুন।
- সংবেদনশীল এই সময়ে, কর্মীদের অসুস্থতাজনিত ছুটির অনুমোদন নিশ্চিত করতে হবে।

উপরে উল্লেখিত ব্যবস্থা গ্রহণের মাধ্যমে কোভিড-১৯ এর বিস্তার রোধ করা সম্ভব।

২. সভা, সমাবেশ ও জনসমাগমে কোভিড-১৯ এর সম্ভাব্য ঝুঁকিগুলি এড়িয়ে চলার উপায়

সভা এবং সমাবেশ আয়োজকদের কোভিড-১৯ এর সম্ভাব্য ঝুঁকি নিয়ে ভাবতে হবে কারণ-

- সভায় বা সমাবেশে উপস্থিত অনেকেই অজান্তে এই ভাইরাস বহন করতে পারে যার ফলে অন্যরা তাদের সংস্পর্শে এসে কোভিড-১৯ এ সংক্রমিত হতে পারে।
- অধিকাংশ মানুষের জন্য কোভিড-১৯ মারাত্মক না হলেও অনেকের জন্য এটা মারাত্মক ও জীবনঘাতী হতে পারে। প্রতি ৫ জনের ১ জন কোভিড-১৯ অক্রান্ত রোগীর হাসপাতালে চিকিৎসা প্রয়োজন।

কোভিড-১৯ ঝুঁকি প্রতিরোধ বা হ্রাস করার জন্য বিবেচিত মূল বিষয়গুলি নিম্নরূপঃ

ক) সভা বা অনুষ্ঠানের পূর্বে-

- কোন সভা করার পূর্বে সভা স্থানের যথাযথ কর্তৃপক্ষের পরামর্শ মোতাবেক ব্যবস্থা গ্রহণ করা।
- সভা বা অনুষ্ঠানে সংক্রমণ প্রতিরোধের জন্য একটি প্রত্নতি পরিকল্পনা গ্রহণ করা।
- সকলের উপস্থিতিতে সভা বা অনুষ্ঠান আয়োজনের প্রয়োজন কিনা তা বিবেচনা করা। টেলিকনফারেন্স বা ইন্টারনেটের মাধ্যমে অনলাইনে সভা আয়োজন করা সম্ভব কিনা তা যাচাই করে দেখা।
- সভা বা অনুষ্ঠানটি ছোট পরিসরে করা যেতে পারে কিনা সেটি বিবেচনা করা যাতে লোক সমাগম কম হয়।
- জনস্বাস্থ্য এবং স্বাস্থ্যসেবা কর্তৃপক্ষের সাথে আগেই যোগাযোগ করা এবং তাদের সকল রকম তথ্য দিয়ে সহযোগিতা করা। তাদের পরামর্শ ও সুপারিশ মেনে চলতে হবে।
- সভায় কোভিড-১৯ এর সংক্রমণ প্রতিরোধের যথাযথ ব্যবস্থাপনার নিমিত্তে সকলের জন্যে টিস্যু, সাবান এবং হ্যান্ড স্যানিটাইজারসহ সকল প্রয়োজনীয় সামগ্রীর পর্যাপ্ত সরবরাহ নিশ্চিত করা। প্রয়োজনে উপকরণগুলোর প্রি-অর্ডার করা।
- শ্বাসতন্ত্রের সমস্যার উপসর্গ কারো মাঝে দেখা দিলে তার জন্য মেডিক্যাল/সার্জিক্যাল মাস্ক সরবরাহের ব্যবস্থা রাখতে হবে।
- যেখানে কোভিড-১৯ ভাইরাস বিতরণ লাভ করছে সেখানে সক্রিয় পর্যবেক্ষণ নিশ্চিত করতে হবে। সভায় অংশগ্রহণকারীদের আগাম পরামর্শ দিতে হবে যে, যদি তাদের কারো মধ্যে কোভিড-১৯ সংক্রমণের এর কোন লক্ষণ দেখা যায় বা কেউ যদি অসুস্থতা বোধ করেন তাহলে সভায় তাদের উপস্থিতি হওয়া কাম্য নয়।
- সভা/ অনুষ্ঠানের আয়োজক অবশ্যই অংশগ্রহণকারী, খাবার পরিবাহনকারী এবং দর্শকদের মোবাইল/ টেলিফোন নম্বর, ই-মেইল ও তাদের বাসস্থানের বিস্তারিত ঠিকানা সংগ্রহ করবেন। যদি কোন অংশগ্রহণকারী সন্দেহজনক সংক্রামক ব্যাধিতে অক্রান্ত হয়ে থাকেন তাহলে তার সকল তথ্য স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষকে সরবরাহ করতে হবে এবং তথ্য প্রদান নিশ্চিত করবেন। কোন অংশগ্রহণকারী তার কোন তথ্য স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষকে প্রদানে অস্বীকৃতি আনালে তিনি ঐ অনুষ্ঠান বা সভায় অংশগ্রহণ করতে পারবে না।
- সভায় অংশগ্রহণকারী কারো মধ্যে কোভিড-১৯ সংক্রান্ত যে কোন ধরনের উপসর্গ (শুকনো কাশি, জ্বর, অসুস্থতা) দেখা দিলে নিম্নোক্ত ব্যবস্থা গ্রহণ করতে হবে-
 - অসুস্থ বোধ করছে বা লক্ষণ রয়েছে এমন ব্যক্তিকে জনসমাগম হতে বিচ্ছিন্ন করে নিরাপদে রাখার জন্য একটি কক্ষ বা অঞ্চল চিহ্নিত করতে হবে।
 - সেখান থেকে অসুস্থ ব্যক্তিকে কিভাবে নিরাপদে স্বাস্থ্যকেন্দ্রে/হাসপাতালে স্থানান্তরিত করা যায় তার পরিকল্পনা থাকতে হবে।
 - যদি সভায় বা অনুষ্ঠানে অংশগ্রহণকারী কোন সদস্য, কর্মী বা পরিষেবা প্রদানকারীর কোভিড-১৯ টেস্টের ফল পজিটিভ হয় সেক্ষেত্রে কি করণীয় তা পূর্বেই ঠিক করে রাখতে হবে।

- কর্মক্ষেত্রে স্বাস্থ্যসেবা প্রদানকারী অথবা জনস্বাস্থ্য কর্তৃপক্ষ অথবা স্বাস্থ্য বিভাগকে গৃহীত সকল পরিকল্পনাগুলো সম্পর্কে পূর্বেই অবহিত করতে হবে।

খ) সভা বা অনুষ্ঠান চলাকালীন সময়ে -

- আয়োজিত সভা বা অনুষ্ঠানে অংশগ্রহণকারীদেরকে মৌখিক বা লিখিত ভাবে কোভিড-১৯ সংক্রান্ত সকল তথ্য প্রদান করতে হবে। অনুষ্ঠানের নিরাপত্তার স্বার্থে আয়োজক কর্তৃক গৃহীত পদক্ষেপ সম্পর্কে অংশগ্রহণকারীদের অবহিত করতে হবে।
- স্পর্শহীন সঞ্চোধনের উপায়গুলি প্রচার ও অনুশীলন করতে হবে এবং অন্যের সংস্পর্শ যথাসম্ভব পরিহার করতে হবে।
- সভায় অংশগ্রহণকারীদের নিয়মিত হাত ধোয়া বা হ্যান্ড রাব বা অ্যালকোহল সমৃদ্ধ হ্যান্ড-স্যানিটাইজার ব্যবহারে উৎসাহিত করতে হবে।
- অংশগ্রহণকারীরা যেন হাঁচি বা কাশি দেয়ার সময় টিস্যু ব্যবহার করে অথবা কনুইয়ের ভাঁজে হাঁচি-কাশি দেয় সে বিষয়ে বারবার অবহিত করতে হবে এবং পরবর্তীতে সেই টিস্যু বা কাপড় যেন ঢাকনা যুক্ত পাত্রে ফেলে দিতে পারে সেই ব্যবস্থা করতে হবে।
- জ্বরুরি অবস্থায় যোগাযোগের জন্য অংশগ্রহণকারীদের একটি ঠিকানা অথবা হটলাইন নম্বর সরবরাহ করতে হবে যাতে তারা পরামর্শের জন্য যোগাযোগ করতে পারে বা কোন তথ্য দিতে পারে।
- অনুষ্ঠানের ডেন্যুটিতে সহজে দৃশ্যমান হয় এমন একাধিক আয়তায় অ্যালকোহল সমৃদ্ধ স্যানিটাইজার বা হ্যান্ড রাব রাখার ব্যবস্থা করতে হবে।
- আসনগুলো এমনভাবে সাজাতে হবে যাতে অংশগ্রহণকারীরা পরস্পরের থেকে কমপক্ষে এক মিটার দূরে অবস্থান করতে পারে।
- পর্যাপ্ত বাতাস চলাচলের সুব্যবস্থা নিশ্চিত করার জন্য যখনই সম্ভব ডেন্যুর জানালা এবং দরজা খুলে রাখতে হবে।
- যদি কেউ অসুস্থতা অনুভব করে তবে পূর্বপরিকল্পিত প্রকৃতি অনুসরণ করুন বা জ্বরুরি নাথারে যোগাযোগ করুন।
- সভাস্থলের আঞ্চলিক পরিস্থিতি বা অংশগ্রহণকারীদের সাম্প্রতিক ভ্রমণের উপর নির্ভর করে অসুস্থতাবোধ করা ব্যক্তিকে একটি সম্পূর্ণ বিচ্ছিন্ন কক্ষে রাখতে হবে। তাকে একটি মাস্ক সরবরাহ করুন যাতে বাড়ি ফিরা পথের অন্য কাউকে সংক্রমিত না করে। অন্যথায় পূর্বনির্ধারিত সনাক্তকরণ কেন্দ্রে নিয়ে যান।
- সকল অংশগ্রহণকারীকে তাদের সহযোগিতার জন্য ধন্যবাদ জ্ঞাপন করতে হবে।

গ) সভা বা অনুষ্ঠান পরবর্তী করণীয় -

- কমপক্ষে এক মাসের জন্য সমস্ত অংশগ্রহণকারীদের নাম এবং যোগাযোগের ঠিকানা সংগ্রহে রাখুন। যাতে অনুষ্ঠান পরবর্তীতে অসুস্থ হয়ে পড়া যে কোন অংশগ্রহণকারীকে জনস্বাস্থ্য কর্তৃপক্ষ সহজেই খুঁজে বের করতে পারে।
- যদি সভা বা অনুষ্ঠানে কোন সন্দেহভাজন কোভিড-১৯ রোগীকে পাওয়া যায় তবে তাকে আলাদা করতে হবে। অন্যান্য অংশগ্রহণকারীদের এ বিষয়ে জানাতে হবে এবং তাদেরকে পরবর্তী ১৪ দিন পর্যন্ত কোন ধরনের লক্ষণ দেখা যায় কিনা তা প্রতিদিন পর্যবেক্ষণ করার ও দিনে দু'বার করে দেহের তাপমাত্রা পরিমাপের পরামর্শ দিতে হবে।

- যদি তাদের কারো হালকা কাশি বা জ্বর (যেমন ৩৭.৩ ডিগ্রি সেন্টিগ্রেড/ ৯৯.২ ডিগ্রী ফারেনহাইট বা তার বেশি) হয় তবে তাদেরকে বাড়িতে থাকা এবং পরিবার হতে সাময়িকভাবে বিচ্ছিন্ন থাকার পরামর্শকরণে হবে। এর অর্থ হল পরিবারের সদস্যসহ অন্যান্য ব্যক্তিবর্গের সাথে ঘনিষ্ঠ যোগাযোগ (কমপক্ষে ১ মিটার দূরত্ব) এড়িয়ে চলতে হবে।
- স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষকে সভায় অংশগ্রহণকারীদের সাম্প্রতিক ভ্রমণ এবং উপসর্গের বিশদ তথ্য প্রদান করতে হবে।
- সকল অংশগ্রহণকারীকে তাদের সহযোগিতার জন্য ধন্যবাদ আপন করতে হবে।

৩. কর্তৃপক্ষ ও কর্মীগণের ভ্রমণকালীন সময়ে সাবধানতাঃ

ক) ভ্রমণের আগে-

- কোভিড-১৯ সংক্রমিত এলাকার সর্বশেষ পরিস্থিতি সম্পর্কে সংশ্লিষ্ট সংস্থার কর্মকর্তা এবং কর্মচারীদের অবশ্যই জেনে নিতে হবে।
- সর্বশেষ তথ্যের ভিত্তিতে সংস্থার কর্মকর্তা-কর্মচারীদের আসন্ন ভ্রমণ পরিকল্পনা সম্পর্কিত সুযোগ সুবিধা এবং ঝুঁকিগুলো মূল্যায়ন করতে হবে।
- কোভিড-১৯ ছড়িয়ে পড়া এলাকায় অসুস্থ এবং ঝুঁকিতে থাকা কর্মচারীদের প্রেরণ করা যথাসম্ভব এড়িয়ে চলতে হবে।
- কোভিড-১৯ আক্রান্ত এলাকায় ভ্রমণের পূর্বে সংশ্লিষ্ট কর্মচারীদেরকে কোভিড-১৯ সম্পর্কে বিজ্ঞ এবং উপযুক্ত কোন ব্যক্তি (যেমন- সংস্থার স্বাস্থ্যসেবা প্রদানকারী, স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষ) দ্বারা ঐ স্থানের সুযোগ সুবিধা সম্পর্কে অবহিত করতে হবে।
- ভ্রমণ করতে যাওয়া কর্মচারীদের হ্যান্ড রাব / হ্যান্ড স্যানিটাইজার এর ছোট বোতল (১০০ মিলি এর নীচে) সরবরাহ করতে হবে যাতে তারা নিয়মিত হাত পরিষ্কার রাখতে পারে।

খ) ভ্রমণের সময়:

- বারবার হাত ধোয়ার বিষয়ে উৎসাহিত করতে হবে এবং হাঁচি-কাশি আছে এমন লোকদের কাছ থেকে কমপক্ষে এক মিটার/তিন ফুটের অধিক দূরে থাকতে সংশ্লিষ্ট কর্মকর্তা-কর্মচারীদের নির্দেশ দিতে হবে।
- ভ্রমণের সময় কর্মচারীদের কেউ অসুস্থ বোধ করলে তার জন্য করণীয় এবং কার সাথে যোগাযোগ করবেন তা জানিয়ে দিতে হবে।
- কর্মকর্তা-কর্মচারীরা যেখানে ভ্রমণ করবেন সেখানকার স্থানীয় কর্তৃপক্ষের নির্দেশাবলী যেন সঠিকভাবে মেনে চলে সেটা নিশ্চিত করতে হবে যেমন- যদি স্থানীয় কর্তৃপক্ষ তাকে কোন আয়গায় যেতে নিষেধ করেন তাহলে সেখানে না যাওয়া। কর্মকর্তা-কর্মচারীদের স্থানীয় ভ্রমণ, চলাচল বা বড় সমাবেশ সম্পর্কিত বিধিনিষেধ মেনে চলতে হবে।

গ) ভ্রমণ থেকে ফিরে আসলে:

- কোভিড-১৯ ছড়িয়ে পড়া এলাকা থেকে ফিরে আসা কর্মচারীদের কোভিড-১৯ এর উপসর্গ পর্যবেক্ষণের জন্য ১৪ দিনের নজরদারিতে (কোয়ারেন্টাইনে) রাখতে হবে। তাদের শরীরের তাপমাত্রা দিনে দুবার করে মাপতে হবে। এসময় তারা বাড়িতেই অবস্থান করবে।

- যদি তাদের হালকা কাশি বা সামান্য জ্বর হয়ে থাকে (যেমন- তাপমাত্রা ৯৯.২ ডিগ্রি ফারেনহাইট বা তার বেশি) তবে তাদের বাড়িতে থাকা পরিবারের সদস্যসহ অন্যান্য লোক হতে বিচ্ছিন্ন হতে হবে। এর অর্থ পরিবারসহ অন্যান্য লোকের সংস্পর্শ এড়িয়ে চলতে হবে (কমপক্ষে এক মিটার দূরত্ব বজায় রাখতে হবে)
- টেলিফোনের মাধ্যমে স্বাস্থ্যসেবা প্রদানকারী বা স্থানীয় জনস্বাস্থ্য বিভাগকে তাদের সাম্প্রতিক ভ্রমণ এবং রোগের লক্ষণগুলি সম্পর্কে বিশদ তথ্য প্রদান করতে হবে।

৪. কোভিড-১৯ ছড়িয়ে পড়লে কর্মক্ষেত্রে প্রযুক্তিকরণঃ

কর্মক্ষেত্রে কোন কোভিড-১৯ এ আক্রান্ত সন্দেহভাজন ব্যক্তি অসুস্থ হয়ে পড়লে কি করণীয় তার একটি পরিকল্পনা তৈরি করতে হবে।

- কর্মস্থলে-
 - ✓ অসুস্থ ব্যক্তিকে এমন কোন স্থানে রাখতে হবে যেখানে তারা অন্যদের থেকে বিচ্ছিন্ন (Isolated) থাকবে। সেই সাথে অসুস্থ ব্যক্তির সাথে যথাসম্ভব কম সংখ্যক মানুষ যেন যোগাযোগ করে নিশ্চিত করতে হবে এবং স্থানীয় স্বাস্থ্যসেবা প্রদানকারী কর্তৃপক্ষের সাথে যোগাযোগ করতে হবে।
 - ✓ কর্মস্থলে অন্যান্য ঝুঁকিপূর্ণ ব্যক্তিদের কীভাবে চিহ্নিত করা যায় তা বিবেচনা করতে হবে। লক্ষ্য রাখতে হবে যেন কেউ নিগ্রহ বা বৈষম্যের শিকার না হয়। সম্প্রতি কোভিড-১৯ আক্রান্ত অঞ্চল ভ্রমণ করেছেন এমন কর্মীদের মধ্যে যারা অন্যান্য গুরুতর অসুস্থ হওয়ার ঝুঁকিতে রয়েছে (যেমন-ডায়াবেটিস, হৃদরোগ, ফুসফুসের রোগ এবং বেশি বয়স) তাদেরকে উচ্চঝুঁকিপূর্ণ হিসেবে অগ্রাধিকার দিতে হবে।
 - ✓ কোভিড-১৯ প্রতিরোধে আপনার করা পরিকল্পনাটি সম্পর্কে স্থানীয় জনস্বাস্থ্য কর্তৃপক্ষকে জানাতে হবে এবং প্রয়োজনে তাদের সহায়তা গ্রহণ করতে হবে।
- দপ্তর বা সংস্থা নিয়মিত টেলিযোগাযোগের মাধ্যমে কর্ম সম্পাদনের ব্যবস্থা করতে হবে। কোভিড-১৯ এর প্রাদুর্ভাব ঘটলে স্বাস্থ্য কর্তৃপক্ষ গণপরিবহন এবং জনসমাগম এড়াতে জনগণকে পরামর্শ দিতে পারে; সে ক্ষেত্রে টেলিযোগাযোগ কর্মীদের নিরাপত্তা নিশ্চিত করার পাশাপাশি ব্যবসা বা কর্মক্ষেত্রে সচল রাখতে সহায়তা করবে।
- কোন সংস্থা বা প্রতিষ্ঠান যে এলাকায় অবস্থিত সেখানে কোভিড-১৯ এর প্রাদুর্ভাব ঘটলে তার জন্য একটি দুর্যোগকালীন ব্যবস্থাপনার পরিকল্পনা তৈরি করতে হবে যা-
 - ✓ প্রণয়নকৃত দুর্যোগকালীন ব্যবস্থাপনার পরিকল্পনা সংশ্লিষ্ট সংস্থাকে সমাজ বা কর্মক্ষেত্রে ছড়িয়ে পড়া কোভিড-১৯ মোকাবেলার সামর্থ্য করবে। অন্যান্য জরুরী স্বাস্থ্যসেবা প্রদানকারী সংস্থার ক্ষেত্রেও এই পরিকল্পনা প্রযোজ্য।
 - ✓ পরিকল্পনাটি এমন হতে হবে যেন অসুস্থতা বা স্থানীয় চলাচলে প্রতিবন্ধকতার জন্য উল্লেখযোগ্য সংখ্যক কর্মী, ঠিকাদার এবং সরবরাহকারীর অনুপস্থিতিতেও প্রতিষ্ঠানটি সচল থাকে।
 - ✓ পরিকল্পনাটির বিষয়ে আপনার কর্মকর্তা-কর্মচারী ও ঠিকাদারদের জানাতে হবে এবং দুর্যোগকালে তারা কি করবে আর কি করবে না তা তাদেরকে অবহিত করতে হবে। এক্ষেত্রে মূল বিষয়গুলোর উপরে অধিক গুরুত্ব আরোপ করতে হবে।
 - ✓ পরিকল্পনাটিতে যেন কোভিড-১৯ আক্রান্তের মানসিক স্বাস্থ্য ও সামাজিক উপর কি প্রভাব পরে সে বিষয়টি আলোচিত হয় তা লক্ষ্য রাখতে হবে। কোভিড-১৯ সম্পর্কিত সঠিক তথ্য প্রাপ্তি এবং সহায়তা প্রদান নিশ্চিত করতে হবে।

- ✓ যেসব ক্ষুদ্র ও মাঝারী ব্যবসা প্রতিষ্ঠানগুলো জরুরীক্ষেত্রে নিজস্ব কর্মীদের স্বাস্থ্য ও কল্যাণের বিষয় নিশ্চিত করতে সমর্থ নয় তাদেরকে আগ্রিম স্থানীয় স্বাস্থ্যসেবা প্রদানকারীদের সাথে যৌথ পারস্পরিক সহযোগিতার পরিকল্পনা করতে হবে।
- ✓ এই পরিকল্পনা তৈরির জন্য স্থানীয় ও জাতীয় পর্যায়ে জনস্বাস্থ্য কর্তৃপক্ষ সহযোগিতা প্রদানেরও প্রত্যাব দিতে পারে।

মনে রাখা জরুরী:

কোভিড-১৯ এর জন্য প্রস্তুত হওয়ার সময় এখনই। এক্ষেত্রে সাধারণ সতর্কতা এবং সঠিক পরিকল্পনা গ্রহণ কোভিড-১৯ প্রতিরোধে বড় ভূমিকা রাখতে পারে। অবিলম্বে নেয়া সঠিক পদক্ষেপ আপনার কর্মক্ষেত্র ও কর্মচারীদের রক্ষা করতে সহায়তা করবে।

ANNEX E: COVID-19 Health and Safety Guidance for the Construction Workforce

COVID-19 Health and Safety Guidance for the Construction Workforce

INSTRUCTIONS

Contractors are required to ensure health and safety of the workers and employees in accordance with environmental health and safety (EHS) provisions of the contract which is in line with ADB SPS 2009 and Bangladesh Labor Law 2006 (Chapter VIII). A supplementary EHS guidelines was prepared to ensure that workers and employees are safe from Pandemic COVID-19 infection while working at the construction sites. This guideline should be used as a supplement to the project's Environmental Health and Safety (EHS) guidelines for the workers. Contractors are encouraged to prepare a site-specific Environmental Health and Safety (EHS) guidelines for reopening the sites and mobilizing labor and resources and get it approved by Executing Agency. The EHS guidelines and COVID-19 EHS guidelines should be available at worksite all the time with no exception.

Prerequisites for Reopening Worksite

1. Consider reopening at limited scale by identifying and engaging essential labor force
2. Avoid worker intensive works as much as possible; encourage use of equipment
3. Engage fulltime EHS professional to oversee the implementation of EHS guidelines
4. Engage a medical professional to prepare health record of the workers and daily health checkup
5. Ensure coverall Personal Protective Equipment (PPE) for medical professional
6. Prepare a list of equipment and vehicles to be used frequently and ensure routine disinfection
7. Make available thermometer, soap, hand sanitizer, disinfectant, and PPE (mask, gloves, boot) at worksite and camp
8. Place adequate number of washbasins, disinfectant tub, dispenser for sanitizer
9. Establish electronic payment system (e.g., BKash, Nagad, Rocket) to pay the daily wage
10. Follow the guidance as provided below.



Locate the closest medical facility equipped with COVID -19 and contact them.



Place washbasins and disinfectant tub for shoes.



Engage EHS professional. Engage Medical professional (fulltime/ part-time).



Place a few COVID-19 signed covered trash bin for disposal of used PPEs.



Supply soap and sanitizer to labor and staff for after office for disinfection.

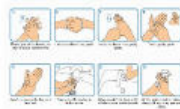
Worksite Entrance Protocol



Everyone entering the worksite must wear a mask and gloves.



During worksite entry que, maintain physical distance of minimum 1m (3ft).



Every personnel should wash their hands with soap for 20 seconds. Display hand washing protocol at entrance.



Spray bottom of shoes of every personnel entering worksite/campsite with disinfectant. Disinfect all vehicles entering site.



use thermometer gun to check temperature. If body temperature found > 37°C send to the designated medical facility.

Worksite Management



Frequently clean and disinfect highly used tools, machineries and surfaces (e.g. tables, toilets) by workers.



Mandatory morning briefing on COVID awareness at site maintaining physical distance.



Use alcohol-based wipe to clean tools, equipment, vehicle before and after use.



Discourage gathering at site. Discourage unnecessary entrance and exit at site.

Camp Management

1. Provide soap, sanitizer, washing facility and safe water at the workers' dwelling. Encourage frequent hand washing.
2. Ensure separate covered bin for disposal of used PPEs.
3. Protect against heat, cold, damp, noise, fire, and disease-carrying animals.
4. Maintain good housekeeping and social distancing in kitchens, meal rooms, canteens.
5. Ensure personal distance at least 1 meter (3 feet), preferably 2m (6ft) during lunch, dinner and prayer.
6. Ensure ample ventilation at the camp.



Place covered waste bins at worksite
Do not forget to dispose your used PPEs in the bins!!

Work at Site Awareness



Inform the designated ESH/Medical personnel immediately if any person starts showing the symptoms of COVID-19.



Encourage respiratory etiquette, including covering coughs and sneezes. Don't touch nose/eye/mouth if not washed recently, do not spit.



Encourage the workers at camp to go out for supplies not more than once a week.




Shorten toolbox meetings. Initiate remote meeting protocol to avoid physical contact.



Stay informed. Get news from WHO and Government news outlets. Ask your EAs. Ask ADB.

How to Handrub?

RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

 **Duration of the entire procedure: 20-30 seconds**

 <p>1a</p>	 <p>1b</p>	 <p>2</p>
Apply a palmful of the product in a cupped hand, covering all surfaces;		Rub hands palm to palm;
 <p>3</p>	 <p>4</p>	 <p>5</p>
Right palm over left dorsum with interlaced fingers and vice versa;	Palm to palm with fingers interlaced;	Backs of fingers to opposing palms with fingers interlocked;
 <p>6</p>	 <p>7</p>	 <p>8</p>
Rotational rubbing of left thumb clasped in right palm and vice versa;	Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;	Once dry, your hands are safe.



**World Health
Organization**

Patient Safety

A World Alliance for Safer Health Care

SAVE LIVES

Clean Your Hands

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this document. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use. WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

Together we can help **stop** **COVID -19** and stay healthy

Cover your nose while
coughing or sneezing



Wash your hands with
soap for 20 sec



Use wastepaper basket
more often!



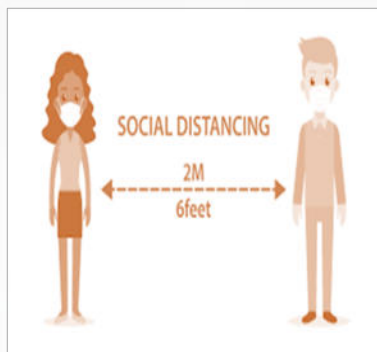
Disinfect bottom of your
shoes



Disinfect yours tools
frequently



Maintain at least 6ft
distance from each other



ANNEX F: COVID-19 Health and Safety guidance for the construction workforce

COVID-19 Health and Safety Guidance for the Construction Workforce

USE OF THIS DOCUMENT

This document should be used as a supplement to the Environmental Health and Safety (EHS) Manual for the workers. Make all the documents available at site all the time. Executing Agencies (EAs) are responsible for providing both documents to the contractors. Contractors should provide both documents at site. The current document should be used in conjunction with ESH manual. Consider this document as 'live document' which should be updated as new information available. A site-specific version of this document should be adopted for specific project sites.

Section 1: Pre-requisite for reopening/opening worksite/campsite:

1. Plan to open/reopen worksite at limited scale (i.e. only essential works at worksite). Map essential/unavoidable works that must be attended at this moment. Identify and engage essential labor force initially. Increase labor force step by step as necessary. Do not engage labor until necessary preparation is done as stipulated in the next paragraphs.
2. Locate the closest medical establishment equipped with COVID -19 response facilities. Establish contact with the medical facility and make agreements with them for cases of potential COVID patient from the work site.
3. Engage a full time EHS professional at site. Also engage a part-time/fulltime medical professional based on the workforce and project size/type.
4. Prepare list of potential workforce/labors. With the help of the EHS/medical professional prepare health records of the labors to be engaged. Seek assistance from registered medical centers if required. Keep the record at site office.
5. Purchase thermometer gun, soap, hand sanitizer, disinfectants and PPEs (mask, hand gloves, hard shoes etc.) and keep it at worksite office. Disinfectants can be diluted bleaching power as directed by Environmental Protection Agency (EPA).
6. Establish site entrance protocol as depicted in **Section 2** below. Redesign the site safety notices/signboards/protocol according to the guidelines provided in this document.
7. Arrange washbasin, soap and clean water at the entrance of every worksite/campsite. Also keep either a disinfectant tub for shoes or keep disinfectant spray that must be sprayed under the boots/hard shoes of the persons entering worksite. Put signboard/poster in front of the washbasin instructing the workers/staff/site visitors to wash both hands for 20 seconds. The board/poster should also display proper hand washing techniques as per WHO guidelines.

8. Provide every personnel working in the site with mask, hand gloves and hard shoes for their personal use. Strictly follow the HSE manual at site. The contractor must have a copy of the HSE manual at site. For assistance contact with relevant EAs.
9. Identify and note a list of commonly used machines/tools and surfaces (e.g. tables, doorknobs, handrail etc.) by workers and camp site dwellers.
10. Make arrangements of electronic payment system affordable for the workers (e.g. bKash, Nogod, Rocket etc.). Update company policies of paid sick leave, medical allowance and medical insurance.

Section 2: Worksite entrance protocol

1. Everyone entering the worksite must wear a mask, gloves and hard shoes. Strictly follow and implement the EHS manual at worksite.
2. At the entrance of the worksite/camp site every personnel must wash their hands for 20 second with maintaining a distance of at least 1m (3 ft) from each other. At this rate 180 person can enter the site in an hour. Depending on this calculation (hourly rate 180pax per washbasin) the contractor can calculate the number of washbasins he/she needs to provide. The wash basins should maintain at least 1.5m distance from each other and the entrance que must maintain 1m distance from each other.
3. Spray bottom of shoes of every personnel entering worksite/campsite with disinfectant or provide shoe storage for worker storing shoe in poly bag before entering the worksite.
4. Procure and use a thermometer gun to check temperature of everyone entering the site. If body temperature is found > 37 degrees, send this person to the designated medical facility for further examination and follow instruction of the medical person in-charge.
5. Prepare disinfectant using ICCDR, B or EPA registered household disinfectant formula (e.g. diluted bleaching powder) and disinfect vehicles upon entry to the worksite/campsite.

Section 3: Daily worksite protocols

1. A designated EHS and medical person should stay all time during work. The EHS/Medical person should also monitor campsite. He/she will be in charge of ensuring physical distances (minimum 1m) among workers, disinfecting surfaces that are commonly used and investigate workers/site personnel health and safety.
2. The designated EHS/medical person (or assistant) must frequently clean and disinfect highly used tools and machineries by workers and surfaces including doorknobs, handrails, toilets, work surfaces, and common areas such as tables, assembly place etc.
3. At the start and end of the day disinfect the total worksite. For campsite, disinfect the total area before the workers/camp dwellers are back from site.
4. Always check if the stock of disinfectant, PPEs, medical supplies are sufficient.
5. Encourage site personnel/camp dwellers to not touch their eyes, mouth or nose if not washed thoroughly with soap recently. Also discourage hand shaking or hugs.
6. Arrange a mandatory site brief on COVID awareness in the morning. The session must be conducted by the EHS/medical professional.
7. Encourage workers/site personnel/camp dwellers to inform the designated ESH/Medical personnel immediately if any colleague starts showing the symptoms of COVID-19.
8. While worksites are commonly well ventilated (if not make sure the work sites are well ventilated), ensure that the camp sites including the rooms designated for the camp dwellers are well ventilated and spacious.

9. Before sharing common tools/machines at worksite, ensure to disinfect.
10. Discourage site personnel to gather and gossip at any time, rather encourage physical distance while chatting/discussing.
11. Keep the day-to-day toolbox meetings as short as possible. Ensure physical distance during meetings.
12. Increase use for internet/phone-based meetings/site visits as much as possible to avoid travelling and physical communication.
13. Restrict worksite personnel to go outside unnecessarily. Also restrict campsite personnel to go outside without any valid cause.
14. If any person related at worksite/campsite fall victim to COVID-19 or being kept isolated for precaution, consider paid leave with no exception allowed.

Section 4: Everyday training

1. Train workers on how to properly put on, use/wear, and take off protective clothing and equipment. The on-site EHS/Medical person should be in-charge of these trainings. These trainings must maintain the WHO's social distancing protocol. Make these trainings mandatory at worksites. Provide 10-15 minutes of a workday for such 'training and encouragement' activities.
2. Encourage respiratory etiquette, including covering coughs and sneezes. Train the site personnel as needed.
3. Contact with EAs/ADB designated professional for any help with training material/knowledge/miscellaneous.

Section 5: Campsite management

1. Ensure sufficient stock of soap, sanitizer, washing facility and safe water at the workers' dwelling (both camp site and home). Encourage frequent hand washing and social distancing at campsite.
2. Ensure a separate covered bin in place at every campsite/worker's dwelling for disposal of used PPEs.
3. Check and ensure if camps are well ventilated and protected against heat, cold, damp, noise, fire, and disease-carrying animals.
4. Maintain good housekeeping and social distancing in kitchens, meal rooms, canteens and toilets. Make sure campsites are using sanitary toilets.
5. Ensure personal distance at least 1 meter (3 feet), preferably 2m (6ft) during lunch, dinner and prayer.

Section 6: Knowledge management and documentation

1. During COVID-19 outbreak new information is coming everyday as the science develops. Site management needs to evolve as new information/current protocol emerges. It is difficult for site medical/EHS professional to keep up with the new knowledge/information that is coming every day in absence of fast internet. Hence, he/she should keep in close contact with the designated EAs/ADB professional for updated information and protocol. This documents also needs to be considered as live document and should be updated as necessary.

Annex G: Emergency response team (COVID-19)

EMERGENCY/CRISIS RESPONSE TEAM (Roles and Responsibilities)

A. Overview

An integrated approach to emergency response involves a range of stakeholders, including the primary responder (i.e. the contractor), supervision consultants, the secondary responder (i.e. EA/IAs) and the tertiary responder (i.e. Donor agencies (e.g. ADB)) along with the local authorities, regulatory agencies and the general public. Such a system therefore requires robust processes regarding information dissemination, training, and designation of responsibility, management actions, monitoring, control, and corrective actions. The Emergency/Crisis Response Team therefore needs to be fully equipped and well communicated.

B. Organization chart of crisis response team

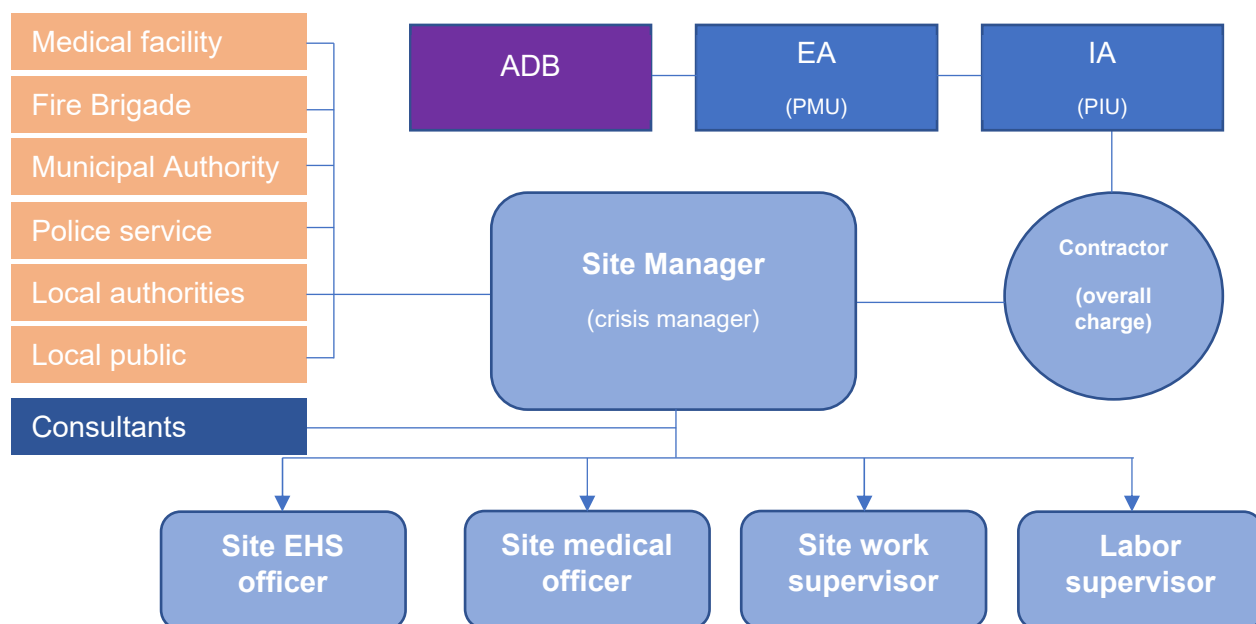


Figure: Organization chart of the crisis management team

Explanation of color code:

Work site body
Executive body
Donor body
External services team
Consultants

Table: Crisis response team

No.	Name	Designation	Mobile no.
1		Site Manager	
2		EHS officer	
3		Medical officer	
4		Worksite supervisor	
5		Labor supervisor	
6		Contractor	
7		Local hospital	
8		Local police station	
9		Local fire brigade	
..			

Annex H: EHS Monitoring and reporting template

Monitoring and Reporting Template

Environmental Health and Safety Monitoring

A. Environmental Health and Safety Checklist

Sl no.	Item	Exist in the worksite?		Recommendation And/ or Remarks	Time frame to comply
		Yes <input type="checkbox"/>	No <input type="checkbox"/>		
1	Site readiness (e.g. is worksite fenced and can be distinguished from general establishment? Is the an EHS professional at site? Has he/she been fulltime professional? Has he/she been present at site every day?)				
2	Site access (e.g., is site access road wide and easily accessible?)				
3	Signboard with safety warnings (e.g. with general EHS safety signboards, are COVID 19 response signboards visible at every corner of worksite?)				
4	Lighting (e.g. is every corner of the worksite is well lit?)				
5	Appropriate PPEs (Helmet, Safety Shoe, Vest, Ear plug, Musk etc.) e.g. Is every person in site is wearing appropriate PPEs?				
6	Fall protection measures (e.g. is the fall protection measures at worksite appropriate and adequate?				
7	Fire extinguishers (e.g. are they at site? How many? Are they placed at vulnerable/most accessible places?)				
8	House keeping (e.g. are all workers health records kept? Is the EMP and EHS manual at site? Has the morning briefing on EHS conducted? Is there any vehicle record/material register/attendance register/complain register kept?)				
9	Garbage bins (e.g. are there garbage bins at site? Are the numbers adequate? Is waste thrown to bins? Are the bins well places?				
10	Drinking water supply (e.g. safe drinking water for worksite been supplied? Is drinking water adequate?				
11	Sanitation facilities (e.g. is there separate male and female toilets established? Are they adequate? Hand wash materials and water being provided at toilets? Are those toilets sanitary?				
12	Dust protection measures (e.g. is mask provided for worksite personnel? Is water sprayed frequently as needed to suppress dust? Are sand class materials covered with plastic sheets?				
13	Noise barrier and reduction equipment (e.g. how much noise is generated by site? Does it exceed maximum human exposure limit? Are workers provided with noise reduction gears such as ear mufflers?)				
14	Shelter (e.g. is there a site office or shelter good enough to take shelter during rain or storm event?)				
15	First aid box (e.g. is there a first aid box at site? Are the contents of the first aid box adequate for primary treatment? Is the first aid box handled by at EHS/medical professional				

Sl no.	Item	Exist in the worksite?		Recommendation And/ or Remarks	Time frame to comply
		Yes <input type="checkbox"/>	No <input type="checkbox"/>		
16	Toolbox meetings (e.g. are toolbox meeting regularly arranged? Are records kept?)				
17	Others (many other checklists can be formulated by the EHS professional on board)				
COVID -19 protocols on top of usual EHS checklist (this applied to campsite also)					
18	COVID-19 posters/signboards (e.g. are COVID-19 awareness/protocol posters are showing all visible corners of the site?)				
19	Entrance protocol (e.g. Is the COVID-19 worksite entrance protocol been followed as stipulated in the COVID -19 response guidance? Are adequate soaps, water has been kept at site entry? Are workers at entrance que using mask, hand gloves and hard shoes? Are disinfectant spray kept at site entry to disinfect underneath the boots of entering persons?)				
20	Vehicle entry protocol (e.g. has the vehicle disinfection protocol has been initiated?)				
21	Social distancing (e.g. are the workers maintaining social distancing all the time?)				
22	Sharing tools/machineries (e.g. are the tools and machineries are wiped to disinfect before sharing/working?)				
23	Disinfecting work area (e.g. is the worksite/ common surfaces, toilets etc. are disinfected before worksite opened in the morning? Has record being kept? Has the worksite been disinfected yesterday after closing for the day?)				
24	Restriction on worksite entry and exit (e.g. has workers being discouraged to travel frequently out of worksite or entering? Has records being kept?)				
25	Stock of disinfectant (e.g. is the stock of disinfectants, soap, PPEs are adequate at worksite?)				

*Attach photos

**Enter additional criteria as required for site specific measures

Reported by (ESC)	Checked by (TL)	Approved by (EA/IA)
Name Designation Signature Date	Name Designation Signature Date	Name Designation Signature Date
Received and agreed to comply by the representative of the contractor	Name Designation Signature Date	

B. Accident/ Incident Investigation Report

Class of Incident		Reported	
<input type="checkbox"/> Injure	<input type="checkbox"/> Property/ Plant Damage	Yes <input type="checkbox"/> No <input type="checkbox"/> Details:	
<input type="checkbox"/> Near Miss	<input type="checkbox"/> Environmental	Further Action Required	
		<input type="checkbox"/> Report to Authorities <input type="checkbox"/> Other	
Details of Incident			
Date of Incident		Time of Incident	am <input type="checkbox"/> pm <input type="checkbox"/>
Witness Name		Witness Contact	
Nature of Incident			
Location of Incident			
Description of Incident			
Details of damage to equipment/property			
Injured Person/s (if applicable)			
Name			
Address			
Date of Birth			
Occupation		Employer	
Referred/transferred to			
Recommended Preventive Action			
Details			
Completed by			
Name		Position	
Signature		Date	

C. Safety patrol/inspection report form

SITE SAFETY PATROL REPORT AND INSTRUCTION						
Date						
Inspector						
No	Location	Comment/Instruction	Photo	Corrective action	Deadline	Responsible person

Reported by (ESC)	Checked by (TL)	Approved by (EA/IA)
Name Designation Signature Date	Name Designation Signature Date	Name Designation Signature Date
Received and agreed to comply by the representative of the contractor	Name Designation Signature Date	

Annex I: 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 silvi-cultural 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 J: Camp Sample Semi-Annual Environmental Monitoring Report Template

I. INTRODUCTION

- Overall project description and objectives
- Description of Project
- Environmental category of the sub-projects
- Details of site personnel and/or consultants responsible for environmental monitoring
- Overall project and sub-project progress and status

No.	Sub-Project Name	Status of Sub-Project				List of Works	Progress of Works
		Design	Pre-Construction	Construction	Operational Phase		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Compliance status with National/ State/ Local statutory environmental requirements

No.	Sub-Project Name	Statutory Environmental Requirements	Status of Compliance	Action Required

Compliance status with environmental loan covenants

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

II. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.

- There should be reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual report send to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:
 - a. What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries?
 - b. If muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads;
 - c. Adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain;

- d. Are there designated areas for concrete works, and re-fuelling?
- e. Are there spill kits on site and if there are site procedure for handling emergencies;
- f. Is there any chemical stored on site and what is the storage condition?
- g. Is there any dewatering activities if yes, where is the water being discharged;
- h. How are the stockpiles being managed?
- i. How is solid and liquid waste being handled on site?
- j. Review of the complaint management system;
- k. Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary Monitoring Table

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

Overall Compliance with CEMP/ EMP

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

III. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

Brief description on the approach and methodology used for environmental monitoring of the Project

- Monitoring of environmental IMPACTS on PROJECT SURROUNDINGS (ambient air, water quality and noise levels)
- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					

Site No.	Date of Sampling	Site Location	Parameters (Monitoring Results)					

Noise Quality Results

Site No.	Date of Testing	Site Location	LAeq (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LAeq (dBA) (Monitoring Results)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LAeq (dBA) (Monitoring Results)	
			Day Time	Night Time

IV. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

Summary of follow up time-bound actions to be taken within a set timeframe.

V. APPENDIXES

Photos
Summary of consultations
Copies of environmental clearances and permits
Sample of environmental site inspection report
Others