

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

Ministry of Water Resources Bangladesh Water Development Board

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Revised Initial Environmental Examination (RIEE)

Revised by

Safeguard Cell

Project Management Unit, Dhaka

IRRIGATION MANAGEMENT IMPROVEMENT PROJECT (IMIP), BWDB

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Irrigation Management Improvement Project (IMIP)

ABBREVIATIONS

AP	Affected Persons
AH	Affected Household
ADB	Asian Development Bank
BADC	Bangladesh Agriculture Development Corporation
BOD	Biological Oxygen Demand
BOQ	Bill of Quantity
PBS-	Palli Biddut Samiti
B/P-	Buried Pipe (uPVC Pipe)
BREB-	Bangladesh Rural Electrification Board
BWDB	-Bangladesh Water Development Board
CAS	Catch Assessment Survey
C-IMO-	Construction phase Irrigation Management Operator
COD	Chemical Oxygen Demand
CW-	Construction Works
DAE	Department of Agricultural Extension
DFR	Draft Final Report
DO	Dissolved Oxygen
DoC	Department of Cooperatives
DOE	Department of Environment
DOF	Department of Fisheries
DoPHE-	Department of Public Health Engineering
DTW	Deep Tube Well
EAP	Environmental Action Plan
EC	Electrical Conductivity
ECA	Environment Conservation Act
ECC	Environmental Clearance Certificate
ECR	Environment Conservation Rules
EEC	European Economic Commission
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
EMR-	Environmental Monitoring Report
EMU	Environmental Management Unit
ERP	Environmental Responsible Procurement
FAP	Flood Action Plan
FAO	Food and Agricultural Organization
FCD	Flood Control, Drainage and Irrigation
FD	Forest Department
FGD	Focus Group Discussion
FOM-	Field Office Manager (IMO)
FPCO	-Flood Planning Coordination Organization

GAP - Gender Action Plan
 GI - Galvanized Iron
 GKIP - Ganges Kobodak Irrigation Project
 GRM - Grievance Redress Mechanism
 GOB - Government of Bangladesh
 GPP - Guidelines for People's Participation
 GPWM-Guidelines for Participatory Water Management
 GRC - Grievance Redress Centre
 ha- hectares
 HHs- House Holds
 H/T- Header Tank
 ICC - Implementation Coordination Committee
 IDA - International Development Agency
 IEC - Important Environmental Components
 IEE - Initial Environmental Examination
 IMIP - Irrigation Management Improvement Project
 IMO - Irrigation Management Operator
 IMED- Implementation, Monitoring and Evaluation Division
 IPM - Integrated Pest Management
 ISPAN- Irrigation Support Project for Asia and Near East
 IWM - Institute of Water Modelling
 IWRM - Integrated Water Resources Management
 IWRMP-Integrated Water Resources Management Plan
 JMC - Joint Management Committee
 KJDRP-Khulna Jessore Drainage Rehabilitation Project
 LDA - Land Donation Agreement
 LLP - Low Lift Pump
 LGI - Local Government Institution
 M-IMO-Management phase Irrigation Management Operator
 MIP - Muhuri Irrigation Project
 MOA - Ministry of Agriculture
 MOEF- Ministry of Environment and Forest
 MOM - Management Operation and Maintenance
 MoU - Memorandum of Understanding
 MOWR-Ministry of Water Resources
 Mt - Metric Ton
 NGO- Non-Governmental Organization
 NWMP-National Water Management Plan
 NWP - National Water Policy
 O&M - Operation and Maintenance
 PAP - Project Affected Person
 PCB- Poly Chlorinated Biphenyl
 PD - Project Director
 PH - Hydrogen Ion concentration in a solution
 PHE - Public Health Engineering
 PIU - Project Implementation Unit
 PMDC- Project Management & Design Consultants

PMU - Project Management Unit
PMO - Project Management Office
POPs - Persistent Organic Pollutants
PPP - Public Private Partnership-
PPE - Personal Protection Equipment
PPTA - Project Preparation Technical Assistance
PRRA - Participatory Rapid Rural Appraisal
PSC - Project Steering Committee
PVC - Poly Vinyl Chloride
PWD - Public Works Department
RAP - Resettlement Action Plan
RCC - Reinforced Cement Concrete
REB - Rural Electrification Board
RF - Resettlement Framework
RSDP - Resettlement and Social Development Plan
SPS - Safeguard Policy Statement
SIDA - Swedish International Development Agency
STW - Shallow Tube Well
SWMC-Surface Water Modelling Centre
TBIP - Teesta Barrage Irrigation Project
UNDP - United Nations Development Program
WARPO-Water Resources Planning Organization
WUO - Water Users Organization
WUG - Water Users Group
WUA - Water Users Association
WMO - Water Management Organization
WMG - Water Management Group
WMA - Water Management Organization
WHO - World Health Organization

GLOSSARY

Affected Person (AP): includes any person, affected households (AHs), firms or private institutions who, on account of changes that result from the project will have their (i) standard of living adversely affected; (ii) right, title, or interest in any house, land (including residential, commercial, agricultural, forest, and/or grazing land), water resources, or any other moveable or fixed assets acquired, possessed, restricted, or otherwise adversely affected, in full or in part, permanently or temporarily; and/or (iii) business, occupation, place of work or residence, or habitat adversely affected, with physical or economic displacement.

Assistance; means support, rehabilitation and restoration measures extended in cash and/or kind over and above the compensation for lost assets.

Awardee: means the person with interests in land to be acquired by the project after their ownership of said land has been confirmed by the respective Deputy Commissioner's office as well as persons with interests in other assets to be acquired through by project. Compensation for acquired assets is provided to 'awardees' through notification under Section 8 of the Acquisition and Requisition of Immovable Property Act, 2017 (ARIPA).

Compensation: means payment in cash or kind for an asset to be acquired or affected by a project at replacement cost.

Displaced persons (DP): Displaced persons in a project area could be of three types: (i) persons with formal legal rights to land lost in its entirety or in part; (ii) persons who lost the land they occupy in its entirety or in part who have no formal legal rights to such land, but who have claims to such lands that are recognized or recognizable under national laws; and (iii) persons who lost the land they occupy in its entirety or in part who have neither formal legal rights nor recognized or recognizable claims to such land. The involuntary resettlement requirements apply to all three types of displaced persons.

Encroachers: mean those people who move into the project area after the cut-off date and are therefore not eligible for compensation or other rehabilitation measures provided by the project. A person or entity that extends their own property or usufruct to neighboring public or state land is also referred to as an encroacher.

Entitlement: means the range of measures comprising cash or kind compensation, relocation cost, income rehabilitation assistance, transfer assistance, income substitution, and relocation which are due to /business restoration which are due to AHs, depending on the type and degree nature of their losses, to restore their social and economic base.

Eminent Domain: means the regulatory authority of the Government to obtain land for public purposes or use as described in the Acquisition and Requisition of Immovable Property Act, 2017 (ARIPA).

Household: A household includes all persons living and eating together (sharing the same kitchen and cooking food together as a single-family unit).

Inventory of losses: means the pre-appraisal inventory of assets as a preliminary record of affected or lost assets.

IMO: The project incorporates the engagement of an Irrigation Management Operator (IMO) under a management service contract to provide services for Management Operation and Maintenance of the Muhuri Irrigation Project (MIP)

Non-title holders: means those who have no recognizable rights or claims to the land that they are occupying and includes people using private or state land without permission, permit or grant i.e. those people without legal title to land and/or structures occupied or used by them. ADB's policy explicitly states that such people cannot be denied compensation.

Project: means the Irrigation Management Improvement Project (IMIP)-Muhuri Irrigation Project (MIP).

Relocation: means displacement or physical moving of the APs from the affected area to a new area/site and rebuilding homes, infrastructure, provision of assets, including productive land/employment and re-establishing income, livelihoods, living and social systems.

Replacement cost: is based on the following elements: (i) fair market value; (ii) transaction costs; (iii) interest accrued; (iv) transition and restoration costs; and (v) other applicable payments, if any.

Resettlement: means all the impacts associated with land acquisition including restriction of access to, or use of, land, acquisition of assets, or impacts on income generation as a result of land acquisition.

Significant impact: The involuntary resettlement impacts of an ADB-supported project are considered significant if 200 or more persons will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating) .

Squatters: means the same as non-titled and includes households, business and common establishments on land owned by the State. Under the project this includes land on part of the crest and slopes of canal dykes, flood control embankments, and similar areas of the drainage channels.

Structures; mean all buildings including primary and secondary structures including houses and ancillary buildings, commercial enterprises, living quarters, community facilities and infrastructures, shops, businesses, fences, and walls.

Vulnerable Households: Individuals and groups who may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status. According to ADB SPS, vulnerable groups are those below the poverty line, the landless, the elderly, women and children, and Indigenous Peoples, physically challenged, and those without legal title to land.

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EXECUTIVE SUMMARY

Muhuri Irrigation Project (MIP) is one of the large-scale surface water irrigation Project of Bangladesh Water Development Board (BWDB). The first feasibility study of MIP was conducted in 1973 with the Technical assistance of World Bank (WB). Its first implementation was started in 1977 and completed in 1986 with the loan of WB. After a long period of 30 years of its operation another attempt was taken to rehabilitate and modernize MIP with the finance by Asian Development Bank (ADB) and Government of Bangladesh (GoB) in 2015 Under Irrigation Management Improvement Project (IMIP). In order to do that an Initial Environmental Examination (IEE) was conducted in 2013 with the technical assistance of ADB.

During the preparation of Development Project Proforma (DPP) of IMIP-MIP no provision of land acquisition and resettlement was included. But during the implementation of rehabilitation and modernization works it was envisage installation of a 33/11 KVA electrical power station is complementary and acquiring of 40 decimal lands is inevitable. Moreover, it was found that many squatters, displaced by river bank erosion, flood and coastal cyclone had already settled on the coastal embankment and some of them needs to be displaced temporarily for raising the embankment height by average one meter. That's why according to WB's Safeguard Policy Statement (SPS-2009) MIP has been re-categorised as B from initially C for involuntary resettlement and this Revised IEE is prepared to comply with ADB's that requirement.

In this revised IEE report selection of the location of proposed Electrical substation, its components (Annex-VII), natural and social environment around the proposed substation has been described. The possible environmental and socio-economic adverse impacts have been studied by visiting the location of the proposed location and a similar Electrical substation (33/11 KVA indoor type) which is being constructed by the Awardee Contractor (Energy Pack Global Ltd) at Sonagazi, Feni. The possible impacts of such Electrical Substation have also been studied from online literature and interviewing Key Informant (Electrical Engineer of C-IMO, Energy Pack Global Ltd and Palli Biddyt Samiti).

The key information of the original IEE report of MIP has been kept almost intact but the entire report has been revised by including the installation of electrical substation and its concerned consequence i.e., land acquisition and resettlement on the local natural environment and communities. Two PCMs has been done in the Bondhua Village (near the substation) and the problems and their possible solution suggested by the land losers and the other PAPs have been recorded. The main demand of the land losers is the land price at the current market rate. They also requested to shift the substation site 10-20 feet back ward i.e., to the East so they can earn their livings by building any shops/groceries/markets etc there. The reporting style has also been changed and improved.

Some project component like dredging/re-excavation of reservoir upstream of Feni Regulator have been dropped from the TA report during preparation of DPP for IMIP-MIP but included in the original IEE report. Those components including their impacts, management and monitoring have been removed from the revised IEE and the new issues like electrical substation, land acquisition and resettlement and Environmental Health and Safety (EHS) due to Covid-19 pandemics with their impacts, management and monitoring have been included to this Revised IEE report.

The main adverse impacts of the proposed substation on the local environment during construction are (a) Loss of land (40 decimal) for electrical substation, (b) reduction of value of the surrounding private land over which the multiple low voltage electrical supply lines will be installed, (c) Loss of aesthetic beauty of the rural natural landscape, (d) temporary disturbance of sound in the nearby homesteads, (e) possibility of spreading, piling, storage of construction materials or construction of labour sheds on surrounding private lands, (f) risks of drainage congestion and water logging if the box/pipe culvert is not constructed across the access road, (g) risk of spreading Covid-19 pandemics with other contagious diseases if proper EHS training and Covid-19 hygiene with adequate sanitising materials are not provided, (h) risk of blasting transformer and spreading of fire in the nearby community if adequate cooling and fire fighting arrangement are not maintained, (i) risks of accidental death due to electrocution if the substation is not protected by constructing high boundary wall with safety fence.

All adverse impacts are manageable and can be eradicated and/or minimised to a tolerable level by implementing and monitoring the EMP prescribed in Chapter-VI, Section 6.3 and 6.4.

The positive impacts are (a) supply of optimum power to the irrigation pumps and the locality, (b) access road to the substation and the surrounding agricultural fields, (c) income generation/employment opportunity for the local workers, labours, contractors/sub contractors and grocers.

The significant adverse and beneficial impacts of the project are summarised below.

Adverse imImpacts	Proposed mitigating measures
<ul style="list-style-type: none"> ➤ Air, water and soil pollution ➤ Risks of accidents and workers' health hazards, ➤ Risk of road accidents, disturbance of local people, damage of local road networks, ➤ Loss of crops or delay in cropping due to delay in installation of irrigation pipes and electricity transmission lines across the field, ➤ Conflicts with local people, ➤ Loss of valuable flora along khals, ➤ Risk of oil and PCB spillage in the local environment and communities, ➤ Risk of fire hazards from substation ➤ Risk of spreading Covid-19 at community 	<ul style="list-style-type: none"> ➤ Watering on dusty unpaved access roads, ➤ Covering of trucks to prevent dust emission, ➤ Adherence to traffic laws and regulations, ➤ Minimize activities during prayer time /rest hours, ➤ Provide healthy accommodation & sanitary facilities to workers in the camp site, ➤ Ensure EHS and labour laws, ➤ Recruit workers locally, ➤ Minimize destruction of bank vegetation ➤ Schedule works in the lean season and complete works rapidly to unwanted delay not to disrupt water (irrigation) supply system, ➤ Ensure fire fighting arrangement in the substation site

level	➤ Train the people on fire fighting once in a year.
➤ Risk of contamination of waters resources and food systems by agro-chemical like fertilizers, pesticides etc and toxic PCBs from transformer	➤ Ensure agriculture extension to support timely and correct pesticide application, introduction of IMP, ➤ Ensure safe storage, handling and disposal of PCBs.

The rice production in the area will increase considerably. However, over all agricultural production will increase which may lead to a regional socio-economic uplift? Main Positive Impacts of the Project are as follows.

Project activity	Related positive impacts
Improved supply of irrigation water to agricultural lands	<ul style="list-style-type: none"> • Increased crop production • Improvement of socio-economic conditions of farmers • Socio-economic uplift of the region • Contribute in national food security, • Increase in number of permanent jobs in agriculture.
Construction activities	<ul style="list-style-type: none"> • Creation of temporary job opportunities
Agriculture support services and cost recovery activities	<ul style="list-style-type: none"> • Income generation of woman and poor people and biodiversity conservation
Construction and installation of electrical substation	<ul style="list-style-type: none"> • Efficient power supply to the irrigation pumps, households and other commercial and educational institutes

The project is primarily a rehabilitation and modernization of the existing irrigation systems. The environmental issues are primarily a function of the original scheme constructed 30years ago and not the proposed additional interventions under the IMIP.

As the squatters will be rehabilitated on the same place of the coastal embankment and the electrical substation is indoor type and Poly Chloride Biphenyl (PCB) will be required to change once in decade by the BREB according to the Stockholm convention signed by GoB so no significant adverse impacts will be found if the proposed EMP and its monitoring is followed properly.

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CHAPTER I- THE PROJECT DESCRIPTION

1.0 INTRODUCTION

In accordance with Asian Development Bank (ADB) guidelines an Environmental Assessment and Review Framework (EARF) was required for all investments funded by the MFF. The EARF outlines the environmental assessment and review frameworks that had to be applied to the program subprojects. BWDB was responsible for preparing the required environmental assessments and obtaining ADB concurrence prior to implementation. These approvals must be in place prior to finalization of contracts and commencement of work.

An Initial Environmental Examination (IEEs) had been carried out in 2012 for the Muhuri Irrigation Project (Trench-I) which has been performed to make the project environmentally sustainable including assessment of the impacts of climate change. More over an EIA was also carried out and ECC was obtained from DoE (Annex-IV) to comply the environmental compliance of GoB. This RIEE study has been developed based on both primary and secondary data.

1.1 RATIONALE OF REVISING THE IEE REPORT

The IEE study was conducted in 2012 and the IEE report was prepared in 2013. During the reporting period the demand of electricity was less in comparison to the present growing demand. That's why during the preparation of first DPP (2014) of this project it was assumed that the existing infrastructure and establishment of the power distribution company in the project area (Feni) would be enough to supply the electricity to the rehabilitated and modernised Muhuri Irrigation Project (MIP), Trench-1 of IMIP. So, no provision of establishing an electrical substation was included in the 1st DPP. But during the long period of implementation of MIP (2014-2020) it has been envisaged that the population within the project has increased and keeping pace with those economic activities, standard of living and also power consumption have been increasing rapidly. As a result, existing power supply infrastructure is not sufficient to supply uninterrupted power supply to 850 newly installed irrigation pumps (each of 5-10 hp) of the project specially during irrigation season. That's why the DPP has been revised (2019) by including the provision for purchasing 0.40 acre of land and installing a 33/11 KVA power substation and the major project financing partner (ADB) has been requested for additional investment to implement MIP effectively. According to ADB investment policy an environmental study with a Revised IEE report is required to prepare and submit to ADB for additional loan/financing.

1.2 DESCRIPTION OF MUHURI IRRIGATION PROJECT UNDER IMIP

The MIP is located in the middle of the South-Eastern Region of the country around the confluence of the Feni, Muhuri and Kalidaskhali rivers in the coastal belt of the Bay of Bengal. The project area covers six Upazilas; Feni sadar, Sonagazi, Fulgazi Chagalnaiya, Parsuram and Mirsarai. Mirsarai upazila lies in the Chittagong district the other 5 Upazilas lie in Feni District. The gross project area measures about 40,000

ha, the cultivated area is 28,600 and the irrigable area is 14,050 ha. The MIP is one of the larger irrigation projects in Bangladesh. The location is shown in Figure-1 below.

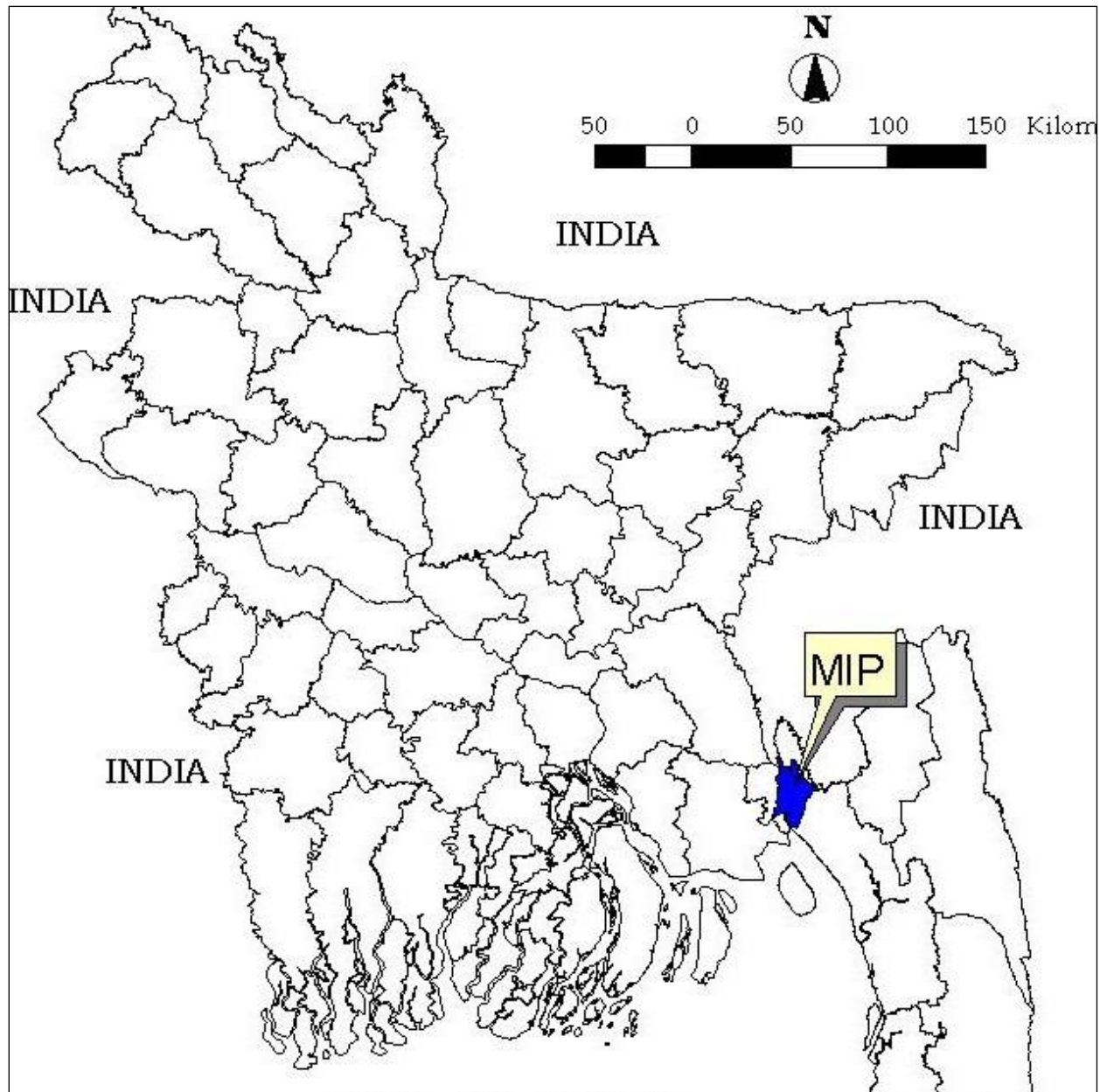


FIGURE 1: LOCATION MAP OF MUHURI IRRIGATION PROJECT (MIP)

The Muhuri Irrigation Project (MIP) has been created in early 1980s by the construction of the Feni Dam and Regulator downstream of the confluence of the Feni, Muhuri and Kalidash-Pahalia rivers. The Feni dam is an earth fill embankment sets up the water level and create a reservoir. The reservoir formed by the earth fill embankment and gated regulator structure provides a source of permanent fresh water, enabling water to enter the natural channels and canal network by gravity. The water is then lifted to agricultural land by small Low Lift Pumps (LLP). The scheme was designed for dry season irrigation as

well as supplemental wet season irrigation. In addition, flood control and protection of tidal water are ensured by the scheme.

The World Bank appraisal for the original project implementation estimated an increase of the Boro rice area from about 6,000ha to 20,000ha. Preventing overland seawater intrusion would bring about 1,200ha of additional un-cropped land into cultivation. The backwater flow from the barrage enables water to enter the natural channels (khals) and canal network by gravity. The water would be then lifted to irrigate the fields by about 800 privately operated low-lift pumps each of 5-14 hp serving about 18ha, allowing for at least one irrigated rice crop a year. Following completion of the project rice production was forecast to increase by 60% providing increased income for about 45,000 families most of whom are small farmers with land holdings of about 0.65ha. Annual rice production would increase from about 73,000 tons to about 145,000 tons at full development.

In 1996 the expansion of the Muhuri project was studied and the Mahuri-Kahua Irrigation Project was developed which partly overlaps the Muhuri Irrigation project. The Muhuri and Muhuri-Kahua project areas are shown in the Figure-3 below.

Initially, farmers experienced major improvement in production and were able to cultivate much larger areas with rice; however siltation of the reservoir and khals has reduced the benefit over the years. The BWDB operates the Feni Regulator the coastal and river embankment and drainage sluices and is also responsible for removing silt from the khals to ensure adequate drainage as well as providing adequate access to water for irrigation. The low lift pumps and the farmer canal systems are currently managed by about 475 private sector pump operators.

1.3 CURRENT ISSUES

The main issue for Muhuri is the gradual loss of area under irrigation. Analysis by the project preparatory technical assistance (PPTA) of the 2011 Boro cropping using satellite analysis estimated the irrigated area from surface water in the Muhuri Irrigation Project (including the Muhuri Kahua) to be about 11,300ha. Groundwater provides an additional 6,600ha of Boro rice. The main causes of the reduction in irrigated area are complex but include:

- (i) Major siltation of the khals and rivers has resulted in much of the irrigation area having no or limited access to khal water.
- (ii) Over the 29 years after construction, the reservoir storage has significantly decreased due to siltation. The original reservoir storage was about 32Mm³ but this has been reduced to about 7Mm³. The current overall storage in reservoir, rivers and khals is 54Mm³ of which 18Mm³ is live storage.
- (iii) There appears to have been reduction in the river flows as a result of increased abstractions in India. Heavy abstraction of ground water is also likely to be reducing the natural recharge to the rivers.
- (iv) There are large annual climatic variations which is affecting water availability, recent cold winters and changes in agricultural practice are delaying the planting dates of Boro rice to late January and

February which puts additional pressure on the scarce water resources during the critical February and March periods.

- (v) The low prices of rice and high prices of inputs including pumping has resulted in many farmers not planting rice.
- (vi) Pump operators find it too expensive to provide water to plots located far from the pumps and most of the irrigated land is a nucleus around each pump.
- (vii) There is a significant drop in the number of operational pumps and the irrigated areas. Pump inventories in 2013 show there are only about 440 operational pumps from an original 800 pumps. The irrigated area from surface water based on 2013 satellite imagery is estimated to be 8400ha in the MIP reduced by 60% from the original target of 23,000ha.
- (viii) Existing infrastructure of Feni Palli Bidyut Samiti is not able to supply power connection efficiently to 850 irrigation pumps are being installed under IMIP-MIP. REB has no capability to install a substation at present in the IMIP area. So installation of an electrical substation is essential for optimum supply of power load to operate the pumps smoothly.

Other issues include deterioration of the coastal embankment and associate's structures which are causing salinity intrusion and impediments to drainage as well as risk from sea water inundation during period's high sea level.

1.4 THE PROPOSED PROJECT STRATEGY

Increased water uses in the upper catchments in India and in Bangladesh has led to some loss of supply. Loss of storage through sedimentation also reduces the water availability. It is likely that increased groundwater abstraction has also reduced the recharge to the rivers. The storage currently only supports about 2,000ha of irrigation.

The limitation of water resources is a major constraint as there is no potential to increase the supply. The role of groundwater has been examined but is already heavily over exploited and no development of groundwater is proposed under the project; there are also environmental issues which need to be considered. Further studies are however proposed to assess the viabilities of improved conjunctive management of the surface and the groundwater. Most of the tube wells are privately owned which limits the scope for groundwater management.

Desilting of the khal will allow many areas to access surface water which are currently unable to irrigate. The increased demand from expansion of the irrigated area through desilting must however be supported by initiatives to reduce water loss and improved water use efficiencies to ensure the supply and demand remain in equilibrium. With current levels of water use efficiencies and storage availability it is estimated that surface water is only sufficient to irrigate about 11,300 ha over both Muhuri and Muhuri Kahua.

To support the expansion of the irrigated area requires water conservation and increased water use efficiency. An integrated approach to improved access to water through desilting of the khal to increase access to wider area combined with water conservation through ; (i) increasing the efficiencies of water distribution to reduce the water losses; (ii) reducing water use by farmers through more precise

irrigation and the volumetric basis of charging; (iii) reducing the quantity of water lost through the boundary of the project through boundary water retention structures and (iii) promoting the diversification from rice to other lower water use crops. The project will also take up pilots and demonstrations of rice cultivation techniques that are less water intensive.

1. The development of pipe distribution systems is proposed to reduce the water losses through improved application, distribution and operational efficiencies. The change from a fixed rate to a volumetric charging system by using a prepaid meter, among users, has shown significant reduction in water use in the Barind project. A schematic and typical layout of the pipe distribution system is shown in **Error! Reference source not found.** Figure-2 below.

FIGURE 2: TYPICAL ARRANGEMENT OF THE UNDERGROUND IRRIGATION PIPELINE DISTRIBUTION

The introduction of prepaid smart card system through the project in conjunction with a buried pipe tertiary distribution system and improved pumping equipment is expected to result in the following:

- (i) Water use efficiency gains of around 39 % from reduced conveyance and operational losses and improved field irrigation practices. The change of basis of charging from a fixed rate per unit area to a volumetric basis is significant to the water use efficiencies.
- (ii) Flexible on-demand irrigation supply to farmers resulting in increased yields as well as support crop diversification.
- (iii) A 15 % shift from rice grown under puddled conditions into non-rice crops, including vegetables. In addition, promoting early planting of vegetables to minimise the water demand during the critical month of March.
- (iv) Pumping (energy) efficiency gains accruing from newer more efficient pumps and motors, and use of pumping equipment that operates efficiently for the discharge and average pumping heads expected for each system.
- (v) 100% cost recovery for OM costs from water users (farmers) by use of prepaid meters with charges based on volume used instead of a fixed rate.
- (vi) Elimination of any exploitation by pump owners and operators or corruption or loss of funds by eliminating cash payments.
- (vii) To allow presently un-irrigated areas to have access to irrigation water.
- (viii) The introduction of on demand irrigation with pumps permanently available, opens opportunities for supplementary irrigation during the whole Rabi and Kharif seasons in addition to irrigation for the Boro crop.

These in turn will enable: (i) about 50% expansion in cropped area; (ii) reduced pumping volumes and costs; (iii) a variety of crops with different planting dates, crop durations and irrigation water requirements, to suit individual farmers; (iv) improved crop yields arising the individual farmers being able to control timing and amounts of irrigations; and (v) sustainable funding for operation and maintenance.

The estimates of current and with-project irrigation volumes and cropped areas are that with the project the net (Rabi) irrigation area could potentially increase from around 11,300 ha to 17,000ha based on: (i) an increase in water use efficiency from 36% to 50%; (ii) a possible crop diversification with 15% of the Rabi cropped area being non-rice; (iii) khal excavation so that all parts of the command have access to water.

Over and above the estimated water savings, the project will also provide agricultural support initiatives to help farmers improve production levels as well as develop water saving initiatives; these would include the use of water saving technologies including system of rice intensification (SRI) and alternate wet and dry irrigation, developing improved cropping patterns and mechanisation. These initiatives will be piloted and demonstrated during years 1 to 4 of the project.

Long term sustainability: siltation of the reservoir will continue but as the reservoir is now only contributing 12% of the live storage further loss of storage will be less significant. Storage in the rivers provides 76% of the storage which would be reasonably stable due to flushing as well as abstraction of sand. The khals which contribute 12% of the live storage will continue to silt but the proposed program of effective maintenance will ensure the storage is maintained. The upstream catchment lies in India so there is no specific scope for catchment management to reduce the level of siltation. Long term

irrigation abstractions in the upstream catchment in India will probably not increase significantly due to the lack of available irrigable land; some increase in water supply abstractions are likely to happen but these are very small relative to irrigation demand. The main long-term mitigation strategy for the project is to continue to diversify from rice to lower water consuming crops such as vegetables and pulses as well as ensuring adequate routine maintenance of the khal.

The investment plan was developed based on close consultation with the Feni Circle of the Bangladesh Water Development Board (BWDB) who prepared estimates of the requirements. It has not been possible to address all of the needs; prioritisation has been applied to measures to increase the irrigation productivity and sustainability. Cost estimates have been prepared based on an analysis of volumes and applying the 2013-unit rates based on the BWDB schedules. The proposed investment incorporates:

- (i) Repair of the original design section of the 22.6 km coastal embankment of polder 60 running from the Feni regulator to the new Little Feni regulator.
- (ii) Rehabilitation of 4 coastal water control structures and construction of 2 new coastal water control structures.
- (iii) River and khal Systems; rehabilitation of 3 water control structures and 5 new water control structures.
- (iv) Excavation of 3.8 million m³ from the 460km of khals to ensure the whole project area has access to water in the Khals during the Boro season as well as providing improved drainage.
- (v) Development of 17,000ha of a modern and highly efficient piped farmer water distribution system to improve timely access to water and reduce water losses. The water savings from the increased efficiency will allow an increased area of irrigation.
- (vi) Provision of prepaid card meters to allow water allocations to be based on a volumetric basis and ensure full and transparent payment and accounting.
- (vii) Full electrification of the pumping to reduce the operational costs and increase management flexibilities. The electrification includes conversion of diesel pump sets to electric and replacement of old electric pumps as well as extension of the grid network to allow connection of pumps.
- (viii) Pilot solar panels and pumps for 30ha
- (ix) Rehabilitation of office space for use by the BWDB and the proposed Irrigation Management Operator

The investment plan is designed to increase the productivity and long-term sustainability of the MIP. The investments have been targeted to improve the irrigation performance and cost recovery. The estimated current and future irrigated areas are shown in Table 1-1below.

TABLE 1: ESTIMATED CURRENT AND FUTURE IRRIGATION AREAS

	Cultivable Area/1	Current Area Boro ha			Future Area of Boro Rice and Non Rice					
		Surface water rice/3	Ground water rice/2	Total rice/1	Surface Water			Ground water rice	Total Surface and GW	
					Total	Rice	Non Rice			
Muhuri	24,800	8,400	3,400	11,800	13,000	11,050	1,950	3,400	16,400	54% increase in area irrigated by SW 38% increase in area irrigated by SW
Muhuri Kahua	13,800	2,900	3,200	6,100	4,000	3,400	600	3,200	7,200	
Total	38,600	11,300	6,600	17,900	17,000	14,450	2,550	6,600	23,600	
Notes	1/ Data from 2011 Satellite Imagery 2/ Data from Upazilla statistics 2011 3/ 8400ha is the estimated current irrigable area from surface water (based on water balance analysis)									

The project area is shown in the Figure-3 below. The main project works including the khal excavation, pipe distribution and electrification are spread over the whole project area. The repairs to the coastal embankment are focused on the west side between the Feni Regulator and the little Feni Regulator.

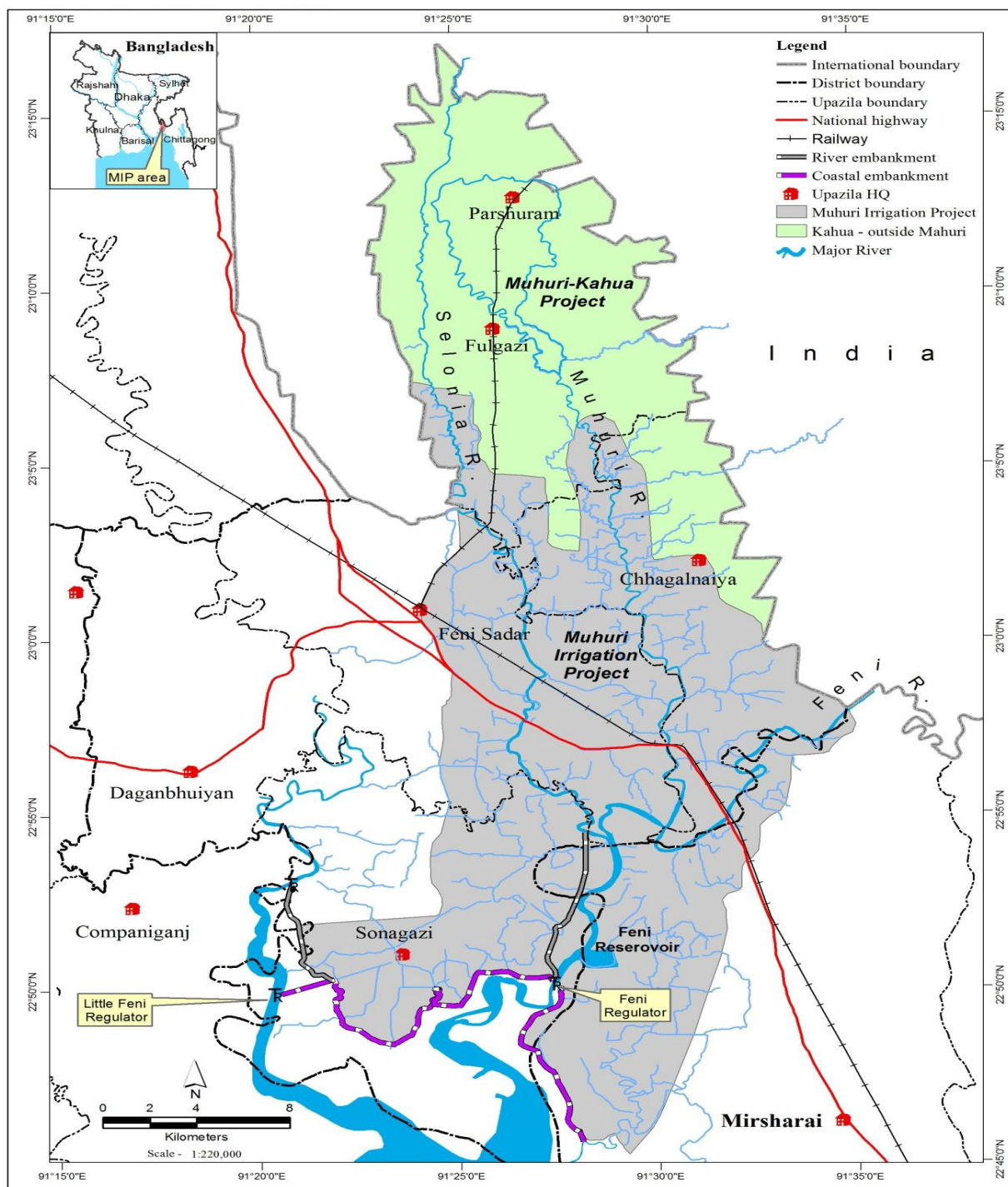


FIGURE 3: MUHURI AND MUHURI-KAHUA IRRIGATION PROJECT

But during preparation of DPP of IMIP, the physical components had gone under significant changes which continued over 2 revisions in 2019 & 2020 during the implementation of MIP based on the field situations.

The physical interventions of MIP have been being implemented from 2016 in the field under 9 contract Packages. The implementations of three packages are completed by 2020 and the remaining are going on in full swing. Finally, in the 2nd Revised DPP, 2020 the following physical components of MIP (Tranche-1) have been distributed along the contract packages and their implementation status are stated in the Table-2 below.

TABLE 2: PROJECT COMPONENTS AND CONSTRUCTION PACKAGES WITH THEIR IMPLEMENTATION STATUS

Package No.	Description of WORKS	Unit	Quantity	Contract Price (mn)	Progress (%)	Status
1	2	3	4	5	6	8
CW-01	Rehabilitation of Coastal Embankment + Re-excavation of Khals Group 1+Re-excavation of Khals Group2	Km	Embank-17.75 Km, Khal-202.00 Km	235.567 (Revised)	81.00%	Completed
CW-02	Re-excavation of Khals Group3 + Re-excavation of Khals Group 4.	Km	Khal 203.00 Km	230.117 (Revised)	92.00%	Completed
CW-03	Farmers' Distribution system, Stage 1: Area 1830 ha: Pipeline	Ha	1830	173.641	93.00%	On going
CW-04	Upgrading of Electrical distribution lines for 18000 ha+ Establishing 1 33/11KVA Substation*	Km / No	210 Km / 1 No	443.600	54.00%	On going
CW-05	Farmers' distribution, pumps and prepaid meters: Stage 2: Area 5070 ha	Ha	5070	574.140	17.00%	On going
CW-06	Farmers' distribution, pumps and prepaid meters: Stage 3: Area 5,400 ha	Ha	5400	657.725	11.00%	On going
CW-07	Farmers' distribution, pumps and prepaid meters: Stage 4: Area 5,700 ha	Ha	5700	749.142	10.00%	On going
CW-08A	Construction of new Water Control Structures, sluice; rehabilitation of structures, Sluice	Nos	11	126.555	95.00%	Completed
CW-08B	Repair of BWDB Buildings of Feni, BWDB	Nos	8	14.597	100.00%	Completed

* The additional component i.e., establishment of an Electrical substation has been included into Contract Package No: CW-04 of the revised DPP and no physical works of it has been started yet as the procedure of land acquisition is going on.

1.5 ADDITIONAL INTERVENTION REQUIRED FOR MIP UNDER IMIP

The requirement of additional interventions i.e., installation of an Electrical substation (Table-02), is already explained in 1.1 of this revised IEE report. A 33/11 KVA indoor type power substation will be installed in Fulgazi Upazilla within the MIP area. The location of the substation is selected by technical

team of Rural Electrification Board (REB) and a total 0.40 acre of land covering BS plot No. 840, 841 and 842 of Doulatpur Mouja (No. 89) of has already been acquired by Deputy Commissioner of Feni in favour of Director, Project Implementation Unit of IMIP-MIP and Executive Engineer, Operation and Maintenance Division, BWDB, Feni (Annex-III). Department of Environment (DoE) has already issued a letter of Clearance on the Location of the proposed substation (Annex-II) in favour of MIP.

Main physical features of the proposed electrical substation

Sl. No.	Main physical features of the Electrical substation	
1	Scheme Type	Indoor type substation
2	No and Capacity of substation	Single unit & Capacity -10/14 MVA
3	Switchgear Type	Vacuum type
3	Type and Insulation of Power Circuit	Medium power vacuum type circuit breaker
4	Transformer Type etc.	Oil filled transformer

1.6 THE MAIN COMPONENTS OF A MEDIUM POWER ELECTRICAL SUBSTATION

According to the state-of-the Art technology components of a 33/11 KVA power substation arranged in linear diagram are as follows-

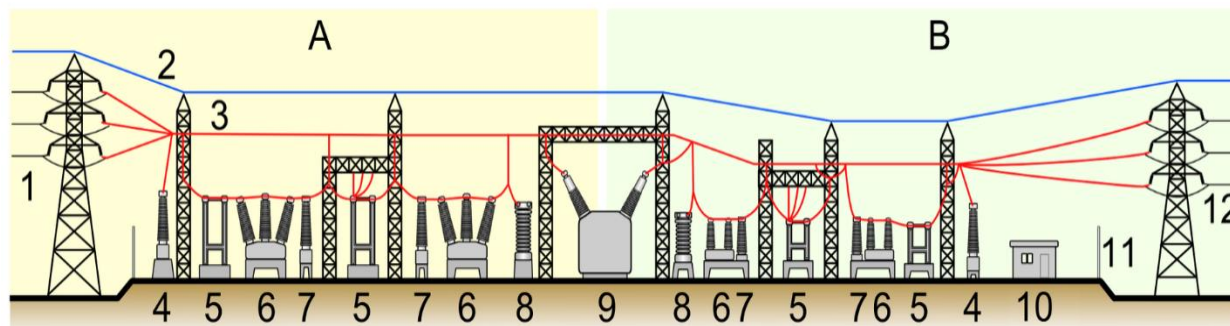


FIGURE 4: LINEAR DIAGRAM OF A 33/11 KVA POWER SUBSTATION (PHOTO SOURCE WIKIPEDIA)

Electrical substation model side-view: Side A-Primary power lines, Side B- Secondary power lines.
1.Primary power lines 2. Ground wire 3. Overhead lines 4. Lightning arrester 5. Disconnect switch 6. Circuit breaker 7. Current transformer 8. Transformer for measurement of electric voltage 9. Main transformer 10. Control building 11. Security fence 12. Secondary power lines

Major components (enumerated above) of a medium type electrical substation are incoming (Primary) power lines (1), outgoing (Secondary) power lines (12) and main transformer (9) in association with some switch and gears for supporting and controlling main units shown in the Figure-4 and all are mounted on a concrete basement. The main function of a power substation is to convert high voltage power (33 KVA) from the transmission into low voltage power (11 KVA) in the feeder lines suitable for

feeding into 850 low lift pumps each of 5-11 KVA consumption capacity. The detail design of the substation is enclosed with this report (Annex-VII).

The proposed substation is indoor type substation where the primary power line with tower (1), secondary power lines with tower (12), overhead power lines with necessary towers (2,3) and main transformer will be in the outdoor (Figure-5) whereas all switches & gears (4,5,6,7,8) and control panel (10) will be installed inside the control building (Figure-6). PCBs are mainly used in transformers to for insulation and cooling the electric coils inside them.



FIGURE 5: OUTDOOR COMPONENTS OF AN ELECTRICAL SUBSTATION



FIGURE 6: INDOOR COMPONENTS OF AN ELECTRICAL SUBSTATION

1.7 IMPLEMENTATION SCHEDULE OF THE PROPOSED ELECTRICAL SUBSTATION

According to the contract Package No CW-4 the construction, installation and commissioning of the proposed substation is February, 2021 to June, 2022. At present the land site has been handed over to the contractor (Energy Pack) and they have filled the site with earth material, rolled and compacted. They constructed an access road temporarily by collecting earth material from the borrow pit (Figure-18) near the substation site. It is a temporary earthen access road for transferring the filling material and heavy equipment trucks. After transfer of those materials the earthen access road will be developed to a metalled one by providing box/pipe culvert underneath. Further construction activities have been stopped till the approval of ADB. After submission of this Revised IEE report and obtaining of ADB's concurrence all construction activities will start in the full swing.

1.8 NEW INITIATIVES FOR IRRIGATION MANAGEMENT FOR MIP

Investing in the rehabilitation and modernization of MIP will only be beneficial if physical improvements are accompanied in parallel with significant strengthening of irrigation management including putting into effect a long-term strategy for OM including: (i) adequate funding; (ii) introduction of new and highly efficient and cost-effective operation and maintenance; and (iii) establishment of an efficient and sustainable management organization.

For the large-scale irrigation schemes the current approaches of Participatory Irrigation Management (PIM) through Government and the water users is proving ineffective. Options for large scale irrigation schemes were examined in 2011 under the ADB TA DIAMMIS which developed proposals for long term sustainable management of the MIP and presented the conceptual framework for the use of third-party management operators to address the current short-comings.

1.9 PROPOSED APPROACH FOR MUHURI PROJECT UNDER IMIP

Currently the Muhuri water is managed by about 475 individual private pump operators who sell water to farmers without regulation. BWDB operates the main regulator and undertakes maintenance work within the limitation of available funds. WUA provide some coordination and liaison activities.

To rationalise and improve the efficiency of the operation and maintenance of the irrigation system. It is proposed that a third-party Irrigation Management Operator (IMO) is contracted by the BWDB to manage the Muhuri Irrigation Project (MIP) on behalf of the government and water users. For Muhuri it is proposed that the IMO will initially be contracted to manage, operate and maintain the Level 2 infrastructure (the khals and minor water control structures) and Level 3 infrastructure (the tertiary systems including the low lift pumps and the proposed pipe water distribution system).

The management of the Level 1 infrastructure – the main regulator, closure dam, coastal embankment, and main rivers would remain with BWDB with the exception of small regulators in the coastal and river embankments which would be assigned to the IMO. The vulnerability of the coastal embankment to natural disasters and large size of the closure dam and regulator make it less appropriate to assign to the IMO at this stage; but could be considered in the future. The operation of the reservoir would follow

agreed operation rules to be developed by the BWDB and the IMO in coordination with the Implementation Coordination Committee (ICC).

It is proposed to develop the management of MIP scheme in two stages; (i) a performance-based Management Design, Supervision and management contract through an Irrigation Management Operator (IMO) over a five-year period; and (ii) followed by a lease contract also through an irrigation management operator (IMO) for a period of around 15 years.

1.10 PROPOSAL FOR THE STAGE ONE MANAGEMENT CONTRACT

The Irrigation Management Operator (IMO) of the MIP under the first stage from years 1 to 5 would be contracted by BWDB to a private company or consortium through international competitive bidding. The contract will be for a five-year period with the IMO responsible for the OM for MIP including the establishment efficient revenue collecting through the prepaid meter systems. In addition, the IMO would be responsible for the (i) supervision of construction of all the investment contracts; (ii) the design for tertiary level infrastructure (farmer canalization and low lift pumps) and (iii) the development of pilot agricultural demonstrations and cost recovery activities. In addition, the IMO will be responsible for the supervision of implementation of the environmental management plan.

CHAPTER II- BASELINE ENVIRONMENT

2.0 DESCRIPTION OF THE ENVIRONMENT

Natural environment in the MIP area are not changed significantly over the last seven years after 1st IEE study. Social environment especially settlements, commercial activities and establishment of brickfields has gone through certain changes. Brickfields have been found detrimental for MIP as those are being established on the agricultural lands reducing the command area of MIP. Some project area of MIP especially in the Mirshawrai, Chattogram has been occupied by Bangladesh Economic Zone Authority (BEZA) for establishing an industrial park. Another attempt has been taken by some private entities to acquire agricultural land within MIP area at Chagolnaiya, Feni which will also reduce a small part of MIP command area. Some poultry farms established on the bank of MIP irrigation canal banks are also polluting the canal water by dumping poultry wastes.

Location of proposed Electrical Substation (ES) site: The site for ES has been selected in the northern end of Bondhua village of Doulatpur Union (BS plot No. 840, 841 and 842 of Doulatpur Mouja No-89) of Fulgazi Upazila of Feni district. Geographical position of the centre point of the substation site is 91°25'59.05"E and 23° 3'36.40"N (Figure-7).



Figure 7: Location Map of Proposed 33/11 KVA electrical substation

The area selected to acquire is 40 decimal which is about 150 feet long and 100 feet wide. The site is situated in the eastern side of Feni-Porshuram road and within 10 meters from the road. The eastern

side of the proposed site is open agricultural field through which a canal has passed (Figure- 7 & 8). In the west of the proposed site, the Feni-Parshuram High way runs behind which a small settlement composed of mostly 5-7 houses (Figure-7, 10 & 11) is over there. There are also 5 houses built scattered alongside the high way and open fields to the north of the site (Figure-7, 12 & 13) and Bondhua village to the south (Figure-7, 14 & 15).

Present condition of the proposed substation site: The access road to the site and the entire site selected for construction of electrical substation is filled up (Figure-9) by earth material and raised about 5 feet high from the ground level. The earth material is supplied by sub-contractor who collected them from nearby borrow pits available both the side of the Feni-Porshuram high way, bank of project's irrigation canal where spoil earth was deposited during excavation, river beds, ditches and private ponds. The construction has not been commenced. It will be started very soon after submission of this revised IEE, obtaining concurrence from ADB and renewal of ECC (Environmental Clearance Certificate) from DoE.



FIGURE 8: OPEN AGRICULTURAL FIELD IN THE EASTERN SIDE OF THE PROPOSED ELECTRICAL SUBSTATION



FIGURE 9: THE SUBSTATION SITE HAS BEEN RAISED ABOUT 5 FEET HIGH BY FILLING EARTH MATERIAL



FIGURE 10: FENI-PORSHURAM HIGH WAY PASSED BY THE WESTERN SIDE JUST 10 METERS AWAY FROM THE SUBSTATION SITE



FIGURE 11: A SMALL SETTLEMENT TO THE WESTERN SIDE OF THE PROPOSED SUBSTATION SITE



FIGURE 12: A HOUSE AT THE NORTH-EASTERN CORNER OF THE SITE



FIGURE 13: OPEN AGRICULTURAL FIELD TO THE NORTH OF THE SITE



FIGURE 14: BONDHUA VILLAGE TO THE SOUTHERN SIDE OF THE PROPOSED SUBSTATION SITE



FIGURE 15: A BORROWPIT PASSING BY THE WESTERN SIDE & A BOUNDARY PILER MARKED RED AT THE SOUTH-WESTERN CORNER

2.1 AGRO-ECOLOGICAL ZONE

The physiographic unit of the project at upstream is: Chittagong Coastal Plain (AEZ# 23), sub-regions are Piedmont Plains and River Flood plain(23a) and Young Tidal Floodplain(23b) with general soil type Non-Calcareous Grey Floodplain Soils(non-saline) in both of the sub-region soils. The soil texture in both of the sub-region soils is loamy. The landscape of the area-comprised of mainly medium high land to high land. The soil type pre-dominates with Non-Calcareous Grey floodplain soils(no-saline).

The physiographic unit of the project at the mid and downstream of the project Old Meghna Estuarine Floodplain (AEZ-19), sub-region is High (19a) with general soil type is Non-Calcareous Dark Grey Floodplain Solis with texture loamy. The landscape is highland. The O.M. is medium (1.7% to 3,5%) and general land fertility is moderate (District Agriculture Census 2001) throughout the project areas,

2.2 CLIMATE

In this region there are three main seasons which are as follows-

- **The Southwest Monsoon:** May to October- 90% of the annual rainfall occurs during this period and relative humidity is high.
- **The Northeast Monsoon:** It lasts from November to March.
- **The Hot Summer:** This hottest season extend from about late March to May. The highest daily temperatures generally occur at this time, and Flash floods often occur from the rivers entering the eastern part of the region from the Tripura Hills.

2.2.1 RAINFALL

The highest rainfall occurs in the south of the region, particularly around Ramgati. The mean annual rainfall at Noakhali is 3 200mm and decreasing north wards to about 2,271mm at Comilla. According to the data available for the station Parshuram (1192– 2002 the average monthly rainfall varies from 3 to 445mm. At this station, the average annual total amount is 2,285 mm. The rainfall (Parashuram) and temperature (Comilla) characteristics are presented in the Figure-8.

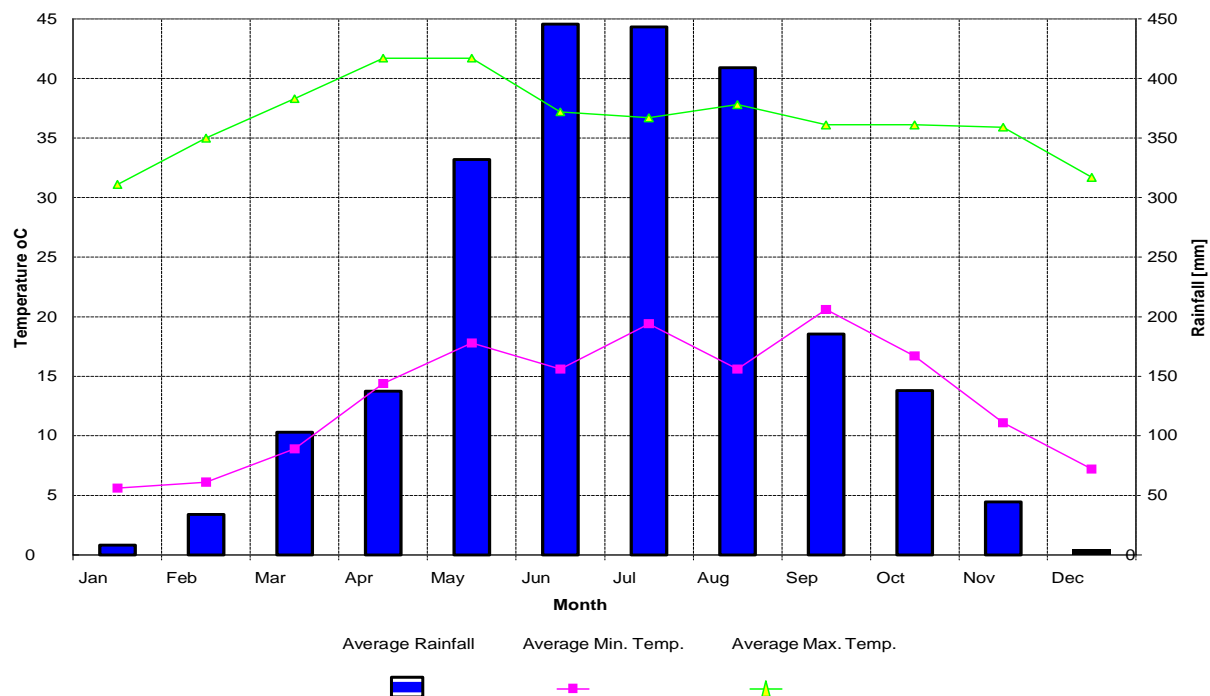


FIGURE- 4: ANNUAL RAINFALL DISTRIBUTION IN THE MIP AREA

2.2.2 EVAPO-TRANSPIRATION

Evapo-transpiration reaches its maximum level in April when temperature, sunshine and wind are all at, or close to, their maximum levels for the year. Potential evapo-transpiration data for 4 stations of the Region are presented in Table-3

TABLE-3 MONTHLYPOTENTIAL EVAPO-TRANSPIRATION (MM)

LOCATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
CHANDPUR	68	82	129	146	139	107	109	112	103	101	77	62	1235
COMILLA	71	89	138	152	144	120	118	122	111	103	81	64	1314
FENI	72	89	130	143	145	115	113	117	110	106	81	68	1288
MAIJDEE COURT	67	83	125	145	141	106	106	115	104	101	78	66	1238

Source: NWRD, WARPO (2020) from BWDB data.

The topographical levels of the project area vary from 7-8m public works datum (PWD) in the north to 4-4.5m PWD in the south and 4.50-5.25 in the west to 5-6m PWD in the east. The area occupies an almost level lands cape of smooth, broad ridges and basins which are underlain by deep silty deposits. In some basins, those silts have been buried by a layer of clay which usually is less than 50 centimetres thick. Seasonal flooding is mainly by stagnation of excess rain water. Soils are relatively uniform within this region, both between adjoining ridges and basins. They are deposited as alluvium, having low to medium ranged permeability. Silty soils predominate, but there are significant proportions of silty clay or clay basin soils in Feni and east of Comilla districts.

2.3 WATER RESOURCES

Major rivers within the project area are the Feni, Kalidas-Pahalia, and Muhuri rivers, in addition, there are many Khals located in the area. Other rivers outside the project area such as Titas, Gumti, Dakatia and Meghna act as the main drainage collectors. Flow data are available for the Muhuri River (at Parshuram) and in the Feni River (at Kaliachari).

Water bodies near the Electrical substation: Bondhua khal average 10 meters wide runs to the north along the side of Feni-Parshuram road touching the boarder of substation and advancing 150 meters to the north again turns right & flow to the south just 100 meters away from the proposed site (Figure-7).

2.3.1 SURFACE WATER RESOURCES

The project area lies in the flood plain of Feni, Muhuri, and Kalidas-Pahalia rivers which flow north to south and fall into Feni reservoir. Surface water irrigation is from the three rivers supported by storage in the rivers, drains and reservoir in the backwater from Feni Regulator. There is a significant level of groundwater.

An assessment of the available surface water to the Muhuri irrigation area (excluding Muhuri Kahua) has been carried out based on BWDB flow gauging data supported by some direct measurement of flows during March and April 2013. Flow and water level measurements are constrained by the very low velocities in the rivers which increases the inaccuracies of measurement. The 20years of flow data is shown in Table-4 which shows a number of inconsistencies. The 75% dependable flow which is norm for Bangladesh has been estimated to provide a total of 180 Mm³ over the period December to April. The total flows from the three rivers are summarised in Table 5 below. There is no flow measurement of the available water to the Mahuri Kahua irrigation area

TABLE-4: FLOW DATA 1991-2012

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991	20.2	14.0	11.0	16.7	147.3	170.3	293.0	212.9	206.1	126.3	52.0	34.9
1992	21.8	19.3	119.9	13.3	15.4	113.6	49.9	132.5	96.6	57.8	22.5	9.5
1993	16.4	18.0	25.3	18.1	83.1	56.1	190.3	90.7	120.9	76.7	53.2	35.7
1994	30.2	23.5	4.5	27.7	47.8	100.6	277.6	146.5	111.8	80.8	47.5	42.8
1995	25.0	17.8	49.3	16.4	197.4	127.1	245.3	327.8	66.8	69.3	26.6	28.9
1996	16.1	14.4	12.0	12.2	74.9	154.0	60.0	128.0	41.0	99.0	166.7	19.7
1997	19.3	15.8	14.5	26.8	48.1	68.6	138.8	158.5	112.1	39.8	13.0	15.4
1998	32.2	31.7	24.3	43.4	86.1	256.6	112.7	176.2	197.3	69.2	49.0	26.4
1999	32.4	17.5	24.2	28.5	28.5	94.8	70.4	134.3	93.4	84.4	50.0	38.2
2000	25.2	34.1	43.8	48.9	122.5	143.2	184.1	245.8	125.4	90.8	92.6	77.3
2001	43.8	35.2	34.2	53.7	19.3	28.1	22.9	35.4	43.6	37.6	23.0	8.1
2002	4.1	1.7	1.1	1.0	2.2	32.2	222.9	72.7	23.4	23.0	9.3	4.1
2003	1.8	0.9	1.1	3.5	0.9	48.1	11.0	25.3	29.7	27.0	20.1	4.7
2004	1.3	0.8	0.7	10.5	0.7	72.7	107.8	363.6	236.3	250.1	174.9	144.5
2005	69.5	12.9	14.7	18.0	73.9	135.7	147.9	224.4	163.1	203.6	160.3	119.3
2006	85.8	82.0	81.7	95.4	90.1	169.1	214.3	313.1	137.2	117.4	90.2	83.7
2007	77.4	15.8	30.8	53.0	179.9	227.1	82.7	20.8	89.0	74.2	-	-
2008	21.4	14.7	15.1	14.1	19.4	31.5	52.2	114.0	104.9	103.3	102.2	100.7
2009	3.3	2.1	2.5	3.2	7.2	5.9	79.6	213.0	166.7	110.8	110.0	104.8
2010	40.7	11.6	7.4	7.3	27.2	89.5	76.4	86.5	76.4	91.9	55.1	34.1
2011	38.5	39.5	44.1	44.7	48.1	46.8	111.4	227.5	107.1	47.9	24.2	35.9
2012	33.0	27.9	33.5	34.0	106.6	119.1	99.5	-	-	-	-	-
Average	30.0	20.5	27.1	26.8	64.8	104.1	129.6	164.3	111.9	89.6	63.9	46.1
75% dependable	16.5	11.4	10.0	14.1	21.1	58.3	68.8	105.2	61.9	50.4	30.5	20.1

TABLE 5 DEPENDABLE SUPPLY TO MUHURI M3/S

River	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Feni	13.2	9.2	7.4	11.6	15.7	31.9	42.1	69.7	39.2	31.4	18.5	14.9
Muhuri	2.1	1.4	1.6	1.6	3.4	16.5	16.7	22.2	14.2	11.9	7.5	3.3
Kalidash Pahalia	1.2	0.8	1.0	1.0	2.0	9.9	10.0	13.3	8.5	7.1	4.5	2.0
Total	16.5	11.4	10.0	14.1	21.1	58.3	68.8	105.2	61.9	50.4	30.5	20.1

2.3.2 LONG TERM IMPACTS OF UPSTREAM ABSTRACTIONS

The area of the catchments in India and Bangladesh based on 1977 feasibility studies are shown in 6 below.

TABLE 6CATCHMENT AREAS

River Catchment Area	India		Bangladesh		Total
	Km2	%	km2	%	km2
Selonia	166	62%	101	38%	267
Muhuri	787	71%	316	29%	1,103
Feni	539	37%	927	63%	1,466
Total	1,492	53%	1,344	47%	2,836

The water sharing agreement for the Feni River remains under discussion. Bangladesh has agreed to allow 1.82 cumec (60 cusec) of water withdrawal by India for drinking purposes and there is an offer is to share the Feni river resources 50:50 basis, but this has not been ratified. The irrigation areas in India relative to Bangladesh are relatively small; of the order of 2000ha compared with the proposed

17,000ha in Bangladesh. The irrigation is upland irrigation and return flows about 50% might be expected from both irrigation and drinking water. Agreements for the Muhuri and Selonia rivers are still pending.

Without assessment of the total water resources and current abstractions in India and implementation of a rainfall runoff model, it is difficult to assess the implications of different water sharing scenarios. The flow monitoring data indicates no decline of water coming from India but the quality of the monitoring needs to be upgraded.

2.3.3 ADAPTATION STRATEGY

The proposed irrigation area is based on 75% dependable flow measured at two measuring locations in the Feni and Muhuri rivers. There remain uncertainties in the quality of the historic data as well predicting the future flows. The proposed area of 17000ha has however has been based on conservative estimates of efficiency and the crop water requirements. Some additional efficiency through the change to a volumetric system would further increase the efficiencies but these have not been quantified and are not incorporated into the water balance.

The strategy to meet any future reduction of flows is to support diversification to non-rice crops during the Rabi season together with development of more efficient scheduling of crops to match the water availability. February and March are the critical months with the river flow recovering quickly to the rains in April. Under a scenario if the inflows were cut by 50% then 17,000ha of irrigated non-rice crop could be supported during the January to March. This could be followed immediately by an Aus rice crop once the flows recover in April. Use of improved shorter period rice varieties with access to irrigation and improved drainage could allow for two to three rice crops during the period of adequate water availability April to December. About 30% of the project investment will be to excavate the khal which will support access to irrigation as well as improve the drainage which will open significant opportunities to intensify the cropping during the periods April to December.

There are many constraints to adjusting cropping and diversification. From experience it has been demonstrated that farmers will be more open to changes in agriculture practices when they face critical water shortage situations and change is supported through demonstrations and training in improved agricultural practices. A key part of the terms of reference for the Muhuri Irrigation Management Operator will be to improve the quality of flow monitoring as well as develop and promote long term and sustainable cropping systems.

More detailed studies on the upstream hydrology and the potential risks from increased abstraction in the upper catchment are ongoing and will be presented in the PPTA Final Report.

The estimated storage has been assessed based on surveys by DIAMMIS during 2011 and IMIIP during 2013. The overall storage of the project including the reservoir, rivers and khal is 54Mm³ of which 17Mm³ above level 3.0m PWD is live storage. Significant sedimentation has occurred since the construction of the project 29 years ago mainly in the reservoir which has lost about 24 Mm³ or 80% of its total storage as well as the khals which have lost about 3.5Mm³ or 30% of their total storage. Storage is currently contributing to about 2,000ha of the irrigation. The loss of storage is expected to stabilise as

storage in the reservoir is already largely lost and the rivers which now provide most of the storage are largely self-flushing. Storage in the khals will be preserved through periodic desilting which will also increase irrigation access currently not possible over much of the scheme due to sedimentation in the khals.

2.4 GROUNDWATER RESOURCES

There is currently heavy use of groundwater for irrigation which is used to support the shortfall of surface water. Shallow groundwater is available within 2 to 4m below the ground surface in the project area but its quality it is not good and availability is variable. The groundwater is exploited by shallow tube wells for irrigation and deep tube wells with hand pumps for drinking water. There are a few deep tube wells where good quality water can be abstracted at a depth of greater than 150m for irrigation these can potentially provide yields of about 20 l/s.

Recharge of groundwater in the project area occurs by slow vertical percolation of rain irrigation water, seepage loss of the run-off the rivers and stored water in canals, khals, streams and rivers in groundwater. There is net groundwater inflow from the uplands to the north which may be a main source of recharge. The rate of percolation of water derived from rainfall to the aquifer is retarded due to thickness and impermeability of the upper clay layer. Recharge begins from the month of May peaks during August; the upper water bearing horizons quickly become saturated and due to the heavy surface soils, much of the potential recharge is rejected.

The Master Plan Organization (MPO) in 1993 estimated the recharge for most of the country based on groundwater modelling studies and is still considered to be the best and the most reliable assessment. The total estimate of useable recharge by the MPO of the five Upazilas is estimated to be 57Mm³ per year the groundwater is already heavily overexploited with current total annual abstraction within the Muhuri and Muhuri Kahua is estimated to be 92 Mm³ irrigating around 6600ha; this is nearly three times the estimated sustainable abstraction volume. The net water requirements for rice even with some element of conjunctive use are high and around 11,000m³/ha or 11 Mm³/1000ha. Consequently, the use of groundwater is not proposed as an option to meet the estimated shortfall in water required to irrigate the entire command area. Although the immediate use of groundwater is not considered appropriate under the IMIIP project 1 some further studies and modelling are proposed to help get a better understanding of groundwater, including the implications of current abstractions and development of long-term management strategies for surface and groundwater.

2.5 LAND USE AND CROPPING

The Muhuri project area actually consists of the Muhuri project area and the Muhuri Kahua project area to the north. The projects overlap and there is an estimated 12,820 ha of cultivated area lying inside both Muhuri and Muhuri-Kahua projects. The estimated areas of Muhuri and Muhuri-Kahua are shown in Table 6 below.

TABLE7: EXISTING LAND USE AND CROPPING PATTERN

Irrigation Project	Land Use (ha)				Rabi Season Cropping (ha)		
	Total	Settlements	Cultivated	Other	Boro Rice	Fallow	Other
Muhuri Project	43,892	15,265	24,776	3,851	11,843	9,773	3,160
Muhuri Kahua Project	21,731	7,168	13,783	780	6,108	7,136	539
Total	65,623	22,433	38,559	4,631	17,951	16,909	3,700

Source: Analysis of 2011 satellite imagery prepared for the project by CEGIS`

Landuse in the location of Electrical Substation: The area surrounding the proposed Electrical substation is mainly agriculture like rice fields, brick fields, roads, canals and scattered settlements both the side of Feni-Porshuram road (Figure-7 & 20).

2.6 WATER BALANCE

To estimate the future irrigable area reference has been made to the water balance as well as the estimated area of crops from the satellite imagery as well as data on groundwater abstraction from Upazila data. There are some issues of data quality and where possible cross referencing of different data sources is used. The present and estimated future irrigable areas are shown in Table 7. There is currently only very minimal non-rice crop, in the future with-project a change to 15% non-rice is estimated.

TABLE 8 ESTIMATED CURRENT AND FUTURE IRRIGABLE AREAS (HA)

	Cultivable Area/1	Current Area Boro ha			Future Area of Boro Rice and Non Rice/4					
		Surface water rice/3	Ground water rice/2	Total rice/1	Surface Water			Ground water rice	Total Surface and GW	
					Total	Rice	Non Rice			
Muhuri	24,800	8,400	3,400	11,800	13,000	11,050	1,950	3,400	16,400	54% increase in area irrigated by Surface Water
Muhuri Kahua	13,800	2,900	3,200	6,100	4,000	3,400	600	3,200	7,200	38% increase in area irrigated by Surface Water
Total	38,600	11,300	6,600	17,900	17,000	14,450	2,550	6,600	23,600	
Notes 1/ Data from 2011 Satellite Imagery 2/ Data from Upazilla statistics 2011 3/ 8400ha is the estimated current irrigable area from surface water (based on water balance analysis) 4/ Analysis by PPTA given in Appendix 3										

Rice prices are currently very low and the margins for rice farming are minimal. To increase the financial returns agricultural support services will be provided under the IMIIP project and will be implemented by the Irrigation Management Operators (IMO) with the objective of enabling small farmers to take up more efficient water use, crop diversification and adjusted cropping calendars through sustainable practices or developing opportunities for more commercial farming or agribusiness. The IMO as a private service provider can potentially offer a nucleus to provide a variety of self-financing on the ground-services either directly or interacting and engaging with existing government and non-

government organisations. Pilot programs will be investigated and developed during the first five years under Tranche 1 to assess viabilities and response to the agriculture support programs before upscaling.

2.7 WATER QUALITY

Some sampling of water quality is presented in table 8. Iron in water from the shallow tube wells is quite high and farmers report some problems; in some cases, they use a mixture of tube well water and river water. The surface water is of suitable quality for irrigation. The sediment load from the eastern rivers, coming down from the hills in India, is very high during the rainy season. This is likely to be attributed to deforestation in the upstream sections of the respective catchments. The Southeast region is one of the hot-spots for high arsenic concentrations in groundwater. The shallow aquifer has high arsenic concentrations in Chandpur, Noakhali and Lakshmipur districts. The most affected aquifers lie beneath the Meghan floodplains.

TABLE 9 WATER QUALITY

Parameter	Limit for irrigation	Groundwater Shallow Tube well			Surface Water from Muhuri River		
		SP1	SP2	SP3	Dharmo Khal	Koriya	Highway Borrowpit Khal
	Water Quality mg/l						
Total Hardness (as CaCO ₃)	60	36	45	44			
Chloride (Cl ⁻)	<150	26	69	32	15	12	9
Nitrate (NO ₃)	5	0.33	0.71	0.61	0.62	0.96	0.7
Sulphate (SO ₄)	250	1	<1	1	<1	2	1
Arsenic (As)	0.1	0.007	0.018	0.007			
Calcium (Ca)		9	10	9	14	12	13
Iron (Fe)	<1.5 *	3.8	4.1	4.2			
Magnesium (Mg)		6	8	7	8	7	7
Potassium (K)		3.3	4.1	4	3.2	3	3.1
Sodium (Na)	70	50.6	87.3	53.7	25.7	21.3	22.5
pH	6.5-8.4	6.45	6.86	6.98	7.75	8.07	7.21
Zinc (Zn)	1	<.08	<0.08	<.08			
Boron (B)	0.5	0.2	0.2	0.22			
EC(μs/cm)	750	247	426	308	173.8	142.8	144.1

* recommend<4 upper limit

Arsenic contamination of groundwater is the prime concern in the region. The problem was first discovered at the end of 1993; it is very much an issue in the Southeast region. The shallow aquifer has high arsenic concentrations including the, Feni districts.

Recent studies by the Department of Public Health Engineering reveal that excess use of ground water for both irrigation and household use have lowered the ground water table. But recharging of ground water table is not occurring simultaneously due to delaying of rainfall, which could be attributed to

climate change. The increased draw down in the ground water table has resulted in an increase in arsenic contamination due to increase in oxidation-reduction potential in the ground water table at shallow level. Summary of arsenic testing of water wells in the region is presented in Table 10, shows that the most affected aquifers lie beneath the Meghna floodplains.

TABLE 10 CONTAMINATION OF WELLS BY ARSENIC

Division	District	Number of Tests Carried Out				% of Wells Contaminated by Arsenic			
		Field Tests	Pre-existing	Regional Survey	All Tests	Field Tests	Pre-existing	Regional Survey	All Tests
Chittagong	Brahmanbaria	536	51	51	638	42.9	43.1	37.3	42.5
	Chandpur	696	179	58	933	83.6	73.2	89.7	82.0
	Comilla	583	65	110	758	31.7	69.2	65.5	39.8
	Feni	80	38	50	168	42.5	28.9	34.0	36.9
	Lakshmipur	336	300	34	670	66.1	83.0	55.9	73.1
	Noakhali	679	430	48	1157	52.7	80.7	70.8	63.9

Source: DPHE, 1999.

Notes: 1/ The % of wells contaminated by arsenic refers to the Bangladesh Standard for Drinking Water (0.05mg/l). 2/ The field tests and pre-existing laboratory test combine available data from all agencies described in Volume S. 3/ The 'Regional Survey' is the project Systematic Regional Arsenic Survey of 41 districts described in Volume S1.

2.7 NATURAL ENVIRONMENT

2.7.1 AQUATIC ECOSYSTEM

(A) WETLANDS: Originally the project area was part of an estuarine environment, where 3 rivers joined and entered in to the sea (Sandwip Channel). Most of the land that is now under agricultural production was under tidal influence, or at least irregularly inundated by sea water. The area was dissected by a multitude of tidal creeks (khals), as well as small rivulets entering the estuary from the hills on the Eastside. Since the construction of the Feni Barrage, the marine influence has ceased; a fresh water lake has formed behind the Feni Barrage, representing a man-made wetland. In ecological terms, the area has lost much of its value (tidal mudflats, mangrove). A new fresh water environment has replaced them riverine conditions.

The aquatic habitats of the rivers, khals, canals, ponds, dighis, ditches, water bodies and the Beels have usual aquatic plants and weeds and the fauna include fishes, turtles and crustaceans in the total project areas. The new fresh water environment is the habitat for new species of fish such as *Bodl*, *Rui*, *Koi*, *Magur*, *Singi*, and herring. Ecologically the most interesting zones in the project area now are the khals, from which irrigation water is pumped. Their banks are generally densely vegetated, providing shelter and food to a variety of birds and other animals.

(B) FISHERIES: The fishery habitats include the Beels, river, Khal and ponds. In rainy season and during high tide saline water fishes migrate from the sea into the project areas through the Kalidas-Pahalia khal due to broken/damaged regulator no.5 and regulator no.10 at Kazirhat as well as through the breached

embankment at the downstream. From the seasonal and perennial water bodies of the total project areas the fish species are found carps (*rui, katla, mrigal, silver carp, grass carp, karpio etc.*), barbs (*putis*), *Chitol, Folai, catfish (Tengra, Singi, Magur, Boal, Pungus)*, Snakehead (*Shol, Taki*), bele, etc. and varieties of prawn (*chingri*). There are more than 1000 ethnic fishers, approximately 3000 neo-fishers (Muslims), more than 4000 subsistence fisher families, more than 800 genuine fish farmers and more than 500 subsistence fish farmers in the total project areas.

Aquatic Ecosystem surrounding the proposed Electrical Substation area: The area proposed for construction of substation is entirely agricultural flood plain formed by Selonja and Muhuri river system. That's why the entire area is dominated by agricultural land mainly rice fields surrounded by Bondhua canal networks and connected to the Selonja River to the west. Moreover, some ponds excavated for raising the homesteads and brick manufacturing are flooded almost every year by flash flood from the upstream of Selonja-Muhuri river system. So, the canals, rivers and ponds constitute the aquatic ecosystem in the area (Figure-16 & 20). The composition of aquatic flora and fauna are more or less similar to those in the entire MIP area described above.



FIGURE 16: BONDHUA CANAL (EXCESSIVELY COVERED BY AQUATIC PLANTS) BETWEEN THE FENI- PORSHURAM ROAD AND THE PROPOSED SUBSTATION SITE (THE RICE FIELD BACKSIDE OF THE TREES)

2.7.2 TERRESTRIAL HABITATS

The main terrestrial habitats of wild life found in the project area are village groves, homesteads vegetations, marginal forests (road side plantations and canal/riverbank plantations/vegetations) and small patches of trees grown/planted along the land borders/corners of agricultural fields.

The wildlife live in those habitats are frogs, toad, snakes, lizards, tortoise, local birds, jackals, rats, shrew, squirrel, wild cats, mongoose, beaver, foxes, tortoise, Mesobag, porcupines and bats are common in the area. Among the birds, moyna, parrots, magpie, cranes, dove, weaver, water hen, kingfishers, woodpeckers and migrating birds are also seen during winter season.

(A) RARE AND ENDANGERED SPECIES: There are no rare and endangered species of flora and fauna are seen in the subproject.

(B) PROTECTED AREAS: There are no nature reserves or sanctuaries or migration corridors for birds/wild animals are found within of the vicinity of the IMIP area specially in the proposed substation site.

(C) CLIMBING ANIMALS: There are no climbing animals like apes, monkeys or python etc in the area which may climb on the electrical transmission tower or lines.

2.8 SOCIO-ECONOMIC ENVIRONMENT

2.8.1 INDUSTRY

The project zone is an agricultural zone. There are no important industries, other than rice processing (part-boiling and drying) plants and brick fields (making, drying, burning, stacking and grinding yards).

2.8.2 INFRASTRUCTURE FACILITIES

In the project area, people use Hand Tube wells and pond water for household purpose. In the dry season water availability of domestic use is quite often insufficient. Sanitation facilities at the communities have been improved over the years but coverage is still limited. Solid waste and sewage management systems are not present in all the area.

The irrigation infrastructure is not functioning in an optimum way due to the siltation of the irrigation canals (originally drainage canals or tidal creeks). These canals need upgrading and re-excavation (which is one of the objectives of the current project). Irrigation facilities in the project area are at present such that there is insufficient water for irrigation; this is caused by raised bottom levels of the canals due to siltation. During receding water levels in the Feni reservoirs, the canals fall dry which mainly affects users at the ends of the canals.

2.8.3 TRANSPORTATION

The main Dhaka-Chittagong highway passes through the project area. Also, the Dhaka - Chittagong rail corridor passes through the project area connecting stations of Brahmanbaria, Akhaura, Comilla, Laksham, Feni and Mirerswari. There are branch lines to Noakhali and Chandpur leaving the main line at Laksham. All railways in this eastern part of Bangladesh are meter gauge. Road communication in the

project area is increasing day by day as government has taken initiative to improve the road system over the last seven years to first IEE study.

The Feni-Parshuram High Way runs through the western side just 10 meter away from the proposed substation (Figure-17 & 20). There is a borrow pit, of maximum 7 m wide in between the highway and the substation site, which has been filled up at many places for making access road to nearby settlements from the high way. In some places the houses and even shops have been built on the borrow pit (Figure-19). The contractor has also made an access road to the substation site by filling the borrow pit. The earth material mostly collected from the borrow pit both the side of the access road (Figure-18). The borrow pits constructed both the side of the High Way serves as also the drainage infrastructure for the villages of its both sides. That's why pipe culverts have been set under each access roads constructed across the borrow pit to ensure the drainage of rain water. But contractor has not set such drainage culvert under the access road to the substation (Figure -17) because the heavier tracks or container mover during carrying heavy transformers and other equipments may damage the culvert.



FIGURE 17: AN ACCESS ROAD BETWEEN THE SUBSTATION SITE AND THE FENI- PORSHURAM HIGH WAY CONSTRUCTED RECENTLY



FIGURE 18: EARTH MATERIAL FOR CONSTRUCTION OF ACCESS ROAD COLLECTED FROM THE BORROW PIT



FIGURE 19: IN PLACES BORROW PIT IS FILLED UP AND A SEMI PACCA MARKET IS BUILT ON IT.

2.8.4 POWER SUPPLY

Towns and their adjacent areas receive power supply from Bangladesh Power Development Board (BPDB). The towns were subject to load sharing, resulting to power failure for 1 to 1.5 hour once or twice a day during the last decade but the situation has improved due to new energy policy and establishing many quick rental power plants throughout the country. In the rural areas power availability is estimated to be around 12 hours in the whole day. In the project area more than 55 % houses are connected to electricity.

2.8.5 LAND USE AND AGRICULTURE

This sub-project uses surface water irrigation water during Rabi or winter season. Cropping intensity is 178%. Triple cropping coverage is 22%, double cropping covers 37% and single cropping is practiced on 41 % of the net irrigable area. The cropping patterns of the IMIIP sub-project are highly dominated by rice. The area for expansion for other crop production is limited due to climatic and agronomic conditions. IMIIP has changed the traditional rain fed farming to intensive irrigated farming. High yielding varieties of field crops are now practiced along with local varieties. Normally, in the IMIIP, MIP water is used for winter irrigation. HYV rice is the main irrigated crop of this sub-project. Pulses, oilseeds, winter vegetables are also cultivated in small areas. Farmers normally grow HYV Aman in Kharif-II season and HYV Aus in Kharif-I by their own managements. Broadcasted Aus, Local improved variety Aus and summer vegetables are also grown.

The main land uses (Figure-20) in the proposed Electrical Substation area are agriculture, settlements, rivers and irrigation canal systems, roads, brick fields etc.

Landuse Map of the Proposed Substation Area, IMIP-MIP

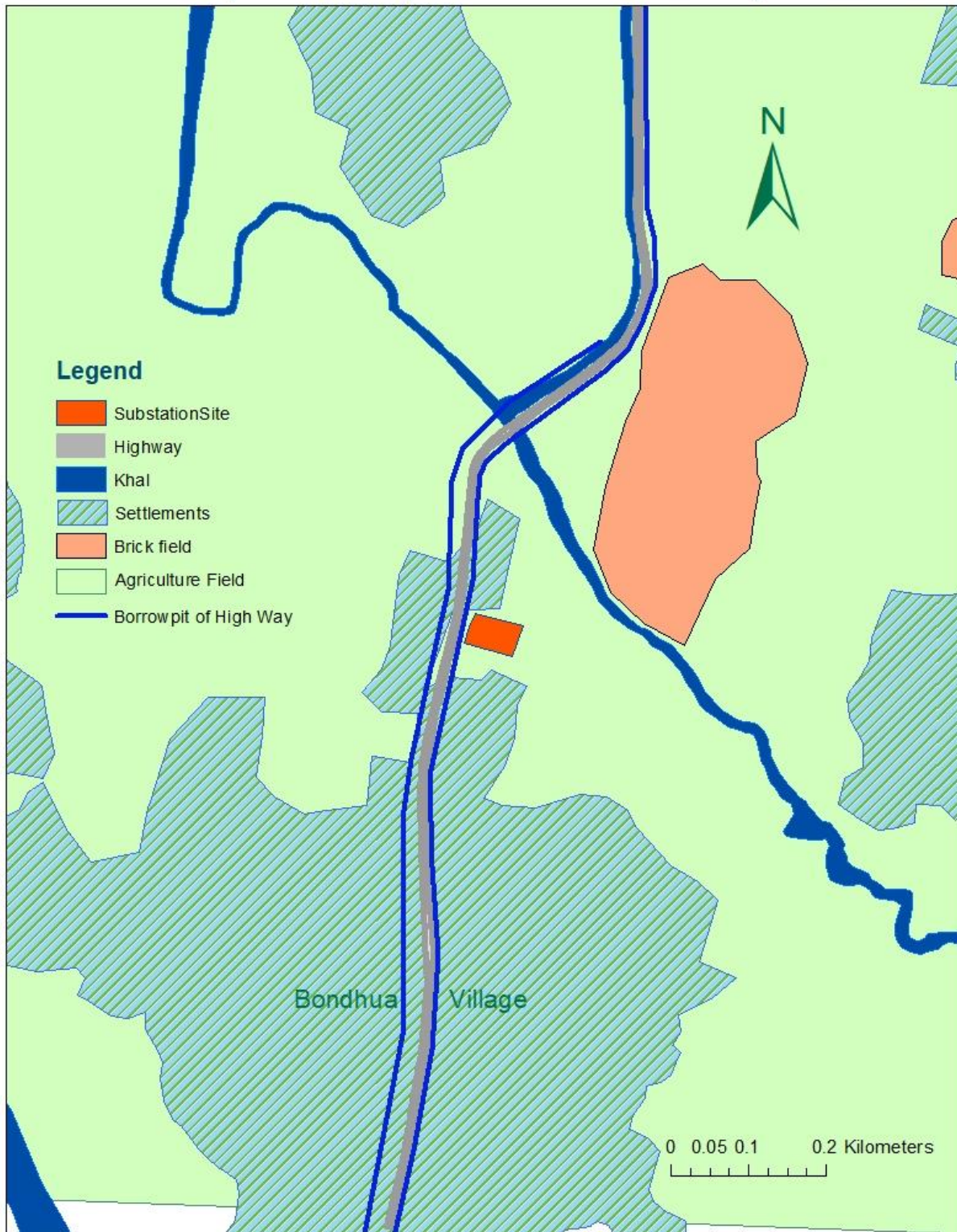


FIGURE 20: SUBSTATION SITE (MARKED BRIGHT RED) AND THE LAND USES SURROUND IT ARE SHOWN ON THE MAP

2.9 SOCIAL AND CULTURAL RESOURCES

2.9.1 POPULATION AND COMMUNITIES

Some of the outcomes of the “Feasibility Study: Irrigation Management Improvement Investment Program’s (IMIIP) Socio-economic and Agricultural Survey are listed below:

- (i) The total estimated population of the 5 Upazilas consists of 479,000 persons
- (ii) Average size of household is 5 persons. The total household no. is 95,800. The main irrigated crops are rice (HYV Boro and HYV transplanted Aman), and others crops are chilli, potato, sweet potato, ground nut, wheat, winter vegetables, pulses and oil seeds.
- (iii) The incidence of (extreme) poverty has been estimated at 18 %, while about 12 % of the population is considered moderately poor.

2.9.2 INDIGENOUS PEOPLE

Indigenous people constitute a very small proportion of the command area population from the statistics indigenous people forms 1.3% of the population. Most of the indigenous people live in Mirsheraï division mainly in the foothills outside the project area. There are only one or two small settlements on the plain where the inhabitants are well integrated with the local Muslim Bengali population and speak Bengali. Since the indigenous do not demonstrate livelihoods systems which are unique, the ADB Indigenous Peoples Safeguards is not triggered. The project is therefore classified as C for indigenous peoples.

2.9.3 CULTURAL, HISTORICAL, ARCHAEOLOGICAL SITES

No historical or cultural sites of national importance are present in and around the project area.

CHAPTER III-POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.0 NATIONAL LAWS AND POLICIES

Bangladesh has a wide range of laws and regulations related to environmental parameters. The most recent and the most important of the environmental laws are the Environment Conservation Act (ECA) of 1995, Environment Conservation Rules (ECR) of 1997 and Environmental Court Act of 2000. The ECR spells out rules and regulations for the enforcement of the ECA. Under the ECR, various development interventions are grouped into three main categories: Green (no environmental assessment required), Orange A (IEE required), Orange B (IEE required) and Red (EIA required) – in accordance with increasing potentials for adverse environmental impacts. Following consultations with the DOE it had been agreed that the project had low environmental impacts and the DOE provided a provisional no objection in favour of the project Director, IMIP which allowed the project processing and approval of the DPP. Once the application is received the DOE made a judgement of the category of the project and classified MIP as a Red category project for which detailed EIA study and EIA report is required for environmental clearance certificate (ECC). BWDB then took initiative to conduct the EIA study, prepared and submitted the EIA report and obtained ECC (Annex-IV) though ADB accepted IEE report as an environmental compliance report for financing IMIP.

Both the ECA and the ECR cover a wide range of environmental issues, but they are neither fully comprehensive nor clear, and comprised of adhoc rules. A more recent legislation for enforcement has been the formulation of the Environment Court Act of 2000, which is authorized to try cases related to offences under the ECA/ ECR. The Cabinet has also approved the Environment Court Bill 2010.

Since the mid-1980s, there had been a growing awareness and understanding in Bangladesh that the natural resources and the environment of the country are being degraded. The Government of Bangladesh recognizes the importance of environmental sustainability as the basis for long term development in the country. Bangladesh is a signatory to Agenda 21 of the 1992 Earth Summit, and it is committed to implement the international legal instrument in its national policies and programs. A National Conservation Strategy was prepared by the Government in 1991, which formed the basis for the formulation of the National Environment Policy (NEP) in 1992.

3.1 LEGAL FRAMEWORK SPECIFIC TO WATER PROGRAMS.

The Water Act passed in May 2013 incorporate various existing water laws related to ownership, development, appropriation, utilization, conservation, and protection of water resources and resolve inconsistencies and conflicts among these. Including the legal basis for ensuring equitable water rights that take account of all uses of water

National Water Policy In article 6, the National Water Policy notes that setting the appropriate legislative framework is fundamental to effective implementation of the water policy. This policy will be given

effect through a National Water Act or Code, which will accommodate the vision and provisions of the water policy and thereby facilitate its implementation.

The BWDB Act (2000): The act covers power and responsibility of the Board, function of the Board, Board general Administration, composition of the Board of Directors, power and responsibility of the Directors and Director General, implementation and management of future projects, transfer of the ownership and management of the existing projects, budget etc. The act requires BWDB to perform the following structural and non-structural functions.

Structural functions include; (i) river & river basin management; (ii) development and construction or erection of reservoir, barrage, embankment, regulator and other infrastructure for flood control; (iii) drainage improvement, irrigation and drought prevention; (iv) augmenting water flows for irrigation, pisciculture, navigation, wildlife conservation, reforestation and overall environmental enhancement, re-excavation of river ways, canal/khal/Beels etc. for optimum changes of water ways; (v) estuary control for land reclamation, accretion and conservation; (vi) river bank erosion control for protection of towns, growth centres, places of historical & national importance; (v) construction and protection of coastal embankment; (vi) prevention of salinity intrusion and mitigation of desertification; and (vii) rain water harvesting for irrigation, environment and water supply.

Non-structural and supportive functions: (i) flood and drought forecasting and warning; (ii) hydrological investigation data collection, compilation and dissemination; (iii) reforestation and fisheries program in BWDB projects, in cooperation with relevant government agencies; (iv) road construction on embankment; (v) research and application; and (vi) organize and ensure local stakeholders' participation for sustainable management of BWDB projects.

The Act was promulgated at a time when it was recognized that there was a need for change in the way the water sector business was carried out. The Act was a response to this and adequately defines the revised roles and responsibilities of BWDB. The issues that relate to the functioning of BWDB and its ability to deliver its defined services in the water sector are not with the Act itself.

3.1.1 NATIONAL ENVIRONMENTAL NETWORK

The national Environmental Monitoring Network, managed by Department of Environment (DoE), was established at the end of 1985. This network comprises a number of locations where environmental quality is regularly tested. These locations include environmental hotspots such as industrial zones, large cities and environmentally sensitive ecological regions. The parameters monitored are basic parameters for air, water, coastal environment, solid waste, noise, acid deposition; Monitoring frequency is 2-3 times per year. The DoE under the Ministry of Environment and Forest (MoEF) has the responsibility for producing a yearly State of the Environment report. The BWDB under the Ministry of Water Resources is responsible for water resources management. It has also the mandate to monitor both surface and ground water (quantity and quality).

3.1.2 APPLICATION FOR ENVIRONMENTAL CLEARANCE CERTIFICATE

BWDB was responsible for obtaining regulatory approval of the project from the Directorate of the Environment. The projects under IMIP which is actually a rehabilitation and modernization of existing irrigation schemes which was normally considered initially as a Category Orange project, i.e. category 'B' as per Department of Environment (DoE), Bangladesh. After submitting the IEE report to DoE for clearance of MIP under IMIP, DoE Categorized it as a Red Category project because for rehabilitation and modernization of MIP 5 new regulators (natural water flow controlling structures) was supposed to be constructed. That's why DoE suggested conducting detailed EIA study of MIP. The procedures for obtaining ECC from DoE, Bangladesh are summarised below.

1. BWDB applied to the DG, DOE for the environment clearance. A copy of the Feasibility Study and IEE report were submitted with the application.
2. The DOE checked the documents, specified MIP as a Red Category project for which an EIA study was required.
3. BWDB prepared a TOR for EIA studies and obtained approval from DoE.
4. DOE provided an interim no objection certificate to facilitate the processing of the DPP preparation,
5. BWDB then conducted the necessary environmental studies (EIA) as specified in the approved TOR prepared by the DOE.
6. BWDB submitted the IEE and EIA for approval including the Submission of the Appropriate Fee for the Environmental Clearance Certificate (ECC) and presented the EIA report in front of ECC committee of DoE.
7. Finally, DOE issued the necessary environmental clearance (Annex-I) under several terms and conditions. No physical works can commence until environmental clearance is received.

National legislative Framework

The national regulatory framework applicable to the proposed substation under MIP, IMIP is briefly described in the table-11 below. It highlights environmental, health & safety issues, National building codes, and social and labour regulations with applicable permits and standards in association with the Project.

TABLE 11: NATIONAL REGULATORY RULES AND ACTS CONCERNED TO THE PROJECT ACTIVITIES

National regulatory	Key requirements	Applicability	Remarks
Bangladesh Environmental Conservation	Mandatory requirement of prior environment clearance for certain category of project for conservation and	Applicable. Project classified under	Site approval certificate is to be obtained from DoE

Act, 1995 (ECA, 1995) and Environment Conservation Rules 1997 (ECR, 1997) ECA & ECR amendment 2000 ECA & ECR amendment 2002	improvement of environment and control and mitigation of pollution of the environment. Standards are described under ECR, 1997 To ascertain responsibility for compensation in case of damage to ecosystem Restriction on polluting automobiles, sale and production of environmental harmful items.	red category. EIA study required to be undertaken.	prior carrying out EIA study. EIA study is carried out on basis of ToR approved by DoE.
Environment Court Act, 2010	To give high priority to environment pollution prevention	Applicable for all projects have potential of environmental threat.	All the developments to be carried out as per ECA 1995 & ECR 1997 and amendments. Regulatory authority is Judiciary and Ministry of Environment & Forest
Bangladesh Wildlife Preservation Act, 1974 and Revision 2008 (Draft)	No person shall damage or destroy any vegetation in any wild life sanctuary & the wild Animals shall not be hunted or captured. For preservation of Wildlife Sanctuaries parks reserves.	Not Applicable. Project site is not located within any wildlife sanctuary/ national park or any other protected area under this act.	Development activity will not have any interface with wildlife or wild habitat at any stage. Regulatory authority is Ministry of Environment and Forest Bangladesh Wild Life Advisory Board
The Penal Code	Chapter XIV of the Penal Code provides offences affective public health, safety, convenience, decency and morals; Section 277: Falling Water or Public Spring or Reservoir; Section 278: Making Atmosphere Noxious to Health; Section 284: Negligent Conduct with Respect to Poisonous Substance; Section 285: Negligent Conduct with Respect to Fire or combustible Matter; Section 286: Negligent Conduct with Respect to Explosive substance. Section 277: whoever voluntarily corrupts or fouls	Applicable.	It is required to take all the measures proposed and suggested by DoE, Bangladesh during both construction an operation phase to minimize the environmental pollution

	the water of any public spring or reservoir, to render it less fit for the purpose for which it is ordinarily used will be punished under the law. Section 278: whoever voluntarily vitiates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the Neighbourhood or passing along a public way will get punishment.		
The Protection and Conservation of Fish Act, 1950 and The Protection and Conservation of Fish Rules, 1985	Prohibit or regulate the construction, temporary or permanent of weirs, dams, bunds, embankment and other structures	Applicable	Necessary permission would need to be taken for road construction crossing water bodies. Regulatory authority is Ministry of Fishery
The Explosive Act, 1884	To prevent any accident due to explosive storage, use or transportation due to careless handling/management	May be Applicable depending on quantity of fuel storage	Fuel will be stored and used at site for running various construction machinery and equipment
Water Pollution Control Ordinance 1970	Prevention of water pollution	Applicable from the prospective of prevention of pollution	Applicable primarily during construction stage (e.g. sewage and equipment washing and maintenance liquid waste discharges at construction camps)
The ground Water Management Ordinance 1985	Management of Ground Water Resources. Tube well shall not be dug in any place without permission from Upazila Parishad.	Applicable, if tube wells will be dug to develop water supply system during operation	Permission should be taken if ground water is used, before digging tube wells

		phase	
Natural Water Bodies Protection Act 2000	The character of water bodies i.e. rivers, canals, tanks, or floodplains identified as water bodies in the master plans or in the master plans formulated under the laws establishing municipalities in division and district towns shall not be changed without approval of concerned ministry	Not applicable. No water body identified as water bodies in the master plans will be filled up	Regulatory authority is RAJUK/Town Development Authority/Municipalities
The Building Construction Act 1952 (with amendments)	An Act to provide for the prevention of haphazard construction of building and excavation of tanks which are likely to interfere with the planning of certain areas in Bangladesh	Applicable as the project involves development of infrastructure	Regulatory authority is Ministry of Works
The Land Acquisition Act, 1894. The Acquisition and Requisition of Immovable Property Ordinance 1982 and subsequent amendments in 1994, 1995, 2004.	To provide appropriate compensation for the land acquired	Applicable	Regulatory authority is Revenue Department
The Vehicle Act, 1927 The Motor Vehicles Ordinance, 1983 The Bengal Motor Vehicle Rules, 1940.	To regulate vehicular exhaust emissions	Applicable as heavy vehicle movement is involved both during construction and operation phase	Regular maintenance and up keeping of the vehicles should be carried out. Regulatory authority is Bangladesh Road Transport Authority
The National Water Policy,	To ensure efficient and equitable management of water resources, proper harnessing and development of surface	Applicable. Ground water may be	Conjunctive use of water should be

2000	and ground water, availability of water to all concerned and institutional capacity building for water resource management	required to be withdrawn for fulfilling water requirement during operation phase	explored
Bangladesh Labour Rules, 2015	Ensure the health and safety compliances of labours during construction, operation and maintenance work and service delivery. Ensure healthy shelter, potable water and protection from pandemics and violence/conflicts	Health and safely equipments, PPE, First aid, compensation for accidental loss and damages,	Construction workers should be provided all safety equipments, materials, ppe, corona vaccination facilities etc by the contractor.

3.2 INTERNATIONAL CONVENTIONS/PROTOCOLS/TREATIES SIGNED BY BANGLADESH

The Government has so far signed, ratified and acceded to over 25 environment-related international conventions, protocols and treaties. Some of the notable ones are the Ramsar Convention on Wetlands, Montreal Protocol on Ozone Layer Depletion, Agenda 21, United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol, Convention on Biological Diversity, and Convention to Combat Desertification. The close relationship between environment and national development planning is embodied in the National Environment Management Action Plan (NEMAP), completed in 1995 with assistance from the United Nations Development Program (UNDP). As a follow-up of the NEMAP and to concretize its vision, the Government executed a UNDP funded Sustainable Environment Management Program (SEMP) between 1998 and 2004, which emphasized several capacity building components of environmental management.

The Government has prepared a National Adaptation Program of Action (NAPA) in 2005 and further revised in 2009, which outlines several climate change adaptation options for the country. A more comprehensive document on climate change, titled „Bangladesh Climate Change Strategy and Action Plan“ (BCCSAP), released in 2008 and further revised in 2009 with 44 programs fewer than six thematic areas. The Government has set up climate change cells in several relevant ministries and line agencies to monitor the activities to mitigate climate change impacts and suggest remedial programs. The Government is planning to set up a climate change department under the MOEF.

3.2.1 STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS (POPS)

A global treaty in May 2001 which was made effective in May 2004 to protect human health and the environment from chemicals that remain intact for a long time and become widely distributed geographically and accumulate in human and wildlife tissue. GOB signed the Stockholm Convention on POPS on 23 May 2001 and was ratified on 27 March 2007. The treaty requires the Parties to take measures to eliminate or reduce the release of POPS in the environment. The POPS of major concern to power sector projects is the polychlorinated biphenyl (PCB) used before as a transformer oil. PCB is not manufactured in Bangladesh and its international production generally was ended in 1980. The transformers to be replaced as part of the project use mineral oil and as shown on the manufacturer's nameplates (which are attached to the transformers) do not contain PCBs; the new transformers will not contain PCBs.

3.2.2 ADB POLICY ON ENVIRONMENTAL ASSESSMENT

1. ADB's environmental and social safeguards Policy Statement, 2009 form the cornerstone of its support to inclusive economic growth and environmental sustainability in Asia and the Pacific. In July 2009, ADB's Board of Directors approved the new Safeguard Policy Statement (SPS) governing the environmental and social safeguards of ADB's operations. The objectives of the SPS are to avoid, or when avoidance is not possible, to minimize and mitigate adverse project impacts on the environment and affected people. Objectives also include helping borrowers strengthen their safeguard systems and develop the capacity to manage environmental and social risks.
2. ADB's environmental safeguards emphasize development and implementation of a comprehensive EMP. Key elements of EMP are mitigation measures, monitoring programs, budgets, and institutional arrangements for implementation. In addition, the environmental assessment process emphasizes public consultation, information disclosure, and consideration of alternatives.
3. The key safeguard areas which must be addressed are (i) environmental; (ii) involuntary resettlement; and (iii) indigenous peoples.

Further, ADB adopts a set of specific safeguard requirements that borrowers or clients are required to meet in addressing environmental and social impacts and risks associated with a specific project. ADB will not finance projects that do not comply with its safeguard policy statement, nor will it finance projects that do not comply with the host country's social and environmental laws and regulations. The safeguard policy statement applies to all ADB-financed and/or ADB-administered sovereign and non-sovereign projects, and their components, regardless of the source of financing.

3.2.3 ADB'S ENVIRONMENTAL SAFEGUARD REQUIREMENTS

Environmental assessment incorporates the following policy principles:

1. Projects are screened and assigned to one of the following categories described in Table 11 as soon as possible.

2. Conduct an environmental assessment for each proposed project. Assess potential transboundary and global impacts, including climate change.
3. Examine alternatives to the project's location, design, technology, and components. Avoid, minimize, mitigate, and/or offset adverse impacts.
4. Prepare an EMP.
5. Carry out meaningful consultation with affected people and facilitate their informed participation.
6. Disclose a draft environmental assessment (including the EMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders.
7. Implement the EMP and monitor its effectiveness. Document and disclose monitoring results.
8. Do not implement project activities in areas of critical habitat, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area.
9. Apply pollution prevention and control technologies and practices consistent with international good practices such as the ADB's Environmental, Health and Safety Guidelines.
10. Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease.
11. Conserve physical cultural resources (PCRs) and avoid destroying or damaging them by using field-based surveys.

The project categorization system and the assessment required are described in Table 12. Most of the environmental impacts of the project are temporary and reversible. The project was categorized as an Environmental Category B project. The project will also address the ADB/ GoB EHS guidelines as they apply to transmission lines and associated infrastructure such as the substations.

TABLE 12: ADB'S ENVIRONMENTAL SAFEGUARDS CATEGORIZATION AND REQUIREMENTS

Category	Definition	Assessment Requirement
A	Likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented, and may affect an area larger than the	Environmental Impact Assessment (EIA)

	sites or facilities subject to physical works.	
B	Likely to have adverse environmental impacts that are less adverse than those of Category A. Impacts are site-specific, few if any of them irreversible, and in most cases mitigation measures can be designed more readily than Category A.	Initial Environmental Examination (IEE)
C	Likely to have minimal or no adverse environmental impacts.	No environmental assessment is required but the environmental implications of the project will be reviewed.
FI	Project involves investment of ADB funds to or through a financial intermediary (FI).	FIs will be required to establish an environmental and social management system (ESMS) commensurate with the nature and risks of the FI's likely future portfolio to be maintained as part of the FI's overall management system.

Source: ADB. Safeguard Policy Statement 2009, page19.

CHAPTER IV- ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 CONSTRUCTION IMPACTS

Overall the specific impacts of each activities will be some generic environmental issues during the construction phase including (i) soil erosion; (ii) localised surface and groundwater contamination; (iii) air (dust) and noise pollution; (iv) contamination from storage and transportation of construction materials; (v) un-authorized dumping or storing construction materials on the neighbouring agricultural fields, homesteads, borrow pits, roads or canals etc., (vi) spreading of contagious diseases or Covid-19 virus among the labours, workers and grocers, shopkeepers, and the local community people, (vii) accidental firing in the labour sheds, injury of labours/workers due to accidental damages during construction/installation of heavy equipments, workers and (viii) community disharmony, conflicts of interest specially during the installation of electric poles in the private agricultural lands or cultural problems.

The mitigation of these generic environment measures will be incorporated into the environmental management plan and incorporated into the contractor's contracts. Mitigation measures will include (i) ensuring proper spoil management placed with slopes that will not erode; (ii) removal and disposal of waste fuel and oil away from the site; (iii) proper storage and transport of toxic materials like PCBs (used in transformers of substation) and highly flammable oil and gas, (iv) establishment of proper worker camps with good hygiene facilities, and (v) good liaison is kept with the community by the supervisor (vi) complying with the ADB's interim health and safety guidelines combating Covid-19 Pandemics (Annex-VI).

4.2 OPERATIONAL IMPACTS

The main operational impacts may be (i) the intensive use of pesticides and fertilisers which can cause land degradation and contamination of the surface and groundwater (ii) localised contamination of land, surface and groundwater resource by oils and toxic coolants like PCB (Poly Chlorinated Biphenyls) used in the transformer for insulation and cooling electrical coil & core and (iii) overheating and blasting of transformers followed by firing in the substation and spreading of fires to control room and nearby homesteads. The access road to the substation may block the surface runoff through the borrow pit across which it has been constructed (Figure-17). At present the situation is not severe but it will create severe drainage congestion and water logging both the side of it.

Summary of Possible Impacts

A summary of possible areas of environmental concern are summarized in Table 13 with an impact evaluation given in Table 14 below.

TABLE 13 SUMMARY OF POSSIBLE IMPACTS

Sl No	IECs	Present Condition	Possible Impact
A. Physical Environment			
1	Regional hydrological regime, flood pattern, etc.	<p>Water scarcity appears in the project areas during dry season/lean period, generally in the upstream and midstream areas.</p> <p>Inundation occurs in monsoon and water logging in pre and post-monsoon is the general hydrological feature.</p> <p>Saline water intrusion occurs through the broken and damaged regulators, breached embankment into the project at downstream areas during rainy season and full tide damaging standing crops. Lowering of ground water level within the dry season</p> <p>Access road to the substation has been constructed across the borrow pit cum drainage canal which drains out the rain water of the Bondhua village.</p>	<p>Re-excavation of khals, reconstruction and rehabilitation of the regulators and water retention structures will reduce water scarcity in dry season/lean period as water holding capacity of the water ways will be increased and hold more rain/flood water in the subproject areas.</p> <p>Inundation and saline water intrusion will be reduced through drainage improvement by re-excavation of the khal and rehabilitation of degraded regulators/sluices along the coastal embankment.</p> <p>Retention of sufficient water in the river and canal system will enhance the ground water recharge and reduce the drying of shallow tube wells in the winter.</p> <p>Access road has blocked the water runoff along the borrow pit cum drainage canal which drains out the rain water of the village (Bondhua) through the borrow pit cum drainage canal.</p>
2	Natural flushing	<p>The upstream and downstream areas are prone to natural flushing in the monsoon.</p> <p>Filling material deposited to the substation site may washout / breach onto the surrounding agricultural fields during flooding or heavy rain.</p>	<p>The project will not create obstacle against natural flushing during the monsoon. Regulated flushing will take place. No impact is anticipated.</p> <p>Strong retaining wall should be constructed surrounding the substation site to prevent any soil erosion/breach and covering the agri-crops. Security fencing also be constructed on the retaining wall.</p>

3	Ground water table	Groundwater table is at normal level as there is no significant abstraction.	No additional groundwater abstraction is proposed. Improved expanded surface water availability may reduce groundwater use and can increase the recharge. Not likely to be disturbed as plenty of water will stand in subproject area in monsoon. Ground water recharge will be increased.
4	Water quality	<p>Water quality may fall due to extensive agricultural practices.</p> <p>Fissile fuels, grease, coolants etc will be used during construction of substation.</p>	<p>Increased agriculture intensification proposed may lead to increased use of fertilizers/pesticides which could increase ground water pollution.</p> <p>Oils and coolants may contaminate the water resources of Bondhua khals and spread to the surrounding downstream if not managed (stored/used/disposed) properly.</p>
5	Water logging and drainage	<p>Some of water logging and drainage is the problem near the upstream and downstream of the project areas.</p> <p>An access road to the substation has been constructed across the borrow pit cum canals without laying any drainage structures like box / pipe culvert underneath.</p>	<p>Water logging and drainage will be reduced significantly by re-excavation of the khal and drainage system excluding natural perennial water bodies. So, drainage condition will improve.</p> <p>The access road will create severe drainage congestion both the side of it. Though the situation is not critical now but it will create severe drainage congestion and water logging during the heavy rain.</p>
6	Erosion and siltation	<p>No erosion but slow siltation of river and Khals</p> <p>Dumping of loose soils/spoils/wastes from the re-excavated river, khals and canal may deposit on nearby croplands.</p>	<p>The project will address siltation of the khals through periodic excavation. Immediately after excavation work there may be some loose soil which may be eroded into the khals and rivers. Siltation of the reservoir will continue but this is not affected by the project.</p> <p>Those spoils are fertile and the farmer will be willing to increase their land fertility by spreading on the cropland.</p>

7	Soil characteristics / fertility	Silty clay occupies most parts of the project areas. Soils are moderately fertile.	Due to increased cropping intensity/crop production land fertility may decrease.
B. Biological Environment			
1	Wetland and aquatic habitat	The rivers, khals, Beels, borrow pits and the ponds are the major aquatic habitats.	<p>The de-silting of the khal will make temporary impacts to the aquatic habitats through removal of some vegetation, removal of benthos on the beds and some increased levels of sediment during the construction. This will be temporary and it is estimated that the natural vegetation and benthos will be comeback in 6-12months.</p> <p>Repairs to small drainage/ salinity control gates in the coastal embankment will reduce the ingress of salt water which will protect crops but may result in some minimal loss of fish movements.</p>
2	Terrestrial habitat	Social forestry within the project areas is present and developed. Vegetation of trees and bushes has increased.	Implementation of the project will require no major clearance of vegetations/trees from the coastal embankment. Some trees on the BWDB land/canal bank/public land may require to be cut for moving long boom excavator to the canal bank.
3	Natural and culture fishery	Natural (capture) fishery in the river, khals, canals and Beels, and culture fishery in the ponds.	There may be some temporary disruption to the natural fisheries during construction but the volume and area of waterways will increase which will help support increased natural fisheries.
4	Wildlife and biodiversity	Moderate wildlife and bio-diversity in the project areas.	No impact on wildlife and biological diversity is expected as the works will be confined to existing embankment/ khals
5	Natural forests and plantation	There is no natural forest in the project areas but moderate vegetation of trees, bushes and social forestations are present.	There is scope for social forestry on the embankment sides as well as the khal banks will be taken up. Implementation of the project will have no impact on natural forests and plantation. Small positive

			impact is expected.
C. Social Environment			
1	Land acquisition/ land loss/ loss of land value.	<p>BWDB owned land is available for river, khal re-excavation, rehabilitation of regulators, sluices</p> <p>40 decimal of land has been acquired for construction and installation of a 33/11 KV electrical substation and 250 km electrical supply lines will be constructed over the private lands from the substation.</p>	<p>No land acquisition will be required either for rehabilitation of canal system, rivers system and coastal embankment or water control structure and LLPs. But 0.4 acre of land will be required to establish a power substation.</p> <p>Proper market price of the land will be given to the land losers. But the private land holders claim that the land value surrounding the substation will decrease significantly, especially those lands over which the power supply lines and the electrical poles will be installed, They expect that the land value will rise rapidly with the change of land use near the high way from cropping to housing & commercial use very soon. So power lines will decrease their land value.</p>
2	Agricultural development	Saline water intrusion effects on Aman crops at the downstream areas and water scarcity delays Boro cultivation and Rabi crops at the upstream and midstream areas.	Agri-crop production will increase due to improved irrigation efficiencies and reduction of water scarcity during dry season/lean period. Inundation will be improved by drainage improvement.
3	Waterways and road transport	<p>Metal as well as earthen roads exist/inside the subproject area. Vans /rickshaw /motorcycle /cars /buses /lorries the main mode of transport. Railway track is present in the area.</p> <p>Feni-Porshuram high way runs by the western side of the proposes electrical substation. An access road has been constructed across the borrow pit between the high way and the</p>	<p>No impact on transport system is anticipated. It is proposed to create a track along one khal bank to support use of mechanical excavation. This can help improve communications.</p> <p>No risk of rural road damage, traffic jam or disturbing the local traffic system as the high way is in good condition and traffic densities are low. The access road will provide the local people access to their fields easily from the high way.</p>

		agricultural fields near the substation.	
4	Employment scopes	<p>Agriculture is the main source of employment. Some income generation activities (IGAs), small business, fisheries, poultry also support employment.</p> <p>Construction of electrical substation and installation of supply line networks.</p>	<p>The project will create 750,000-person days of agriculture. In addition, there will be 500,000-person days of skilled and unskilled required during the construction period.</p> <p>The earth felling, construction and installation of electrical substation and 250 km supply lines will create employment opportunity for the local labours, contractors and grocery providers.</p>
5	Health and nutrition	The landless and the destitute have poor health facilities and nutrition status.	Due to increased crop production and income generation, health and nutritional status will improve. Project will support the expansion of the grid electricity to areas presently with no access.
6	Community impact	<p>There are more than 1000 ethnic fishers, approximately 3000 neo fishers, more than 4000 subsistence fishers, more than 800 families' genuine fish farmers and more than 500 subsistence fish farmers in the project areas.</p> <p>The installation of an electrical substation and a network of 250 km supply net work in the project area.</p>	<p>No significant change. The loss of vegetation due to clearing of khal will quickly return. Increased and expanded network of khal due to excavation will support fisheries.</p> <p>Not only he irrigation pumps but also the community people could use that installations and have continuous supply of efficient power supply in their houses, schools, colleges, shops, markets and small industries.</p>
7	Culture and heritage sites	No cultural and recreational centre and heritage spot within the project area.	May be enhanced cultural activities due to increased economic activity.

TABLE 14: IMPACT EVALUATION MATRIX

Nr	Selected IECs	Positive Impact			Adverse/Negative		
		Unknown	Beneficial	No change	Small	Medium	Large
A. Physical Environment							
1	Regional hydrological regime, flood pattern, etc.		√				
2	Natural flushing		√				
3	Ground water table		√				
4	Water quality				√		
5	Water logging and drainage		√				
6	Erosion and siltation				√		
7	Soil characteristics fertility				√		
B. Biological Environment							
1	Wetland and aquatic habitat			√			
2	Terrestrial habitat			√			
3	Natural and culture fishery				√		
4	Wildlife and bio- diversity			√			
5	Unwanted aquatic weeds and hyacinth			√			
6	Natural forests and plantation			√			
C. Social Environment							
1	Land acquisition/land loss				√		
2	Agricultural development		√				
3	Waterways and road transport		√				
4	Employment scopes		√				
5	Health and nutrition		√				
6	Community impact		√				
7	Culture and heritage		√				

The minor adverse impacts identified simple mitigation of which are proposed below-

- (i) Clearing of drainage/irrigation khals may disturb the natural vegetation which helps stabilization of canal banks. To help stabilize the banks social forestry by IMO as cost recovery program along the khal banks is proposed.
- (ii) Clearing of the vegetation from the drains may impact on the natural refuge areas for fish; this is quite minor and the aquatic vegetation will quickly re-establish there. There is significant scope for fishery and duck rearing practices in the khal, river and reservoir by the WUG as a part of coast recovery program.
- (iii) Land loss for substation will be compensated properly by ensuring the market price.

4.3 IMPACTS RELATING TO SPECIFIC ASPECTS OF THE PROJECT

4.3.1 IMPACTS RELATING TO PROJECT LOCATION

- (i) **Encroachment into forests and wetlands:** The project is an irrigation and flood protection infrastructure rehabilitation project, and most of the project components are located at the same sites of the existing constructions. The project will not encroach any forest. The excavation of khals may damage the densely vegetated banks, and with this, fauna will lose its habitat [*minor temporary impact*]. The vegetation is bushes and grasses and small trees which will quickly reestablish. The project will support social forestry along the khal banks. Periodic maintenance once every six years will result in disruption so fast-growing species to be promoted. If any trees need to be logged, replanting will occur at 1:3.

An electrical substation with supply line will be constructed and installed on/over the open agricultural lands. So there is no scope of clearing forest or other vegetation.

- (ii) **Impediment to movement of wildlife, cattle and people:** Most structures already exist and will only be upgraded at their present location. The khals destined for excavation are mostly natural creeks or drains. By implementing the works, no additional impediments to the movement of wildlife will be created, other than existing in the original situation. Cattle do however graze in the rice fields during the Boro season which may be reduced if expansion of Boro rice is taken up.

An electrical substation will be constructed on open agricultural land just 10 m away from the high way and the supply lines will be installed over the open agricultural lands during the dry season. So the scope of impediment of wild life, cattle and local people is very limited or rare.

- (iii) **Impediment of historical/cultural monuments, buildings and values:** No historical/cultural monuments and buildings of value are known to exist near the construction sites in the project area. In execution of the work, the contractor has to avoid damaging or harming in any way cemeteries and the Hindu shrines that may be in the vicinity of the works.
- (iv) **Conflicts in water supply rights:** In the current situation there are no conflicts in water rights. Implementation of the project will not give rise to any such problems.
- (v) **Regional flooding/drainage hazards:** Drainage will be improved by excavation of the khal. The rehabilitation of the coastal embankments will reduce the risk of flooding.

The substation area is prone to inundation by flush floods from the nearby Indian hilly terrain but the Selonia River is far away from the proposed site. So there is no scope of soil erosion, breach or land sliding from/due to the substation site which has been raised 3 feet above the high flood level recorded in the area. The access road may create drainage congestion in some extent near the substation site.

Downstream impacts: Since the IMIIP scheme is situated on the downstream end of a system of 3 joining rivers; the diversion of water does not affect any downstream user functions. The main relevant issue is sedimentation of the channel downstream of the regulator. If water is not released from the regulator for flushing, the regulator becomes clogged by the downstream sedimentation, deposited there by the in and

out flowing tide. During the dry months, water is conserved in the reservoir to provide irrigation water; flushing through the regulator is minimized. Sometimes the sediment has to be removed (mechanically) because the gates can no longer be operated. This aspect is primarily a water management issue that can be managed by timely flushing. By implementation of the IMIIP, the storage of fresh water in the system will increase. It is anticipated that the irrigation demand will not affect the availability of water for flushing after the end of Boro season. The project will develop operation procedures for the reservoir and gates to optimize the water use and also help support flushing.

4.3.2 IMPACTS AND MITIGATING MEASURES RELATED TO OVERSIGHT IN PLANNING AND DESIGN

- (i) **Suitability of water quality for irrigation:** The quality of the water taken from the inflowing Rivers is suitable for irrigation purposes [*no significant impact*].
- (ii) **Downstream water quality problems:** Increase and intensification of the irrigated agriculture in the project area will lead to increased use of agrochemicals: fertilizers, herbicides and pesticides. At present, no serious problems are known with respect to the water quality of drainage water. The proposed project is estimated to lead to a modest increase in cropping intensity the load of agrochemicals is also likely to increase accordingly. The Ministry of Agriculture, through its extension services, stimulates the farmers to adopt a more rational mode of application of agrochemicals. The project will also introduce improved training and awareness on improved agricultural practices including introduction of integrated pest management (IPM) [*small to moderate significant impact*].
- (iii) **The availability of fertilizer and agrochemicals** are sometimes limited (due to an inadequate distribution and delivery system; the system is state controlled). When the products become available, the farmers may tend to compensate for the late application by excessive use. A timely availability of agrochemicals in sufficient quantity would avoid such behavior. Therefore, the system of distribution and sale of agro-chemical should be improved, possible by full privatization. The efforts by the extension services of the Ministry of Agriculture to teach farmers an optimum use of agrochemicals should be continued, and possibly extended.
- (iv) **Adequacy of drainage planning:** The technical design of the drainage facilities will be based on full technical analysis including requirements for climate change. During the last 10-20 years a number of drainage problems have appeared. A component of the current project is to address and resolve these problems [*positive impact*].
- (v) **Land use conflicts:** Some land use conflicts are may arise, since 0.400 acres of agricultural land are being acquired. The measures to compensate the land losers properly have been taken. Some land holders have already obtained their land value (3 times of the rate fixed by the Department of Land) and remaining are going to have that price very soon. The top up price, to ensure the current market price, has been evaluated by the advisory committee formed by the Government which will be paid very soon.
- (vi) **Inequities in water distribution:** The project aims at improving the canal system of the command area. At present water supply is insufficient due to low conveyance capacity of canals (bed level has raised due to siltation). Furthermore, due to inadequate water management procedures, the tail ends of the system regularly face shortages. Extension and upgrading of the canal system will

improve this situation and the water will be distributed more evenly over the area, decreasing inequities between farmers *[positive impact]*.

- (vii) **Canal maintenance:** OM of irrigation works in Bangladesh has in recent years generally been poor, largely due to inadequate funding. The project will establish improved and more efficient operation and maintenance systems by reorganizing the institutional setting *[positive impact]*. This will ensure that sufficient funds are made available for maintenance of the canals and on canal structures. Operational and maintenance arrangements have to be adapted in accordance with the requirements.

4.3.3 IMPACTS AND MITIGATING MEASURES RELATED TO THE REHABILITATION/CONSTRUCTION WORKS.

The various risks and nuisances related to construction works can be considered as small to moderate. The Contractor should be responsible for implementation of the “Environmental Management Plan”, including an “occupational health and safety program” for construction workers, and for provision of medical facilities on the site.

- (i) **Erosion control:** The proposed project interventions will not lead to relevant erosion problems. On the other hand, the excavation and reshaping of the different canals will produce large volumes of sand, and silt. This material will have to be disposed of. Sand in Bangladesh is used for raising platforms of houses, construction of roads or filling low lying areas. Silt if of the correct constituency can be used on the fields to support agriculture. It is expected that the material produced by the works can be utilized if the soil is suitable and not contaminated. There is no indication that the materials to be excavated are polluted however samples of material will be tested for any contaminants prior to disposal *[often positive, locally small significant impact]*.
- (ii) **Rehabilitation/construction stage nuisance, pollution and hazards:** Rehabilitation/construction activities in the project area are of a large scale, but will not be concentrated in a limited area, with the exception of the new construction of some small regulators. All other rehabilitation/construction activities, mainly excavation of khals and the development of piped irrigation are spread out over a large area and are located in areas with few people living nearby. The works will be temporary, affecting limited areas at the same time. Although hazards and nuisance will be temporary, they may be some limited air pollution near the construction areas. Most of the work will be by manual labor. Dust production can be reduced by periodic watering of construction sites (important in the dry season) and paving of access areas. Vehicles transporting construction material (sand, cement, stones) should be covered to prevent dust dispersion. Concrete batching plants have to be located over 200 m from residential sites.
- (iii) At present, noise levels in rural areas in the MIP are low and meet the Bangladesh Noise Standards (ECR, 1997). During the construction phase noise may be caused by generators, construction equipment, vehicles used for material transport. Noise of this type of equipment can reach 90 dBA each at 15 meters distance, which is above the Bangladesh ECR permissible noise levels in public and residential areas. However as stated above, construction will generally not take place in public or residential areas. Vehicles and construction equipment have to be checked for operational noise levels, vibration and gas emissions to meet the Bangladesh Standards (ECR, 1997). Mufflers should be installed and maintained as necessary to meet these standards. The routes used for material transport should avoid densely populated areas as much as possible and when needed vehicles should proceed at reduced speed. Transport and construction have to be minimal during prayer and rest times, the

major potential sources of vibration are heavy vehicles. The routes used for material transport will not pass through densely populated areas. Therefore, this impact will be negligible.

The proposed electrical substation will be indoor type and medium power switch gear type where the transmission lines and main transformer will be installed outside but all other controlling machineries specially the switch gears will be installed inside a two storey building. So neighboring localities will not be exposed to any noise or sound pollution.

- (iv) Earthworks will be localized with no haulage of spoil. Spoil would put on the khal banks but set back from the waterway to avoid land slip. Spoil over and above the safe capacity of the banks would be either spread on the nearby fields or transported to support fill for houses. The transporting of silt would only be required in areas of housing and would be minimal. The routes used for material transport will not pass through densely populated areas. Therefore, this impact will be negligible.
- (v) During construction there is some risk of pollution of soil, surface water and/or groundwater. The principal potential sources of pollution include: (i) surface run-off water from construction sites; (ii) leakage/spillage of combustibles and greases from equipment and storage tanks; (iii) discharge of domestic wastewater and solid waste at construction workers camp sites. Water pollution at construction sites can be minimized by avoiding disposal of solid waste (construction waste, sand, stones etc.) and waste grease and oil from construction equipment to agricultural field, ponds, rivers or wells. Wastes should be collected and transported to the approved disposal sites. Excavation has to be minimized to reduce sediment entrainment as much as possible. The Contractor has to install adequate separate sanitation systems (for example mobile toilet facilities) for male and female workers or require them to use public sanitation facilities to prevent untreated domestic waste discharge. Wastewater has to be collected by temporary gas tank and treated mechanically before being discharged to rivers, ponds or the soil. Any accidental oil spill should be reported and cleaned. The contractor will be required to comply with these requirements and present as part of his bid the measures he will take to avoid contamination.

The substation area is low lying. So there is no scope of piling excess spoil earth in the surrounding area rather it is raised by filling earth material through subcontract. But there may remain some construction material like sands, stones, brick chips or broken concrete blocks etc scattered or piled on the nearby lands which

- (vi) The main health and safety issue during the rehabilitation/construction phase is accidents to construction workers who are at risk at the workplace because they work with and near machinery and improper facilities at worker camps. Risk for accidents due to traffic is not unconceivable. Traffic is expected to increase; especially in areas where people are not used to such traffic, road accidents are a serious risk. Construction stage hazards and severity and frequency of accidents can be reduced considerably when construction equipment is well maintained.

Environmental health and safety regulations and procedures clearly stated in Bangladesh labor law and also incorporated in the contractor's bid documents/contract agreement must be strictly *implemented and enforced*. Safety gear and sufficient PPEs for combating Covid-19 pandemics should be issued to the construction workers, supervisors and site engineers. They should be trained on EHS procedure. The contractor should keep first aid kits, hand sanitizers, safety masks, washing materials available on the site. Sanitation facilities for construction workers should be provided to minimize the

risk of transmission of contagious diseases. In the labor shed the workers must provide enough space i.e., the minimum distance between the workers' bed must be maintained 2m.

Conflicts between construction workers and local people may be caused by differences in customs, traditions and differences in income. Problems are not expected since most of the workers will be recruited from the local area and will be familiar with customs and traditions. To avoid problems between construction workers and local people, construction workers should be recruited as much as possible from the local community.

- (vii) **Extraction of earth material/ filling material:** Soil for the coastal embankment would be sourced from the existing BWDB owned land along sea and country side of the embankment. The volume requirements are not as large as the embankment works are restricted to repairs. However, all borrow sites will be rehabilitated.

Earth material for raising the substation site (40 decimals) and construction of access road (10 m) has already been collected from the nearby borrow pits, river beds, ditches and spoilage from irrigation canals banks and barren lands. So no agricultural land has been excavated for earth material.

- (viii) **Disruption of irrigation water supply:** Improper timing of the rehabilitation/construction activities associated with canal excavation and lining reinforcement may negatively affect drainage and water supply. The planning is to execute all earthworks affecting the water flow to the farmers, during the period end November till end March. It will be necessary to develop rigid rehabilitation/construction timetables for canal reinforcement to minimize disruption to the beneficiaries. In addition, consultation with all affected parties will be required to reach agreement on exactly how the works will proceed. During this period irrigation should be applied so that the disruption of water supply will be minimal.

The substation is within 10 meter of Feni-Porshuram high way and the access road or the substation has not crossed any irrigation canal or buried pipe lines. So there is no risk of disrupting water supply in the crop fields or other firms.

- (ix) **Damage to ecosystem due to construction works:** The main impact on flora and fauna may be caused by the excavation works of the khals. The work may lead to destruction of the flora of their banks. It is recommended to execute the excavation works with utmost care, with conservation to the extent possible of the bank vegetation. The re-excavation works and reshaping of irrigation canals will temporarily affect the fish shelter in the canals. Therefore, the damage to the ecosystem in the canals and canal banks is deemed to present a small significant impact.

There is no natural forest, national parks, aquatic or terrestrial ecosystems, important wild life habitats or their migratory roots which needs to be intervened for construction and installation of electrical substation. Marley the irrigation canals, borrow pits, croplands and homestead vegetation are the ecosystems available near the substation area. But the substation site will cross a small section of the borrow pits where there is no ecologically important wild life or vegetation which may be damaged.

4.3.4 IMPACTS AND MITIGATING MEASURES RELATED TO OPERATION

- (i) **Canal maintenance:** Operation and maintenance (O&M) of irrigation works in Bangladesh has generally been poor in recent years, due to inadequate funding and poor operation and maintenance. The project will put in place efficient and sustainable OM systems including cost recovery. The IMO will be responsible to manage the tertiary systems.
- (ii) **Adverse soil conditions:** There may be an intensification of agricultural activities due to reliable supply of irrigation water. The project will introduce training and awareness on improved agricultural practices including introduction of integrated pest management.
- (iii) **Change in ground water hydrology:** The proposed project is beneficial for the ground water resources. The better availability of irrigation water and the increase in irrigated area will increase the recharge. Moreover, when surface water irrigation from the project becomes more readily available reliance on groundwater will decrease.

The substation will not use any ground water or produce any effluent or waste water which may bring any change of ground water hydrology. So there is no risk of such change in the substation area.

- (iv) **Change in drainage:** The excavation of khals will lead to a better availability of irrigation water. But the same interventions will cause an increased drainage capacity during period of excess rainfall.

After completion of the transfer of heavy equipments to the site box/ pipe culverts will be constructed/ laid down beneath the access road. So there will be no risk of drainage congestion during operation.

- (v) **Increasing the irrigated area** may increase the breeding habitat for insects. As such, the project may have a negative impact on the public health, since the incidence of vector-borne diseases like malaria and dengue fever may increase. However, the proposed project activities, such as excavation of the khals will improve the drainage conditions in the IMIIP. Education and awareness raising programs may also help to reduce the risk of vector-borne diseases.
- (vi) **Downstream Impacts:** The MIP scheme is situated on the downstream end of a system of 3 rivers prior to entering the sea. The diversion of water does not affect any downstream user functions. The main relevant issue is sedimentation of the channel downstream of the regulator. If no water is released from the regulator for flushing, the regulator becomes clogged by the downstream sedimentation, deposited there by the in-and out-flowing tide. During the dry months, water is conserved in the reservoir to provide irrigation water and no flushing through the regulator is minimized. Sometimes the sediment has to be removed (mechanically) because the gates can no longer be operated. It is proposed that operation procedures for the barrage are developed to ensure the water conservation and environmental needs are managed effectively.
- (vii) **Operation of the Barrage:** There are some issues of the operation of the barrage; fishermen want water released to catch fish, farmers want water retained for agriculture and fish cage operators want water retained. The operator will have to discuss with all users to develop procedures for the operation of the barrage. During the critical Boro cultivation period the barrage requires to be kept closed to conserve water.

4.4 IMPACTS OF CLIMATE CHANGE

Bangladesh is one of the most vulnerable countries to climate variability and change due to its geographic location, low deltaic floodplain, very large inflows from major trans-boundary rivers and the influence of erratic monsoon rainfall. Despite the wide consensus on climate change there are wide ranging estimates on the quantification of the changes in climate parameters and the time scale over which changes will occur. A review of climate change impacts on the Muhuri Irrigation Project has been carried out to determine levels of resilience to be incorporated into the design of the project. Coastal cyclones from the Bay of Bengal and upstream river floods during monsoon season pose significant impacts on the project area. In particular, cyclones in coastal zone of Bangladesh accounted for several of the world's worst natural disaster in the twentieth century. The main climate change impacts and the proposed adaptation measures are described in Linked Document 18 Climate Change: Project Adaptation Report and summarised below.

4.4.1 SEA LEVEL RISE AND STORM SURGE

The Muhuri project area lies at the apex of the Bay of Bengal and coastal cyclones together with upstream river floods during monsoon season pose significant impact on the project area. The MIP is protected by the coastal embankment of Polders 60 and 61. The embankment needs strengthening including provision of adequate protection from storm surges and wave impacts under the impacts of climate change including sea level rise. The embankment provides for the safety of properties, lives and livelihood of the local communities inside the MIP.

The coastal embankment the Coastal Embankment Improvement Project (CEIP)¹ has carried out extensive studies of the Polders in the South West of Bangladesh and report provides a basis of estimating climate resilience for the Muhuri Irrigation Project. No specific studies storm surge studies have however been implemented for the eastern Bangladesh. Recommendations in the CEIP report which are now adopted as a standard for Bangladesh include:

- (i) Design storm surges need to be based on the historic data of 38 cyclone situations including 19 actual events but assuming the cyclones hit at high tide level.
- (ii) Embankment designs would be based on the situation in 2050 with climate change and be based on the IPCC predictions for 2050 which require consideration of +0.50m sea level rise and a 10% increase in wind speed in every cyclone.
- (iii) The norms for coastal flood protection incorporate a 1:20 year flood, where agricultural damage is predominant and a 1:100-year flood where loss of human lives, properties and installations are predominant. The CEIP found that the embankment sections become impractical and uneconomic, when 1 in 100 years frequency storm level is selected for the design of embankment in addition to the requirements for climate change resilience. The CEIP study therefore proposes a surge level of 25 years return period in addition to the rise in storm surge due to the impact of climate change. Subsequently for areas where human lives are predominant it is also recommended to consider some additional

¹ Ministry of Water Resources, Bangladesh Water Development Board Detailed Design Report for Flood Embankments Drainage Canal, Protection Works and Hydraulic Structures May 2012.

approach, when 1 in 25 years frequency is selected to minimize the losses of lives etc. by providing adequate number of cyclone shelters distributed throughout the vulnerable zone and ensuring that the cyclone warning system works efficiently and reliably.

Studies and Evaluation for Muhuri. Some preliminary analysis of coastal climate change impacts was carried out for Muhuri.

- (i) The current embankments are designed for historic assessment of sea levels including high tides, historic storm surges and allowance for waver run up. The current design crest level is 7.93m PWD. The current embankment has suffered 2-3 occurrences localised and some overtopping in the last 20 years but these have not caused any breaches. These have resulted in some local flooding and loss of crop and minor damage to homesteads.
- (ii) The Polder 60 embankment is set back from the sea; preliminary assessments by the IWM indicate a 1m increase in crest height may be required to meet the needs of long-term climate resilience.
- (iii) The Polder 61 embankment is directly exposed to the sea and preliminary estimates indicate a 5m increase in embankment height may be required to meet the long-term needs of climate resilience.
- (iv) The assessments are indicative and need to be supported by detailed hydrodynamic modelling. For Polder 60 there is also a need to review the alignment. There is now about 3km of reclaimed land on the sea side of the existing embankment. The ongoing river training work downstream of the Feni barrage may increase the extent of this reclaimed land. The future embankment should consider whether the climate resilient embankment should incorporate the reclaimed land which includes a number of settlements.
- (v) The required embankment crest levels need to be reconfirmed by full mathematical modelling of flood flows, tidal surge and sea levels with updated bathymetry.
- (vi) The engineering design of the new embankment and structures is complex and the cost increases would be very significant. Detailed planning is required to reassess the alignment as the existing alignment excludes quite large areas of land outside the existing embankment. Land acquisition requirements for the embankment would be very extensive requiring extensive consultation and mitigation measures.
- (vii) Parts of the embankment are used as roads-raising the crest would require demolition of the roads or creating a new embankment butting onto the existing embankment.
- (viii) Climate proofing one portion of the embankment and leaving other parts without climate proof may limit the protection due to flood inflow from the parts without climate resilience.
- (ix) The climate resilience can in most cases be added to the existing embankment without requirement for demolition. The exception is where there are asphalt or brick roads where the option is demolishing the road or build a new embankment butting onto the road.

Climate proofing the coastal embankment requires major investment and will involve significant design work and would result in significant resettlement and is not proposed to be taken up under the IMIIP project. . The requirements for climate proofing the coastal embankment for Muhuri should be taken up as part of the overall climate proofing the eastern coastal zone of Bangladesh. `Climate change is gradual and the existing embankment has only overtopped once or twice with minor damage in the last 30 years. The embankment in Polder 60 is in poor condition in many parts and it is concluded rehabilitation to the original design is the first step and will provide a high degree of protection. In Polder 61 the embankment has recently been rehabilitated and the land inside the embankment is fish ponds and will provide a good buffer from storm surge. Provision of climate resilience should be taken up as soon as possible preferably within the next 5

years but the immediate requirements can be met by the original design section. The climate proofing requires detailed modelling of storm surge and flood levels, complex engineering design, a review of the alignment and significant land acquisition.

4.4.2 CHANGES IN RAINFALL AND RAINFALL PATTERNS

The IPCC predictions are for an overall increase in annual rainfall, higher variability in the rainfall patterns is also predicted. Global Circulation Models (GCM) with their relative coarse grid-cell resolution (several 100km) have reasonable skill in reproducing temperature characteristics however their capacity to reproduce and predict precipitation varies considerably and the accuracy must be taken with caution.

Various down scaled climate change models for Bangladesh as well as the catchments in India² indicate increased monsoon precipitation between 0-20 %. The IPCC estimates that variability and extremes of the rainfall patterns will increase.

The Muhuri project is totally dependent on the monsoon rainfall and an increase under climate change will be generally beneficial. Monsoon variations however will need to be incorporated into the water management plan to be prepared by the IMO. The proposal for Muhuri is the low lift pumps would be installed and available for supplementary irrigation throughout the year which will provide a significant level of resilience to climate variations for the Kharif and Aus cropping which presently have no access to surface water irrigation. Periodic reduction in the monsoon rainfall can be expected which will impact on the winter flows to Muhuri and affect the Boro season cropping especially rice. Monitoring of monsoon rainfall patterns including sourcing data from the Indian catchments can provide a key input to advise farmers on the prospects for Boro cropping. Improved water management including mechanisms to reduce rice water requirements and crop diversification to lower consuming crops are key adaptation measures which will be promoted under the project.

Increased Rainfall Intensity: Studies by IWM³ assessed the impacts of climate change on drainage performance of the existing drainage networks of polders in the south west Bangladesh. The study incorporated simulation incorporating considering climate change-induced parameter (change in rainfall, sea level rise). The rainfall is assessed to increase by 26% for the month of March, April and May and 13% for the months of June, July and August in accordance with 4th IPCC report. In addition, 50cm sea level rise was simulated at the downstream boundaries.

The design parameters for the re-excavation of the Khal have been prepared. The accuracy of climate change impacts relating to extreme rainfall events remains quite poor but it is estimated the frequency and quantity of extreme rainfall events will increase. Currently the standard drainage modulus for non-urban drainage is for a 1 in 10 return period storms. This has been discussed with the BWDB and it has been proposed to

² ADB TA 7417 Support for the National Action Plan for Climate Change India Support to the National Water Mission

³ Institute of Water Modelling (IWM) Studies for Drainage in Polders in South West Bangladesh

increase the drainage modulus to a 1 in 25 return period to incorporate the likely increase in rainfall intensity from climate change. This is considered adequate as significant over excavation can result in increased rate of sedimentation. The drains will be routinely excavated once every 5-7 years and additional section can be added quite easily when the climate change information becomes more reliable.

4.4.3 TEMPERATURE

Projections for increased temperature under climate change are reasonably robust. The results from the various climate change downscaling using PRECIS⁴ indicate temperature increases of mean annual air temperatures of around 2°C by 2030. Increased temperatures need adaptation measures to select the optimum rice varieties. Increased evapo-transpiration will increase the crop water requirements.

In recent years cold winters have resulted in crop damage and there is a trend for farmers to plant later; planting appears to be delayed by about 1 month. The delayed planting does affect crop water balance and puts more pressure on the water demand during March which is the critical period for the water availability-demand balance. Further studies will be taken up under the Muhuri Management contract to better assess the impacts of delayed planting of Boro rice and the options for adaptation. Crop diversification including more use of cold resistant crops is a proposed adaptation response. The project will support agriculture support services which will include piloting and demonstrating new cropping which can provide increased returns, reduced water requirements as well as resilience to climate change.

Long term and increased temperatures can affect rice yields.

4.4.4 CLIMATE ADAPTATION RESPONSE AND RECOMMENDATIONS

The project will incorporate the following measures to meet the potential impacts of climate change.

- (i). Increase the drainage design modulus from 1:10 year return period to 1:25year return period as a response the likely increase rainfall intensity.
- (ii). Increase the irrigation efficiency by 39% by through the use of piped distribution and pre-paid meter systems. Together with a 15% diversification to non-rice crops will increase the irrigable area from 11,300ha to 17,000ha.
- (iii). Provide access to irrigation on demand throughout the year for 17,000ha to help meet current and future climate uncertainties. Currently irrigation only available during period January to April.
- (iv). The project will provide agricultural support services to promote the diversification from rice, water saving methods, training and extension to support the establishment of sustainable and climate resilient cropping systems.
- (v). Repair the coastal embankment to restore it to its original design section as an interim measure prior to the implementation of the 2nd Stage of the Coastal Embankment Improvement Project (CEIP) to be implemented by the Government as a follow-on program under the CEIP1 project which is currently working in the western part of Bangladesh.

4.5 OVERALL ENVIRONMENTAL CRITERIA

⁴ Providing Regional Climates for Impact Studies

- (i) Unwarranted losses of precious resources: In the IMIIP area, no major natural resources are present, which would be affected by the project. As such, the rehabilitation/construction work will not lead to unwarranted losses of precious resources [no significant impact].
- (ii) Unwarranted accelerated use of resources for short-term gains: No Unwarranted accelerated use of resources for short-term gains are expected [no significant impact].
- (iii) Adverse effects on the national energy and foreign exchange situation: By implementation of the project, a more efficient use of the water can be made, increasing productivity and the irrigated surface. The project will not affect the national energy situation [no significant impact].
- (iv) Unwarranted hazards to endangered species. The project will not encroach into natural forests or wetlands and the environmental quality of air, soil and water will not be affected significantly. As such, no unwarranted hazards to endangered species are expected [no significant impact].
- (v) Undesired population migration to urban sector. The rehabilitation/construction work of IMIIP will enhance the socio-economic and living conditions in the rural area of the project area. Therefore, no undesired population migration to urban sector is expected. On the contrary, the project will contribute to stemming the flow of people from the rural areas to the towns [positive impact].
- (vi) The project will increase the area rice which will result in some increases of methane emissions from the paddy fields. The project will support agricultural technologies such as SRI and alternative wetting and drying which are shown to reduce the levels of methane. The project will also support the diversification to non-rice crops

4.6 LAND ACQUISITION AND RESETTLEMENT

The MIP was Categorized as “C” project for involuntary re-settlement in accordance with the ADB’s Safeguard Policy Statement (SPS)- 2009. Requirement for temporary relocation and re-settlement initially envisaged has been avoided through: (i) modified designs by reducing the cross sections (steeper side slopes) allowing for some increase in hydraulics in populated area; and (ii) removing the embankment rehabilitation from the construction program. So no resettlement plan under ADB's Re-settlement Framework (RF) was prepared initially.

During the feasibility study of IMIP in the year 2013/14 most of physical works specially rehabilitation of coastal embankments, reconstructions/re-sectioning of drainage/irrigation canal were proposed to be conducted on old/degraded coastal embankment/canals. More over So, there was no scope or requirement of land acquisition or re-settlement of squatter houses/structures etc. in the project area.

But during the implementation of MIP it was noticed that installation of an Electrical substation is compulsory to ensure the uninterrupted supply of electricity to 850 irrigation pumps of MIP. So the DPP has been revised by including the budget provision for installation of a power substation and acquiring 40 decimal of lands for that. More over during the last several years a number of squatter families and titled households (who has own land near the said embankment and constructed living houses/shops partly on the slope of the embankment and sluice gates and partly on their own land) were living/running small business on the slope of embankment and sluice gates in Sonagazi Upazla of Feni District and they had to displace their houses/shops and in some cases, these were partly displaced.

Due to inclusion of land acquisition and resettlement of squatters the project has been categorized as B (SPS-2009) which requires preparation, implementation and monitoring of resettlement Plan. An initiative for re-settlement of those squatters and titled households has been taken by PMU to comply with ADB's resettlement policy (SPS-2009) in cooperation with the concerned ministries and local administration (DC) of Feni district (Project Area). Several committees were formed and they submitted their reports investigating the affected households and verifying their loss. An RP has been prepared by PMU with the technical assistance of ADB and it has been approved officially by PMU, IMIP, BWDB. The RP follows the Government's laws and regulations and ADB's (SPS,2009) guidelines and prescribes for entitlement to compensate the loss of project affected land holders for acquiring land and assets lost at replacement cost as well as re-settlement assistances. A Social safeguard Monitoring team has already formed under Safeguard Cell of PMU office, Dhaka (Annex-II). The implementation of Resettlement Action Plan (RAP)/Resettlement Management Plan (RMP) The implementation of RP is going on and the First semiannual SMR, 2021 has been submitted to ADB.

For the assessment of the significance of the (detrimental) impacts, no formal weighing procedure was used and only a distinction between no significant small significant impacts, moderate significant impacts and major significant impacts was made. This assessment was based on expert judgment. The screening showed that most of the impacts related to the issues of the two checklists are not significant or of small significance. The most significant impacts and the proposed mitigating measures are described below and listed in Table 15 below.

TABLE 15 OVERVIEW OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Sl. No	Issue / Impact	Mitigation Measures	Implementing Agency	Budget source	Supervision
Impacts due to Project Implementation					
1	Damage to ecosystem during construction specially canal bank vegetation	Minimize damage to vegetation during re-excavation of canals by long boom excavators. 3 saplings should be planted for cutting each tree,	Contractor' IMO	Included in the contract Included in the cost recovery budget	IMO/PIU IMO/PMU
2	Construction related impacts: noise, dust, vibration, pollution (air, soil, water) accidents (work, road) Spreading of Covid-19 pandemics in the labor sheds and the local community	Proper maintenance, H&S regulations and enforcement, Safe operating procedures /training operators; Maximize hiring of local staff	Contractor Contractor	Included in Contract	IMO/PIU IMO IMO/PIU

Sl. No	Issue / Impact	Mitigation Measures	Implementing Agency	Budget source	Supervision
	Social conflicts	Establish a safeguard and GRM Desk at C-IMO office, Feni and engage ICC to concerned procedures.	Contractor /C-IMO	ICC to be funded by Irrigation Service Charge revenue	IMO/PIU
	Unauthorized use of private land for staking or storing of construction materials or construction of laborsheds near the proposed substation site	To avoid private lands for using by contractors. If needed proper compensation must be ensured or the land should be rented for the whole period of cropping seasons.	Contractor	Included in the contract	
Impacts due to Planning/design deficiency					
3	Planning/design targets and impacts to be monitored and reviewed.	Ensure planning/design assumptions and targets are met.	IMO in consultation with ICC	PMU	PMU Safeguard Monitoring cell
Due to Operational Deficiencies					
4	Pollution of ground water and surface water by agrochemicals	Rational use of agrochemicals; training of farmers on IPM, crop rotation. Monitoring water quality,	DAE/ BWDB Extension Service	PMU & C-IMO training budget	PMU/IMO
5	By oils and PCBs released from electrical substation	Ensure safe storage and handling of oils and safe disposal of PCBs	REB/PBS	Budget of REB /PBS	DOE/ PBS
6	Over heating & bursting of transformers and fire dispersal in the surrounding homesteads	Ensure regular monitoring inspection of transformers, ensure fire fighting arrangement and training of operation staffs	REB/PBS	Budget of REB /PBS	DOE/ PBS
7	Barrage Operation Impacts	Barrage operation procedures to be developed and agreed.	PMDC	PMDC budget	PMU/SMC
Overall Environmental Review Criteria					
8	Water allocations, cropping patterns, stakeholder reports	Criteria to be defined and reviewed every 6 months	IMO	IMO contract through loan	PMU

Notes: All activities to be monitored by PMU. PMU has established a Safeguards Monitoring Cell headed by one Safeguard officer of Environmental Science background who will be accompanied by two members; (i) Resettlement officer and (ii) social safeguard/Gender officer for monitoring, supervision, conflict resolution, Grievance redress and reporting.

CHAPTER V-INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

5.1 PUBLIC CONSULTATION AND DISCLOSURE

The environmental and project planning teams carried out extensive consultations on the technical, socio-economic aspects and environmental aspects. The public consultation was carried out from December 2012 to June 2013 as part of the field activities for entire MIP. was done using approaches including,

- (i) Focus Group Discussions (FGDs) and Semi Structured Interviews (SSIs), Key interviews were held among the beneficiaries, farmers and project areas people in the six upazilas of Parshuram, Chhagalnaiya, Feni Sadar, Fulgazi, Sonagazi and Mirerswari.
- (ii) Formal/ informal discussions with Government officials and other stakeholders; consultations were held in the field as well as Upazila and Project level workshops during the period December 2012 to June 2013. Final workshops and consultations are planned for July 2013.
- (iii) Meetings were organized with various stakeholders as well as with the Feni District Department of Public Health Engineering (DPHE) on water quality data and information of shallow and ground water table of the project areas in those Upazilas within the framework of the feasibility study.
- (iv) Visit by 40 stakeholders in two visits (farmers, WUA representatives and Government officials) and to the Barind Multipurpose Management Development Authority (BMDA) in Rajshahi Western Bangladesh to see first-hand similar approaches to those proposed for Muhuri Irrigation Project.

The PMU safeguard team visited the proposed Electrical Substation area (An additional component of IMIP-MIP) in November, 2020 and May, 2021 for conducting Public Consultation Meetings (PCMs) at two local communities of Bondhua village (south and western side of the substation site). The team leader conducted open discussions with the local land losers, farmers, shop keepers, households, Union Parishad members, teachers, political leaders and WUA leaders etc. surrounding the substation site and probable project affected people (Figure-21 & 22) below.



FIGURE 21: A PCM CONDUCTED BY PMU SAFEGUARD TEAM IN THE BONDHUA VILLAGE (TO THE SOUTH OF THE SUBSTATION)



FIGURE 22: A PCM CONDUCTED BY PMU SAFEGUARD TEAM IN THE BONDHUA VILLAGE (TO THE WEST OF THE SUBSTATION)

Following issues were discussed in the PCMs-

Social & Environmental issues

- (a) A 33/11 KVA Electrical substation will be installed in your area for supplying electricity to the irrigation pumps under MIP. What do you think about the substation going to be installed? Is it beneficial or harmful for this locality, peoples, agricultural lands, crops, domestic/wild animals and environment & how?
- (b) What are your suggestions to enhance the beneficial impacts and/or reduce the harmful impacts if any?

Resettlement & Grievance issues

- (c) Have you lost your agricultural lands for proposed Electrical Substation? If yes, then what other losses, you expect, should be compensated?
- (d) How your losses can be reduced and/or compensated?

5.2 Comments and Feedback

The following comments on the environmental assessment were obtained from the consulted stakeholders:

- (i) Rehabilitation/improvement/reconstruction of the project is supported, because it will create good conditions for economic development and improvement of the environment,
- (ii) Rehabilitation/improvement of the project will not damage terrestrial and aquatic resource in the project influence area,
- (iii) Rehabilitation/improvement/reconstruction of the project will retain more water during dry seasons in the rivers and khals and irrigation facilities will be increased,
- (iv) Rehabilitation/improvement/reconstruction of the project will protect salinity intrusion in the project areas at the downstream, which will check crop damage in those areas, will increase crop cultivation and cropping intensity,
- (v) Plantation and social forestation will be increased, which will increase dens of wild lives, exotic species (both flora and fauna) in the project areas,
- (vi) The predicted potential environmental impacts and measures for impact mitigation suggested and explained by the Project Environmentalist were clearly understood.

The participants (Annex-V) of the PCMs conducted by PMU safeguard team on May-June, 2021 at the proposed substation area provided the following feedback-

- (a) Land value of the proposed site of the substation is higher than three times of government rate (Mouja value). So land value should be increased to the current market price. They demanded land price 2.5 lakh Taka per decimal.
- (b) The land losers specially those had land plots near the high way requested to shift the proposed location of the substation at least 10-20 feet towards the east and leave the same (10-20 feet) to the west side near the high way so that they can earn their livings by establishing some shops or grocery markets there.

- (c) Two land losers claimed that major parts of their plots have been acquired by the IMIP and the remaining minor part have been narrower. So they exclaimed that the market value of their remaining marginal land has decreased. They claimed compensation for that.
- (d) The electrical supply lines from the substation should not be installed over their land. They suggested that the supply line can be drawn under the ground or along the road or land boarder.
- (e) Some households especially those near the proposed site were found worried about the sound which may produce from the substation.
- (f) Some participants especially those having land near the proposed site requested to keep the access road constructed for substation open for all. They also suggested providing drainage facilities by laying down box or pipe culvert across the access road.
- (g) Two grocers and a mini snacks shop owner hope that the substation will increase their earning significantly as the construction workers, supervisors, drivers etc. during construction and operation will buy commodities from them. They also hope that the area will be developed and industrialized after establishment of the substation.
- (h) Nobody mentioned any possible damages of soil, water, air, agriculture, trees, biodiversity and environment.

5.3 VISIT TO EXAMPLE PROJECT BARIND TRACT

In addition, feedback based on stakeholder response to the visit to Barind where a similar system of meter card system has been established was obtained. Ten stakeholders from Muhuri (mostly farmers) visited BMDA schemes in January 2013 and another 30 farmers visited in May 2013. The general feedback is summarised below:

1. Irrigation service to farmers was good, for example:

- a. Water is available whenever required by an individual farmer (i.e., reliable & flexible supply)
- b. Low water charges (about 1/3 of Muhuri)
- c. Financial transactions are transparent and secure with 100% payment for water according to the volume used

2. Construction and O&M

- a. High quality and quick construction enabled by adoption of buried uPVC pipelines
- b. No land take or obstruction to farm vehicle movements
- c. 50-year design life for uPVC pipeline and low maintenance (design life of pumps and meters is 10-20 years)

3. Results

- a. A variety of crops are cultivated in Rabi
- b. Improved water use efficiency (and energy efficiency) so that the cropped area may increase
- c. Increased productivity with near triple cropping
- d. Sustainable /self-financing.

The environmental assessment process under the ADB's Safeguards Policy Statement requires the disclosure of the IEE in an accessible place and language to the public during the completion of the IEE. The BWDB will provide a Bengali version of a summary IEE in public places by providing relevant environmental information, including information from the documents as above in a timely manner, in an accessible place and in a form

and language(s) understandable to affected people and other stakeholders. For illiterate people other suitable communication methods will be used. The BWDB will also organize meeting/ seminar in the locality to inform people effectively including providing copies of the IEE for display at the district and Upazila level during the same period when the IEE is disclosed on the ADB website.

5.4 GRIEVANCE REDRESS MECHANISM

A grievance redress mechanism (GRM) has been established through the Implementation Coordination Committee (ICC). The ICC will be under the leadership of the BWDB Zonal Chief Engineer. Members of the ICC will include representatives from the offices of the Deputy Commissioner, the Water Users Federation, Water User Associations, the Rural Electrification Board, Department of Agriculture Extension, and law enforcement. The Irrigation Management Operator for each sub project will also be the member secretary of the ICC. The ICC will deal with field implementation issues that arise related to conflicts, safeguards, security, and more generally concerns about the performance of the implementing parties and would meet four times per year at a location close to each sub project. The PMU with the support of the PMDC will be responsible for the establishment of the ICCs which will need to establish within six months of the loan agreement.

The IMO will be responsible for customer relations including grievances. The APs will register their grievances to the appointed person (Field Manager) at the IMO Upazila office, who will document the complaint in the “grievance register book”. The IMO will be responsible for responding the grievance either directly by resolving the matter, determine the corrective action or take up the grievance with the appropriate authority. A response will be provided to affected party within 7 days. The IMO will use a register to book to list; (i) the date of grievance registered, (ii) name / address of complainant, (iii) the nature of grievance, and (iv) the response. In case the IMO is unable to resolve the issue in 7 days, the matter will be forwarded to the office of the WUA. The corrective action will be carried out as agreed and documented in the grievance register book. The outcome will also form part of the progress reports to the ICC.

Where the AP considers the grievance not appropriately resolved than the AP can take the grievance to the WUA who in turn will submit to the ICC who will discuss the grievance with the appropriate committee. If a serious grievance is lodged outside the control of the IMO or the WUA a special ICC meeting can be called. Since the ICC meeting will have to be convened at short notice, at a minimum the IMO and a representative of the WUA, and a community representative should be present. If need be other members will be consulted to help respond within the given time frame. The ICC will prepare a formal, written assessment that describes the complaint and confirms whether the grievance is genuine. A response on the matter will be provided to the APs within 7 days by the ICC in consultation with necessary parties.

During the entire process, the alternative to appeal at court will remain open if the complainant wishes. The details and information on use of this grievance redress mechanism will be communicated to the local communities and beneficiaries by the project staff working in the subproject area.

CHAPTER VI- ENVIRONMENTAL MANAGEMENT& MONITORING PLAN

6.1 INSTITUTIONAL ARRANGEMENTS

The institutional set-up with respect to project implementation and environmental management is defined in the main report. The organisation is summarized in Figure-10 below. The environmental responsibilities are shown in Figure-11.

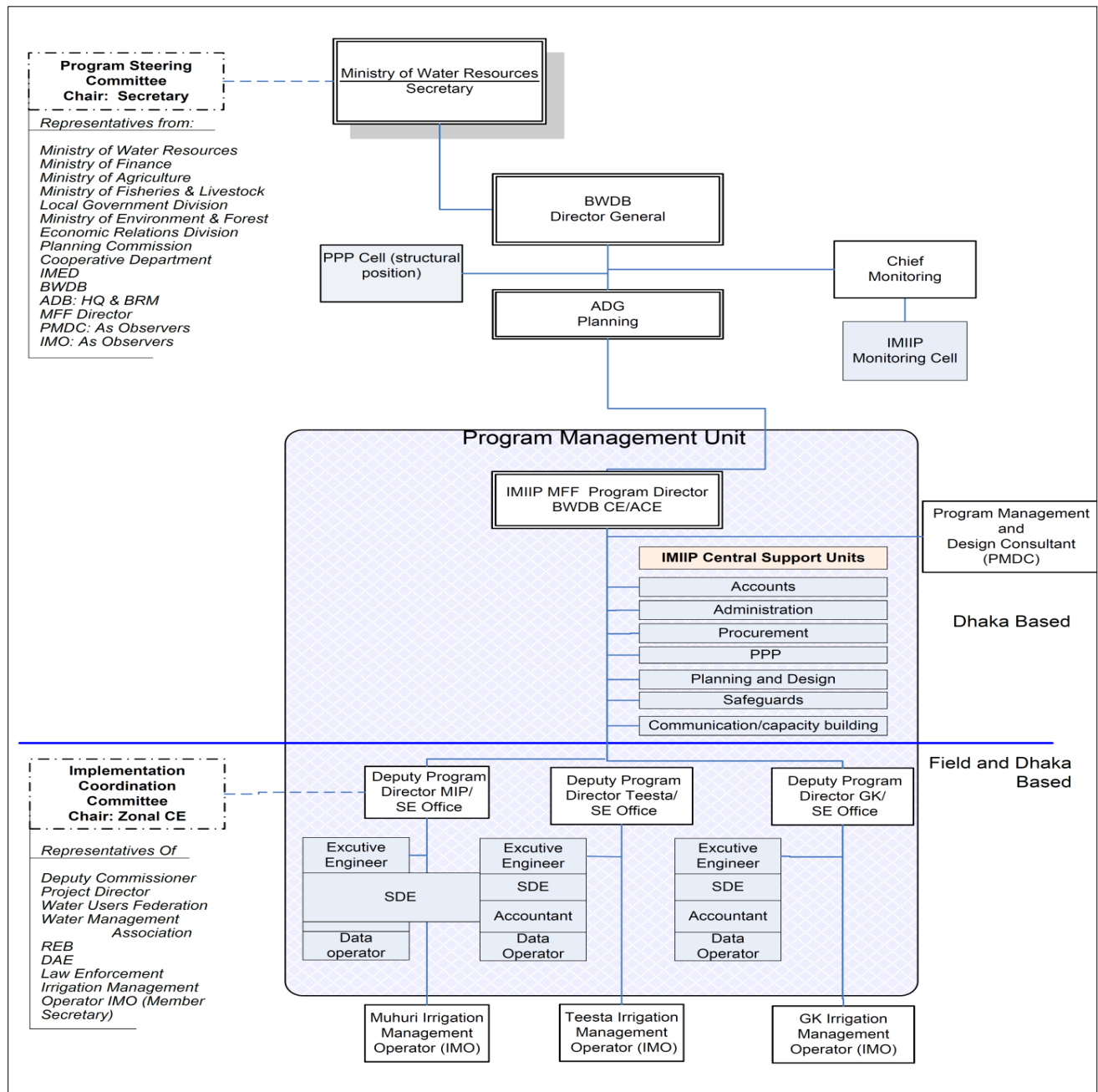


FIGURE 23: PROJECT IMPLEMENTATION ARRANGEMENTS

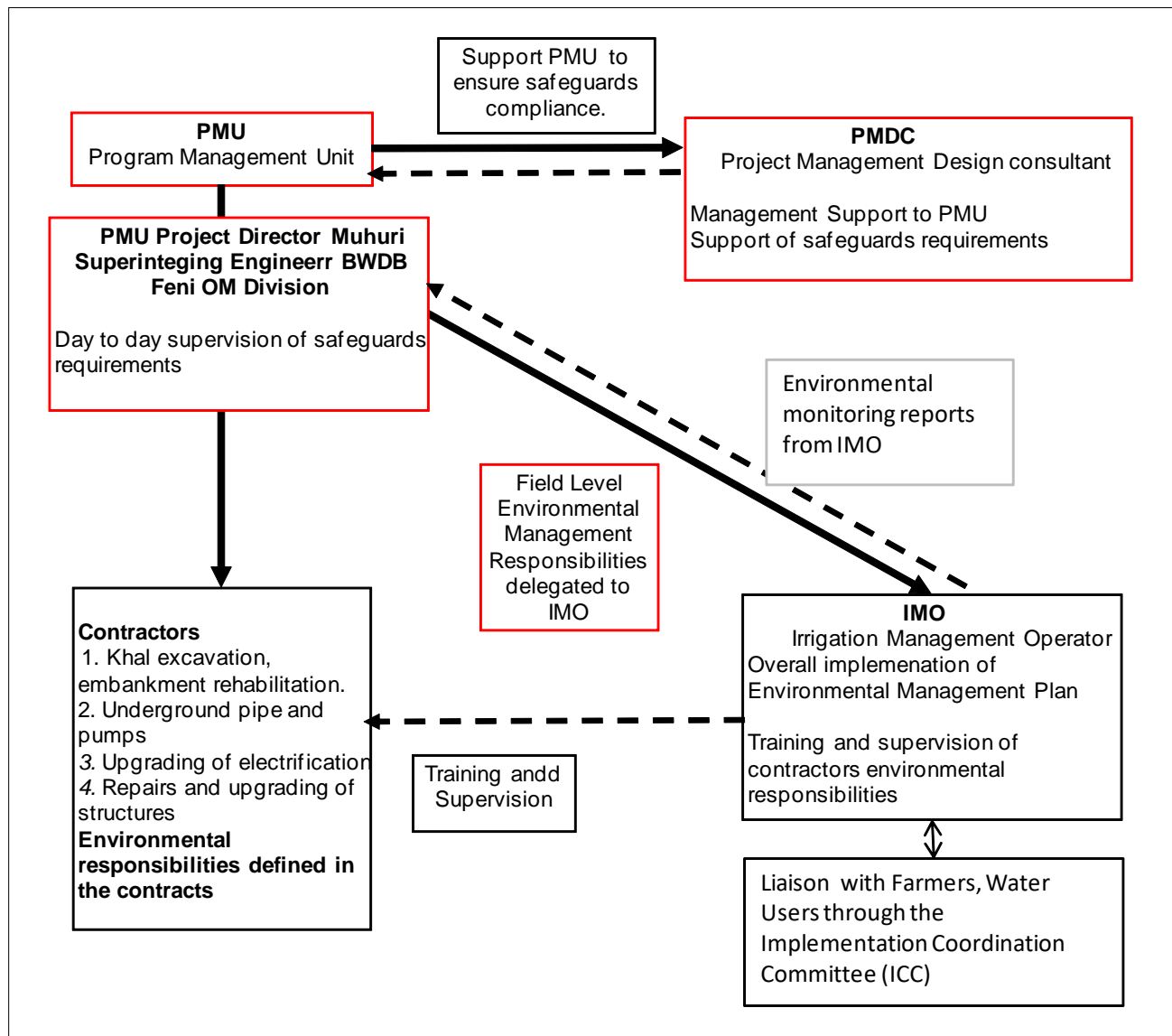


FIGURE 24: ENVIRONMENTAL RESPONSIBILITIES

6.2 EXECUTING AGENCY

The Executing Agency for the Project will be the Bangladesh Water Development Board. A full time MFF Program Director will be assigned to manage the IMIIP loan. The MFF Program Director will also lead the Project Management Unit and would have at least the rank of a Chief Engineer. The MFF Project director would report directly to the ADG Planning. For each tranche of the MFF a Deputy Program Director with the rank of Superintending Engineer will be assigned to manage the activity of each individual project. The MFF program director and the deputy program director would be supported by central support units consisting of; accounts, administration, procurement, PPP, planning and design, safeguards and communication/capacity building.

6.2.1 PROJECT MANAGEMENT UNIT (PMU)

The Director, Project Implementation Unit (PIU) established in Feni under PMU will assume primary responsibility for the environmental monitoring as well as implementation of EMPs for the MIP; the Director, PIU will report to the Project Director. A safeguard Monitoring Cell will be established in the PMU which will be responsible for environment, resettlement, and any other social development obligations. The officers in the safeguard unit will be supported by the PMDC consultants. The safeguards cell will be staffed by the safeguards officers; (i) an environment officer, (ii) a resettlement officer and (iii) a social safeguards/gender officer.

The duties of the safeguards cell will include: (i) oversight of construction contractors for monitoring and implementing the environmental management plan; (ii) preparing and implementing environmental good practices; (iii) liaising with the environmental agencies to obtain necessary permits/approvals and seeking their help to solve the environment-related issues of project implementation; (iv) providing awareness training on environmental and social issues related to irrigation rehabilitation projects under the IMIP. (v) Preparation of environmental monitoring reports every 6 months for EIAs (as required by DoE) and once a year for IEEs (as required by ADB). Submission of reports is required by the DOE to meet GOB requirements.

The PMU through the safeguard cell with support from the PMDC consultants will be responsible for the monitoring of the environmental management plan including:

- (i) Obtain environmental clearance from ADB and DOE for environmental compliance before awarding any civil works contracts for that subproject.
- (ii) Ensure mitigation measures stated in the EIA/IEE's are incorporated in the project design and EMP requirements are described in the bidding documents. EMP including any specific requirements of DOE shall be incorporated in the contract documents.
- (iii) During implementation ensure that EMP is been implemented and recommend corrective measures for any unforeseen impacts
- (iv) Ensure that any grievances from any stakeholders are adequately addressed
Submit periodic monitoring reports to ADB and GOB.

ADB will monitor the implementation of mitigation measures through project review missions, and conduct environmental performance monitoring as necessary. The PMU will be supported by the PMDC and the Muhuri IMO (Para 117 describes the role of the IMO). The PMDC will primarily support the development of the overall safeguards of the MFF program whereas the Muhuri IMO will be responsible for the collection of the field level data and monitoring of the execution of the Environmental Management Plan by the contractors, water quality operating procedures and the health and safety plan during sub-project implementation. The occurrence of accidents can be monitored by keeping records of number of times workers were hospitalized or had to go to a clinic for first aid in relation to accidents at the construction sites. Incidence of conflicts with local population can be assessed with a simple questionnaire. The survey should be carried out twice a year during construction.

6.2.2 PROJECT MANAGEMENT AND DESIGN CONSULTANTS (PMDC)

The PMDC has a key role to support the overall project management of the Muhuri Irrigation Project. The PMDC will work closely with the Irrigation Management Operator (IMO) to develop efficient and sustainable

management. The PMDC terms of reference includes supporting the PMU to effectively monitor and ensure the necessary safeguards including environmental issues. The PMDC's role would be primarily directed to the overall MFF program whereas the IMO's would focus on each individual sub-project.

6.2.3 IRRIGATION MANAGEMENT OPERATOR (IMO)

An Irrigation Management Operator (IMO) will be engaged to manage the Muhuri Irrigation Project and will be located and operate within or near the Muhuri project area. The role of the IMOs will evolve from managing the field design and construction supervision during the irrigation system modernization stage to managing, operating, and maintaining the system under longer-term lease arrangements during the system operation stage. For the system modernization stage, which is proposed to have five year duration, the IMO would be contracted through a management contract by the PMU. During this period, the IMO will:

- (i) Develop operation, maintenance, and management systems and procedures that will carry on following completion of physical work,
- (ii) Establish a better understanding of system operating costs and revenue streams as input to the longer-term lease arrangements that follow-on the system modernization stage.
- (iii) Liaising with BWDB and the newly established Implementation Coordination Committee (ICC)
- (iv) Undertake participatory design of farmer distribution systems,
- (v) Supervise the work of contractors engaged for system modernization
- (vi) Ensure compliance with environmental requirements.
- (vii) Conduct demonstrations and other agricultural support activities
- (viii) Conduct pilots to investigate complementary cost recovery
- (ix) Support the necessary environmental monitoring and ensure the effective implementation of the Environmental Monitoring Plan (EMP).

Environmental monitoring during construction and after project implementation (the operational phase) will be assigned to the IMO. The objective of environmental monitoring in the project area is to ensure further socio-economic development while maintaining acceptable environmental quality and sustenance of natural and ecological resources. Environmental monitoring mainly has to assure that the mitigation measures are implemented in a satisfactorily manner, and evaluated to confirm that they are achieving their original objectives. The monitoring program for the Muhuri sub-project would concentrate on; (i) various environmental impacts due to improvement/construction/rehabilitation works; (ii) pollution of surface water and groundwater, both during construction/improvement/rehabilitation as well as during the operation phase.

The IMO will provide a key role towards the environmental management plan including-

- (i) The IMO would be responsible for the supervision of all the construction work and would act as the supervising engineer.
- (ii) The IMO is required to collect and compile water data and environmental data
- (iii) The IMO will establish and implement long term management operation and maintenance of the Muhuri Irrigation Project
- (iv) The IMO will implement Agricultural Support Services and Pilot Cost Recovery Activities both of which will contribute to the environmental mitigation responses.

The high-level management skills of the IMOs with both national and international staff will allow a development of national management skills which can be provide a key base resource in Bangladesh for irrigation management and the development of a framework for improved water resources and environmental management.

6.2.4 RESPONSIBILITIES OF THE CONTRACTOR

The contractor(s) will implement mitigation measures during the rehabilitation/construction stage as defined in this EMP which will be included in the contract. The contractors will be responsible for minimizing nuisance to the population, minimize the risk of pollution, as well as of accidents. The contractors' effort in environmental management is to be supervised by the IMO, and BWDB and PMDC. The IMO as the supervisor is responsible to conduct quarterly monitoring of the implementation of mitigation measures by the contractor. The IMO will prepare and submit quarterly monitoring reports to the PMU who will consolidate the information and include in the annual environmental monitoring report to be submitted to ADB. The contractors will provide the IMO with monthly reports on the implementation of mitigation measures. The reports prepared by the contractors along with quarterly monitoring reports to be prepared by the IMO will be consolidated and submitted to PMU for review.

6.2.5 IMPLEMENTATION COORDINATION COMMITTEE

To facilitate implementation of the projects under the loan, an Implementation Coordination Committee (ICC) will be established for each sub project of the MFF. The ICC will be under the leadership of the BWDB Zonal Chief Engineer. Members of the ICC will include representatives from the offices of the Deputy Commissioner, the Water Users Federation, Water User Associations, the Rural Electrification Board, Department of Agriculture Extension, and law enforcement. The Irrigation Management Operator for each sub project will also be a member of the ICC. The ICC will deal with field implementation issues that arise related to conflicts, safeguards, security, and more generally concerns about the performance of the implementing parties and would meet four times per year at a location close to each sub project.

A communications office operated by the Implementation Coordination Committee (ICC) will be established to register complaints and incidents. A record of accidents (on the road and at the works) should be maintained. To monitor the effect of the (increased) use of agrochemicals like fertilizers and pesticides (and of the possible pollution due to works) on surface water and ground water, water samples are to be taken and analysed in the field and laboratory monitoring plan/program will be required to monitor the environmental impacts and implementation of the mitigation plans. This work would be carried out by the IMO.

6.3 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

In order to minimize the adverse impacts of MIP on the local environment and communities and enhance the benefits an EMP (Table-16), implementation and monitoring set up and their responsibilities have been stated below.

TABLE 16: ENVIRONMENTAL MANAGEMENT PLAN

Nr	Action	Resource Impact	Mitigation Measures	Responsibility		Cost
				Implementation	Monitoring	
A. Impacts on Water Resources During Design						
1	Khals have adequate capacity to meet long term drainage needs.	Extreme rainfall events including climate change may cause flooding and damage.	Technical design of the khal to base on 1:25 year return period (increased from 1:10 year return period) to incorporate provision for climate change. Over-excavation not recommended as will increase sedimentation rate.	PPTA Design Consultant during 2013	BWDB Design cell	PPTA budget
2	Improved water efficiency will reduce the recharge to the groundwater.	The use of pipe distribution may reduce the groundwater recharge. Improved surface water management will however reduce demand from groundwater.	Develop appropriate plan for conjunctive groundwater use.	PMDC will conduct groundwater studies.	PMU and the IMO to monitor groundwater use and levels	PMDC and IMO contracts
B Impact on Soil Resources During Design						
3	Excavation of khal including removal of vegetation	Excavation of khal including removal of vegetation may increase instability of banks.	Khal side slopes to be kept a 1:1.5 to ensure stability, Contract document to specify correct cutting procedures, Social forestry practice to re-establish vegetation (1:3 ratio) and turfing measures	Contractor	IMO	Included in contract

Nr	Action	Resource Impact	Mitigation Measures	Responsibility		Cost
				Implementation	Monitoring	
4	Placing of soil material from khal excavation	Soil material if not properly managed can slip back into khal or encroach onto farmers' fields	Most spoil will be placed on the banks but uncontaminated spoil with the correct constituency can be used for fill for housing or spread on the fields.	Contractor	IMO	Included in contract
5	Soil borrowed areas for rehabilitation of coastal embankment	Soils borrow areas for the coastal embankment can cause instability of embankment. Resulting areas of excavation will fill with water and can be breeding location for mosquitoes.	Soil to be sourced from the existing land adjoining the coastal embankment. Soil borrowed areas to be set back not less than 8m from the toe of the embankment. Borrow areas to be from existing BWDB land along the coastal embankment. where appropriate to be used as fish ponds.	Contractor	IMO	Included in contract Social forestry from loan funds
C. Impacts on Local Community During Construction						
6	Excavation, filling, grading and finishing of earthworks	The work will be a mix of manual labour & machinery. Dust fumes and noise in the vicinity of the works	Reduce ambient dust levels by spraying. Remove construction debris and dispose of in an approved location.	Contractor	IMO	Included in contract
7	Construction and installation of Electrical substation.	Unauthorised piling or storing of construction materials on the surrounding private land during construction	Contractor should avoid using private land for piling, storing or construction of labour sheds. If unavoidable then proper compensation should be paid to the land holders.	Contractor	IMO/PIU	Included in the contract
8	Physical contact of workers during	Covid-19 pandemics may spread rapidly among the	Proper health and hygiene , specially physical distancing and/ or quarantine,	Contractor	IMO/PIU	Included in

Nr	Action	Resource Impact	Mitigation Measures	Responsibility		Cost
				Implementation	Monitoring	
	construction and installation of substation	workers and the local community	when needed, should be strictly maintained in the work place/ labour sheds. Adequate washing materials, sanitizers, PPE should be provided to them			contract
9	Construction activities near and inside community areas	Construction vehicles can disturb the local communities	Select machinery and vehicle transport routes away from communities. Consult with local communities about working hours.	Contractor	IMO	Included in contract
	Operation of construction vehicles	Air and noise pollution	Adequate maintenance	Contractor	IMO	Included in contract
	Impacts on archaeological sites, graveyards or other community heritage artefacts.	Not envisaged but in the event of any chance findings	Ensure the construction companies have understanding. If archaeological remains are found work has to immediately stop until impact verified by Department of Archaeology.	Contractor	IMO	Included in contract
D	Impacts on Wetland Habitats During Construction					
10	Drainage may remove wetland areas	There are a few low-lying areas that are wetlands	Very low land will not be provided with drainage	PPTA Design consultant	BWDB design unit	PPTA budget
11	Excavation and removal of vegetation from	The vegetation along the khal provides a refuge for fish and other aquatic life.	Secondary aquatic vegetation will quickly comeback quickly from the near by aquatic habitats..	Contractor	IMO	Budget provided in IMO

Nr	Action	Resource Impact	Mitigation Measures	Responsibility		Cost
				Implementation	Monitoring	
	khal and khal banks	Removal of trees from canal bank may impact the environment adversely	Three saplings should be planted on the canal bank after re-sectioning instead of each tree removed.			contract
12	Establishment of electrical substation	Oil and gas released from construction site can contaminate soil, water and aquatic life. cause fire hazards	Highly flammable and toxic substances should be handled cautiously and store/transport safely. Fire fighting arrangements like equipment and trained manpower must be ensured.	Contractor	IMO	Included in contract
E	Impacts on Environment During Operation					
13	Soil degradation due to poor on-farm management,	Intensive agriculture may cause soil exhaustion and soil toxicity due to chemical usage and lack of knowledge among farmers	Appropriate soil management and soil testing systems and educate farmers on it. Repeated information sharing on good agriculture and soil management practices	IMO will provide agricultural support	PMU and third-party monitoring organization	IMO budget
14	Increased agrichemicals in surface and ground water systems, and reduced quality of return flows	Increased use of agrichemicals envisaged to meet target of intensification and increasing yields	Farmers education on proper use and management of agrichemicals, including their waste Ensuring a farmer-friendly method for disposal of agrichemical waste, as identified during project design	IMO will provide agricultural support	PMU and third-party monitoring organization	IMO budget
15	Operation of electrical substation	Oils and highly toxic insulating & coolant, PCB released from transformer may contaminate local	Safe storage, handling and disposal of highly flammable and toxic materials like PCBs should be ensured.	PBS/REB	IMO/REB	PBS

Nr	Action	Resource Impact	Mitigation Measures	Responsibility		Cost
				Implementation	Monitoring	
		aquatic environment.	Fire fighting arrangements like equipment and trained manpower must be ensured.			
F	Impacts on the Society					
16	Workers / labour camps and facilities.	External labour can cause disruption and disturbance on the local communities	Provide appropriate shelter and other facility for any labour brought from outside. Ensure no conflict with local population. Provide sanitation and waste management faculties	Contractor	IMO	Included in contract
17	Construction of access road to the proposed substation.	Closing of natural drainage of rainwater through the borrow pit cum khal.	Box or pipe culvert should be provided underneath the access road after transfer of heavy equipments to the site.	Contractor	IMO	Included in contract / Estimate

6.4 ENVIRONMENTAL MONITORING

The objective of the environmental monitoring in the project area would be to ensure that the project is implemented while maintaining acceptable environmental quality and sustenance of natural and ecological resources. Environmental monitoring mainly has to assure that the mitigating measures are implemented in a satisfactory manner and constructed and initiated on schedule, as well as evaluated to confirm that they are achieving their original objectives. To increase the cost effectiveness of the monitoring program, it should focus on the key parameters and criteria, and measurements of different parameters at the same site have to be carried out simultaneously.

The overall responsibility rests with the Project Management Unit (PMU) of the BWDB. Engagement of with the local institutions and stakeholders will be an essential part of the monitoring activities. As described in Para 119 the IMO will also be responsible for several monitoring tasks.

6.4.1 ENVIRONMENTAL MONITORING PLAN

It is proposed to restrict the environmental monitoring to the principal components of the project supported by viable and meaningful monitoring parameters. The monitoring will build on the baseline which will reflect the situation in 2014 prior to the project interventions. Routine monitoring will be implemented through the IMO who will compile secondary data from other agencies as well as some primary data collection. The IMO will prepare quarterly construction progress reports of the project will include a short section giving the present status of implementation of environmental safeguards, and report any environmental concerns, if they exist. The requirements for environmental monitoring are summarized in Table-17. The full monitoring requirements would be defined in the contract of the IMO.

TABLE 17 : ENVIRONMENTAL MONITORING PLAN

Nr	Project Activities	Parameter	Actions and Monitoring Frequency	Responsible authority
1	Re-excavation of khals	<p>Removal of trees and vegetation.</p> <p>Management of spoil material excavated from the khal.</p> <p>Sedimentation-surveys and water analysis suspended solids.</p> <p>Status of regeneration of natural vegetation and plantation on canal bank.</p>	<p>Baseline inventory of trees and vegetation over 5% sample area. (25km) including photographs.</p> <p>Baseline and annual monitoring of social forestry activities. Assessment of survival rates of trees.</p> <p>Detailed cross section surveys of khal to process payments to incorporate assessment of spoil management including photographs.</p> <p>Annual monitoring of sedimentation every year during construction and for 6 years after (total 10 years). To include one periodic re-excavation.</p> <p>Cross section surveys every three years to assess sedimentation rates.</p> <p>Rainfall and river flow records to assess design parameters.</p>	IMO/PIU

Nr	Project Activities	Parameter	Actions and Monitoring Frequency	Responsible authority
2	Rehabilitation of Coastal Embankment	Monitoring of construction progress Monitoring of borrow areas	Periodic progress reports, Periodic progress reports-photographs. Daily monitoring of sea levels from existing monitoring stations	IMO/PIU
3	New Pipe distribution, Installation of electrical transmission line and substation	Farmer agreements Monitoring of water use Progress of installation and environmental compliance	Farmers accept the proposed layouts and have prepared MoUs to accept proposals. Bi-annual assessment of water pumped and revenue based on data from prepaid meters. Progress reports of installation and implementation of environmental compliance issues should be monitored by the contractor daily by contractor and field manager of IMO, Monthly by PIU / IMO Safeguard Officer and Quarterly by PMU Safeguard team.	IMO/PIU
4	Operation of main and secondary regulators.	Monitoring of water level and releases from the Feni regulator	Daily water level data at regulator Data on gate opening Calibration of discharges	IMO in coordination with BWDB
5	Hydrology	Monitoring of discharge for Feni, Muhuri and Kalidash Pahalia rivers	Improving the quality of flow monitoring. Use of Horizontal Acoustic Flow Doppler Flow Meter (ADCP)	Hydrology unit BWDB Comilla.
6	Intensification of agriculture	Increased cropped areas Increased yields Increased farm inputs	To be based on the Benchmarking Activities being proposed by the ADB TA More Food for Less Water including analysis of satellite imagery Farmer interviews and secondary data.	IMO

Nr	Project Activities	Parameter	Actions and Monitoring Frequency	Responsible authority
		Increased use of pesticides Increased mechanization Increased use of water saving technologies	Follow on monitoring would be carried out by the IMO annually including water efficiency assessments and the take up of improved agricultural systems. Use of pesticides will be monitored as part of the agricultural take up monitoring as well as sampling and testing of the water in the drains and shallow groundwater	
7	Groundwater use	Groundwater use	Monitoring of number of tube wells and groundwater use. Monitoring of groundwater levels	IMO
9	Excavation and disposal of silt from canals	Test samples of silt for heavy metals prior to disposal	Monitoring removal/ spreading of excavated spoil material by the contractors/farmers during and immediately after completion of excavation works.	IMO
10	Occupation of private lands by contractor for using as construction sites	Area of private land used by the contractors for temporary storage of construction materials or construction of labour sheds by contractors, Damage of crops, trees, agricultural lands, structures by contractors' vehicles	Recording any complains raised by the private land owners and villagers for un-authorised using and damaging their lands by contractors	IMO
11	Drainage congestion & water logging	The box/pipe culvert provided underneath the access road is functioning	Inspection and recording whether the box/pipe culvert underneath the access road has been provided or not and functional	IMO/PIU/PMU

6.4.2 THE COST OF THE ENVIRONMENTAL MONITORING

The cost of the environmental monitoring is summarised in the Table-15 below.

TABLE 18: COST OF ENVIRONMENTAL MONITORING

Parameters	Cost (Tk/yr)			Total (Tk)	Total \$
	Year 1 Baseline	During Year 2-4 During construction period	Year 5-10 Recurrent costs (Tk/yr)		
Routine Monitoring by Irrigation Management Operator	800,000.	400,000	400,000	4,400,000	55,000
Bi-annual verification by PMU and PMDC	400,000	400,000	200,000	2,800,000	35,000
Total	1,200,000	800,000	600,000	2,800,000	90,000

6.5 INSTITUTIONAL STRENGTHENING AND CAPACITY BUILDING

The BWDB have limited internal capacity to handle environment related activities and the environmental activities will need to be outsourced. The PMU will require having some in house expertise on environmental management and a qualified officer is proposed to deploy in the PMU from another of BWDB or departments or out sourcing.

Strengthening of the PMU and the MFF stakeholders in environmental management will be the responsibility of the PMDC who will also be responsible for the establishment and strengthening of the Safeguards Cell as well as training for stakeholders in the projects being implemented. Environmental training and awareness for the Muhuri Project will be the responsibility of the IMO. The proposed training program is summarized in **Error! Reference source not found..**

TABLE 19: ENVIRONMENTAL STRENGTHENING AND CAPACITY BUILDING FOR MIP

Nr	Capacity Building Activity	Frequency	Responsibility and budget	Type of training	Who will be trained
1	Awareness on ADB environmental procedures, monitoring and EMP needs	Once project start	PMDC	Half day workshop led by environment specialist of the PMDC	All stakeholders involved in project design and implementation.
2	Programme awareness training	Annually	IMO	Half day workshop	Muhuri stakeholders
3	Identification of possible environmental issues and possible mitigation actions and monitoring requirements. Feedback on actual and potential environmental issues.	At project start and annually	IMO with support from PMDC specialists	1 day – including both field visits and group discussions	BWDB staff, IMO supervisors, contractors, Water User Associations, Department of Agriculture and representatives from the ICC and other key stakeholders.

6.6 CONCLUSIONS AND RECOMMENDATIONS

The project, aims at improving the agricultural production in the IMIIP area by means of rehabilitation of the irrigation infrastructure and related facilities. In summary, the project can be described as an irrigation and flood protection rehabilitation project aiming at improving agricultural production in the Muhuri Irrigation Project.

The main negative impacts of the project are summarized in table 18 below.

TABLE 20: MAINNEGATIVEIMPACTSAND PROPOSED MITIGATION MEASURES

<ul style="list-style-type: none"> ➤ Air, water and soil pollution ➤ Risks of accidents and workers' health hazards, ➤ Risk of road accidents, disturbance of local people, damage of local road networks, ➤ Loss of crops or delay in cropping due to delay in installation of irrigation pipes and electricity transmission lines across the field, ➤ Conflicts with local people, ➤ Loss of valuable flora along khals, ➤ Risk of oil and PCB spillage in the local environment and communities, ➤ Risk of fire hazards from substation ➤ Risk of spreading Covid-19 at community level 	<ul style="list-style-type: none"> ➤ Watering on dusty unpaved access roads, ➤ Covering of trucks to prevent dust emission, ➤ Adherence to traffic laws and regulations, ➤ Minimize activities during prayer time/rest hours, ➤ Provide healthy accommodation sanitary facilities to workers in the camp site, ➤ Ensure EHS and labour laws, ➤ Recruit workers locally, ➤ Minimize destruction of bank vegetation ➤ Schedule works in the lean season and complete works rapidly to unwanted delay not to disrupt water (irrigation) supply system, ➤ Ensure fire fighting arrangement in the substation site ➤ Train the people on fire fighting once in a year.
<ul style="list-style-type: none"> ➤ Risk of contamination of waters resources and food systems by agro-chemical like fertilizers, pesticides etc and toxic PCBs from transformer 	<ul style="list-style-type: none"> ➤ Ensure agriculture extension to support timely and correct pesticide application, introduction of IMP, ➤ Ensure safe storage, handling and disposal of PCBs.

The main positive impacts of the project are summarized in Table-21. The rice production in the area will increase considerably. However, overall agricultural production will increase and this may lead to a regional socio-economic uplift.

TABLE 21: MAIN POSITIVE IMPACTS OF THE PROJECT

Project Activities	Positive Impacts
Improved supply of irrigation water to agricultural lands	<ul style="list-style-type: none"> • Increased crop production • Improvement of socio-economic conditions of farmers • Socio-economic uplift of the region • Contribute in national food security, • Increase in number of permanent jobs in agriculture
Construction activities	<ul style="list-style-type: none"> • Creation of temporary job opportunities
Agriculture support services and cost recovery activities	<ul style="list-style-type: none"> • Income generation of woman and poor people and biodiversity conservation
Construction and installation of electrical substation	<ul style="list-style-type: none"> • Efficient power supply to the irrigation pumps, households and other commercial and educational institu5\tes

Finally, the positive impacts are expected to surpass the negative impacts, on the condition that the project rehabilitation activities are carefully planned and that due attention is given to the social aspects and risks of project implementation. If carefully implemented and due attention is paid to the proposed mitigating measures, the project will be an example for rehabilitation and modernization of other old irrigation projects of BWDB as well as other organization throughout the country and elsewhere.

CHAPTER VII- ANNEXURE

ANNEX-I: SELECTION OF SUBSTATION LOCATION

প্রকল্প পরিচালকের দপ্তর
পিএমইউ, সেচ ব্যবস্থাপনা উন্নয়ন প্রকল্প
(আইএমআইপি)-
মুহুরি সেচ প্রকল্প (এমআইপি)
বাংলাদেশ পানি উন্নয়ন বোর্ড
হাসান কোর্ট (৪র্থ তলা)
২৩/১, মতিঝিল বা/এ, ঢাকা-১০০০।
ফোন: ৯৫৫৬১২৪, ফ্যাক্স ৯৫৯২২০১
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স্মারক নং: পিডি/আইএমআইপি/আর-২/৬৯৫

তারিখ: ১৪/০২/২০১৯ খ্রিঃ।

বরাবর
ম্যানেজার
পল্লী বিদ্যুত সমিতি
ফেনী।

বিষয়: এশীয় উন্নয়ন ব্যাংক (ADB) এর ঋণ সহায়তাপুষ্ট Irrigation Management Improvement Project (IMIP) for Muhuri Irrigation Project শীর্ষক প্রকল্পের আওতায় ১টি সাবস্টেশন নির্মাণের লক্ষ্যে তফসিলভুক্ত জমি নির্বাচন প্রসঙ্গে।

উপর্যুক্ত বিষয়ে আপনার অবগতির জন্য জানানো যাচ্ছে যে, BWDB ও BREB/PBS, Feni-র মধ্যে সমঝোতাস্বাক্ষরের আলোকে বর্ণিত প্রকল্পের আওতায় ১টি ১০/১৪ MVA সাবস্টেশন নির্মাণের জন্য ইতোমধ্যে ঠিকাদার নিয়োগ করা হয়েছে। প্রকল্পের আওতায় উক্ত সাবস্টেশন নির্মাণের জন্য ১টি জমি নির্বাচন করা প্রয়োজন। ইতোমধ্যে ফুলগাজী উপজেলার উপজেলা নির্বাহী অফিসারের সাথে যোগাযোগপূর্বক নিম্নবর্ণিত তফসিলভুক্ত ৩৭ শতাংশ খাস জমি পরিদর্শনপূর্বক বাপাউবো'র পক্ষ থেকে প্রাথমিকভাবে নির্বাচন করা হয়েছে। উল্লেখ্য প্রকল্পের ডিপিপি'তে জমি অধিগ্রহণের কোন সংস্থান নেই অথচ অনতিবিলম্বে সাবস্টেশন নির্মাণ কাজ আড়ম্বল করা প্রয়োজন। জমিটি সকলের প্রত্যাশিত স্থানে না হলেও উক্ত স্থানে সাবস্টেশন নির্মাণে অসুবিধা হবে মর্মে প্রতীয়মান হয় না।

এমতাবস্থায়, উক্ত জমিতে সাবস্টেশন নির্মাণের বিষয়ে আপনার সম্মতি প্রদানের জন্য অনুরোধ করা হলো। সম্মতি প্রাপ্তির পর বাপাউবো বাংলাদেশ সরকার হতে উক্ত জমি স্থায়ীভাবে বন্দোবস্ত নেয়ার জন্য প্রয়োজনীয় ব্যবস্থা গ্রহণ করবে। বিষয়টি জরুরী বিবেচনা করবেন।

তফসিলঃ জমির পরিমাণ-৩৭ শতাংশ, খতিয়ান বিএস-০১, দাগ নং ৭২৬, মৌজা-ভবানী চকবস্তা, জে এল-৭৯, থানা-ফুলগাজী, জেলা-ফেনী।

সংযুক্তি: বর্ণনামতে।

(মো: রাফিউস সাজ্জাদ)
তত্ত্বাবধায়ক প্রকৌশলী

প্রকল্প পরিচালক
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অনুলিপি:

- ১) অতিরিক্ত মহাপরিচালক (পরিকল্পনা), বাপাউবো, ঢাকা।
- ২) জনাব কুমার চন্দ্র মন্ডল, প্রধান প্রকৌশলী (প্রকল্প), লিয়াজো কর্মকর্তা, বাপাউবো, ঢাকা।
- ৩) তত্ত্বাবধায়ক প্রকৌশলী, ফেনী পল্লী সার্কেল, বাপাউবো, ফেনী।
- ৪) নির্বাহী প্রকৌশলী, পিআইইউ, ফেনী পল্লী বিভাগ, বাপাউবো, ফেনী।
- ৫) জিএম/ডিজিএম, C-IMO, IMIP, ফেনী।



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তারিখঃ ১৮ ফাল্গুন, ১৪২৫ বঙ্গাব্দ
০২ মার্চ, ২০১৯ খ্রিষ্টাব্দ

তত্ত্বাবধায়ক প্রকৌশলী

ও

প্রকল্প পরিচালক

আইএমআইপি-এমআইপি

বাপাউবো, ঢাকা।

বিষয়ঃ এশীয় উন্নয়ন ব্যাংক (ADB) এর ঋণ সহায়তাপ্রাপ্ত Irrigation Management Improvement Project (IMIP) for Muhuri Irrigation Project শীর্ষক প্রকল্পের আওতায় ১ টি ৩৩/১১ কেভি উপকেন্দ্র নির্মাণের লক্ষ্যে ভূসিলভুজ জমি নির্বাচন প্রসংগে।

সূত্রঃ (১) পিডি/আইএমআইপি/আর-২/৬৯৫, তারিখঃ ১৪/০২/২০১৯ খ্রিঃ।

উপর্যুক্ত বিষয় ও সূত্রের আলোকে জানানো যাচ্ছে যে, বাপাউবো এর পক্ষ হতে প্রাথমিকভাবে নির্বাচিত সূত্র-১ এ উল্লিখিত জমিটি ফেনী পবিসের স্থানীয় বৈদ্যুতিক উপদেষ্টাসহ বাপবিবো ও পবিসের সংশ্লিষ্ট কর্মকর্তা কর্তৃক পরিদর্শন করা হয়েছে। উক্ত স্থান পরিদর্শনকালে নিম্নোক্ত সমস্যা সমূহ পরিলক্ষিত হয়।

- প্রস্তাবিত স্থানটি বৈদ্যুতিক লোড সেন্টারে অবস্থিত নয়।
- প্রস্তাবিত স্থানের প্রায় ১.৫ কিঃ মিঃ সামনেই মুন্সিরহাট বাজার সংলগ্ন ফেনী পবিসের একটি ২০ এমভিএ ক্ষমতা সম্পন্ন ৩৩/১১ কেভি উপকেন্দ্র রয়েছে। প্রস্তাবিত স্থানের আশে পাশের সকল লোড উক্ত উপকেন্দ্রের মাধ্যমে সরবরাহ করা হয়। একটি উপকেন্দ্রের পাশেই আরেকটি উপকেন্দ্র স্থাপন করা কারিগরি দিক থেকে কোন ভাবেই যুক্তিযুক্ত নয়।
- প্রস্তাবিত স্থানটি সমতল ভূমি হতে প্রায় ১০ ফুট এবং ফেনী-পরশুরাম পাক। সড়ক হতে প্রায় ৩০ ফুট নীচে অবস্থিত।
- গতীয়া নদীর মোহনায় প্রস্তাবিত ভূমির দুই পাশে দুইটি ব্রীজ আছে। যার নিচ দিয়ে সারা বছর পানি প্রবাহমান থাকে এবং বর্ষাকালে উজান থেকে আসা পানিতে স্থানটি তলিয়ে যায়। উক্ত স্থানে অর্থাৎ গতীয়া নদীর স্রোতের মুখে ভারি ভারি যন্ত্রাংশ স্থাপনের মাধ্যমে উপকেন্দ্র নির্মাণ করলে ভূমি খসে যাওয়ার সম্ভাবনা রয়েছে।
- প্রস্তাবিত ভূমিটি গর্ত হওয়ায় প্রায় ৩০ ফুট এর চেয়ে বেশি উচ্চতায় মাটি ভরাট করতে হবে এবং এর উপরই পাওয়ার ট্রান্সফরমারসহ উপকেন্দ্রের অনেক ভারি ভারি যন্ত্রাংশ স্থাপন, কন্ট্রোল রুম নির্মাণ করতে হবে যা ঝুঁকিপূর্ণ।
- মৌজা ম্যাপ হতে দেখা যায় প্রস্তাবিত ভূমিটি ত্রিভুজ আকৃতির কিন্তু উপকেন্দ্র নির্মাণ করার জন্য আয়তাকার ভূমির প্রয়োজন যার সাধারণ সাইজ (১০০ ফুট X ১৭০ ফুট) অথবা (১১০ ফুট X ১৬০ ফুট)।
- সহকারী কমিশনার (ভূমি), ফুলগাজী এর সহিত আলোচনা করে জানা যায়, সর্বোচ্চ ৩০ শতাংশ খাস ভূমি বরাদ্দ দেওয়া যাবে কিন্তু বাপবিবোর নীতিমালা অনুসারে একটি ৩৩/১১ কেভি উপকেন্দ্র নির্মাণ করার জন্য কমপক্ষে ৪০ শতাংশ জায়গার প্রয়োজন হবে।
- প্রস্তাবিত স্থানটি বুপালী ব্রিক ফিল্ড সংলগ্ন দক্ষিণ আনন্দপুর এলাকার ফেনী-পরশুরাম প্রধান সড়ক ঘেঁষে অবস্থিত। বিলোনিয়া স্থল বন্দরের জন্য বাংলাদেশ সরকার কর্তৃক রাস্তাটি সম্প্রসারণের পরিকল্পনা রয়েছে। প্রস্তাবিত স্থানে উপকেন্দ্র নির্মাণ করা হলে ভবিষ্যতে রাস্তা সম্প্রসারণে বিঘ্ন সৃষ্টি হবে।
- একটি ৩৩/১১ কেভি উপকেন্দ্রের জন্য ৩৩ কেভি সোর্স লাইন এবং কমপক্ষে ০৬টি ১১ কেভি আউটগোয়িং ফিডার নির্মাণ করা প্রয়োজন। প্রস্তাবিত স্থানটির তিনপাশে নদী/খাল এবং এক পাশে ব্রিক ফিল্ড থাকায় উক্ত ফিডার সমূহ নির্মাণে জটিলতার সৃষ্টি হবে।
- একটি উপকেন্দ্রের সাথে ৩৩ কেভি লাইন লস, পাওয়ার ট্রান্সফরমার লস, অন্যান্য আনুষঙ্গিক যন্ত্রাংশের লস, ১১ কেভি ফিডার লস ইত্যাদি ওতপ্রোতভাবে জড়িত। প্রস্তাবিত স্থানে উপকেন্দ্র নির্মাণ করা হলে পবিসের সিস্টেম লস হ্রাসের পরিবর্তে বৃদ্ধি পাওয়ার সম্ভাবনা রয়েছে।
- একটি উপকেন্দ্র পরিচালনার জন্য কমপক্ষে ০৪ জন লাইনম্যান এবং একজন জুনিয়র ইঞ্জিনিয়ার প্রয়োজন। প্রস্তাবিত জায়গাটি লোড সেন্টারে না হওয়ায় উক্ত জনবলের কর্মঘণ্টা নষ্ট হবে।

(মোঃ মিজানুর রহমান)
জেনারেল ম্যানেজার

০৮। অফিস নথি/মাটার নথি।

[illegible]

ANNEX-II: LOCATION CLEARANCE OF SUBSTATION

শেখ হাসিনার বাংলাদেশ
পরিচ্ছন্ন পরিবেশ

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
পরিবেশ অধিদপ্তর
পরিবেশ ভবন, ই/১৬ আগারগাঁও
শেরে বাংলা নগর, ঢাকা ১২০৭
www.doe.gov.bd



স্মারক নং-২২.০২.০০০০.০১৮.৯৯.০০১.২০. ২২

তারিখ: ০৬ ফাল্গুন, ১৪২৬ বঙ্গাব্দ।
১৯ ফেব্রুয়ারি, ২০২০।

বিষয়ঃ ফেনী জেলার মহরী সেচ প্রকল্পের পুনর্বাসন প্রকল্প আই.এম.পি এর প্যাকেজ CW-04 এর আওতায় ফেনী জেলার ফুলগাজী উপজেলার দৌলতপুর মৌজায় ৪০ (চল্লিশ) শতক ভূমি অধিগ্রহণের নিমিত্ত অনাপত্তি পত্র।

মুদ্রাঃ ১। নির্বাহী প্রকৌশলী (অঃদাঃ), বাংলাদেশ পানি উন্নয়ন বোর্ড, ফেনী কার্যালয়ের পত্র: নিঃপ্র/ফেনী/পওর/১৫০৬;

তারিখ: ২৫/১১/২০১৯ খ্রি:

২। পরিবেশ অধিদপ্তর চট্টগ্রাম অঞ্চল কার্যালয়ের পত্র: ২২.০২.৩০০০.২১০.৫২.০৭১.১৯.২৫১; তারিখঃ ২০/০১/২০২০ খ্রিঃ

উপর্যুক্ত বিষয় ও সূত্রের পরিপ্রেক্ষিতে জানানো যাচ্ছে যে, ফেনী জেলার মহরী সেচ প্রকল্পের পুনর্বাসন প্রকল্প আই.এম.পি এর প্যাকেজ CW-04 এর আওতায় ফেনী জেলার ফুলগাজী উপজেলার দৌলতপুর মৌজায় মোট ৪০ (চল্লিশ) শতক ভূমি অধিগ্রহণের জন্য নিম্নবর্ণিত বিষয়াদি প্রতিপালনের শর্তে অত্র দপ্তর হতে নির্দেশক্রমে অনাপত্তি প্রদান করা হলোঃ

- আলোচ্য প্রকল্পের কার্যক্রমের মাধ্যমে যাতে পারিপার্শ্বিক পরিবেশ (যথাঃ মাটি, পানি, বায়ু)-এর উপর কোন বিরূপ প্রভাব না পড়ে সে বিষয়ে যথোপযুক্ত ব্যবস্থা গ্রহণ করতে হবে;
- প্রকল্পের কার্যক্রমের আওতায় পারিপার্শ্বিক জীববৈচিত্র্য ও বন/গাছপালা ক্ষতিগ্রস্ত করা যাবে না এবং প্রাকৃতিকভাবে সৃষ্ট নদমা ও খালের প্রবাহ কোনভাবেই বিঘ্ন করা যাবে না;
- এ প্রকল্প কার্যক্রমে সৃষ্ট কঠিন বর্জ্য পরিকল্পিত উপায়ে সংগ্রহপূর্বক পরিবেশসম্মতভাবে নিরাপদ অপসারণ অথবা পুনঃব্যবহারের ব্যবস্থা করতে হবে। প্রকল্প কার্যক্রম চলাকালে সৃষ্ট অতিরিক্ত ধূলাবালি যাতে জনসাধারণের ক্ষতি না করে তার ব্যবস্থা গ্রহণ করতে হবে;
- আলোচ্য প্রকল্প কার্যক্রমে Green Building Concept-সমূহ যথাযথভাবে অনুসরণ করতে হবে। নবায়নযোগ্য জ্বালানী (সৌরশক্তি) ব্যবহার, প্রযোজ্য ক্ষেত্রে বাংলাদেশ ন্যাশনাল বিল্ডিং কোড যথাযথভাবে অনুসরণ করতে হবে;
- এ প্রকল্প কার্যক্রমের আওতায় শব্দ নিয়ন্ত্রণের জন্য যথাযথ ব্যবস্থাদি গ্রহণপূর্বক তা সর্বদা কার্যকর রাখতে হবে এবং শব্দের সানসাত্রা শব্দ দুষণ (নিয়ন্ত্রণ) বিধিমালা-২০০৬ এর মধ্যে থাকতে হবে;
- নির্মাণ কার্যক্রমের মাধ্যমে কোনো প্রকার বায়ুদূষণ সৃষ্টি করা যাবে না। নির্মাণ কাজ চলাকালীন নির্মাণাধীন অবকাঠামো যথাযথভাবে ঢেকে রাখতে হবে এবং নির্মাণাধীন এলাকায় নিয়মিত পানি ছিটিয়ে বায়ু দূষণ নিয়ন্ত্রণ করতে হবে
- বায়ু দূষণ নিয়ন্ত্রণের জন্য নির্মাণ সামগ্রী ঢেকে রাখতে হবে এবং নির্মাণ সামগ্রী পরিবহনের সময়ও ঢেকে পরিবহন করতে হবে;
- প্রকল্প এলাকার ন্যূনতম ৩৩% জায়গা ফলদ ও বনজ গাছ লাগিয়ে সবুজায়ন করতে হবে;
- অত্র নির্মাণপন্থায় যথোপযুক্ত ব্যবস্থাদি গড়ে তুলতে হবে। এ প্রকল্প কার্যক্রমের বাস্তবায়নে কর্মরত শ্রমিকদের পেশাগত স্বাস্থ্য রক্ষার্থে সকল ব্যবস্থা গ্রহণ করতে হবে;
- আলোচ্য প্রকল্পের কার্যক্রমের মাধ্যমে কোন নদী/খাল/বিল/হাওর/বাড়/দিঘি/পুকুর/অর্ণা/জলাশয় ভরাট করা যাবে না;

ফর্ম নং: ০৩৮	তারিখ: ০৩/০৩/২০
১। ই: পি: ৫১-১/২, ফেনী উপজেলার দৌলতপুর মৌজা	২। অফিসি: হাজি মাহবুব
৩। মতামত প্রকৌশলী	৪। উপস্থাপন করে প্রকৌশলী ব্যবস্থা নিও
৫। নির্বাহী প্রকৌশলী (অঃদাঃ)	৬। আলোচ্য প্রকল্প/অধিগ্রহণের নাম ও বর্ণনা
৭। প্রকল্পের বিবরণ	৮। প্রকল্পের স্থান
৯। ই: পি: হাওর	১০। পূর্ণি সূত্রের বেশি বর্ণনা
১১। প্রকল্পের বিবরণ	১২। প্রকল্পের স্থান
<p>নির্বাহী প্রকৌশলী ফেনী-১০৩ বিভাগ, বাগদাড়া, ফেনী।</p>	

- (ট) আলোচ্য প্রকল্পের আওতায় কোনভাবেই খালের প্রশস্ততা হ্রাস করা যাবে না; খাল/জলাশয়ের উপর রাস্তা তৈরীর জন্য কালভার্ট নির্মানের প্রয়োজন হলে যথাযথ কর্তৃপক্ষের পূর্বানুমতি গ্রহণ করতে হবে।
- (ঠ) প্রকল্পের বাস্তবায়ন অগ্রগতি পরিবীক্ষণ সংক্রান্ত কমিটিতে পরিবেশ অধিদপ্তরের সংশ্লিষ্ট মহানগর/বিভাগীয়/আঞ্চলিক/জেলা কার্যালয়ের একজন প্রতিনিধি অধ্যুক্ত করতে হবে;
- (ড) প্রকল্প বাস্তবায়নকালীন সময়ে পরিবেশ অধিদপ্তর কর্তৃক অন্য কোন নির্দেশনা প্রদত্ত হলে তা যথাযথভাবে অনুসরণ করতে হবে;
- (ঢ) এই অনাপত্তিপত্র জমির মালিকানা স্বত্ব নির্ধারণ করে না।

২২/০৬/২০২০
(সৈয়দ নজমুল আহসান)
পরিচালক (পরিবেশগত ছাড়পত্র)
ফোনঃ ৮১৮১৬৭৩

নির্বাহী প্রকৌশলী (অঃদাঃ)

ফেনী পওর বিভাগ,

বাংলাদেশ পানি উন্নয়ন বোর্ড, ফেনী।

অনুলিপিঃ

- ১। পরিচালক, পরিবেশ অধিদপ্তর, চট্টগ্রাম অঞ্চল কার্যালয়, চট্টগ্রাম।
- ২। উপপরিচালক, পরিবেশ অধিদপ্তর, ফেনী জেলা কার্যালয়, ফেনী।
- ৩। সহকারী পরিচালক, মহাপরিচালক মহোদয়ের শাখা, পরিবেশ অধিদপ্তর, সদর দপ্তর, ঢাকা।

ডায়েরী নং ২২২	তারিখ- ২২/০৬/২০২০
* নির্বাহী প্রকৌশলী (পরিকল্পনা)	* অতি জরুরী / জরুরী।
* নির্বাহী প্রকৌশলী (নকশা)	* আলোচ্য করণ।
* উপ-প্রধান (সম্প্রদায়ন)	* মতামত দিন।
* উপ-প্রধান/সহকারী প্রধান (অর্থনীতি)	* প্রয়োজনীয় ব্যবস্থা নিন।
* উপ-পরিচালক (হিসাব/অর্থ)	* পূর্ব সুস্থ সহ নথীতে পেশ করান।
* উপ-বিভাগীয় প্রকৌশলী (সংগ্রহ)	* নথীতে রাখুন।
* উপ-বিভাগীয় প্রকৌশলী (পিপিপি)	* ভাষাধা পত্র দিন।
* সহকারী প্রধান (সমাজ বিজ্ঞান)	
* সহকারী পরিচালক (প্রশাসন)	
* সহকারী প্রকৌশলী (এম আই এস এক্সপার্ট)	
* নির্বাহী প্রকৌশলী	

২২/০৬/২০
প্রকল্প পরিচালক

CWS-04 file

ANNEX-III: PUBLIC HEARING FOR LAND ACQUISITION BY DEPUTY COMMISSIONER

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
জেলা প্রশাসকের কার্যালয়, ফেনী
(ভূমি অধিগ্রহণ শাখা)
www.feni.gov.bd

স্মারক নং- ৩১.২০.৩০০০.০২২.১৪.০০১.২০-১৬

তারিখঃ ৩১/০৫/২০২০ খ্রি.

বিষয় : অধিগ্রহণের বিরুদ্ধে আপত্তির বিষয়ে শুনানীর নোটিশ

উপর্যুক্ত বিষয়ের পরিপ্রেক্ষিতে জানানো যাচ্ছে যে, মুহুরী সেচ প্রকল্পের পুনর্বাসন প্রকল্প আই.এম.আই.পি প্যাকেজ সি.ডব্লিউ-০৪ এর আওতায় ফেনী জেলার ফুলগাজী উপজেলায় ৮৯ নং দৌলতপুর মৌজায় একটি “বৈদ্যুতিক সাব-স্টেশন” নির্মাণ প্রকল্পের এল.এ. কেস নং- ০৮/২০১৯-২০২০ মূলে প্রস্তাবিত ৮৯ নং দৌলতপুর মৌজার বি.এস ৮৪১ ও ৮৪২ দাগের ভূমির অধিগ্রহণের বিরুদ্ধে আপনারা একটি লিগ্যাল নোটিশ দাখিলের মাধ্যমে আপত্তি জানান। উক্ত আপত্তির বিষয়ে বিষয়ে আগামী ০৮/০৬/২০২০ খ্রিঃ তারিখ সকাল ১১.০০ ঘটিকায় অতিরিক্ত জেলা প্রশাসক (রাজস্ব), ফেনী মহোদয় শুনানী গ্রহণ করবেন। উক্ত ধার্য তারিখ ও সময়ে আপনার/আপনাদের মালিকানার স্বপক্ষে প্রয়োজনীয় সকল মূল দলিল, খতিয়ান ও অন্যান্য কাগজপত্রসহ মতাসময়ে শুনানীতে উপস্থিত থাকার জন্য বলা হলো। অন্যথায় আপনার কোন আপত্তি নেই মর্মে অধিগ্রহণ কার্যক্রম সম্পন্ন করা হবে।

(মোঃ কমরুজ্জামান)
ভূমি অধিগ্রহণ কর্মকর্তা
ফেনী।

প্রাপকঃ ১। শেখ আহাৎ চৌধুরী, এয়ার আহাৎ চৌধুরী ৩। আবুল খায়ের চৌধুরী, পিতা: মৃত নাদেরেরজ্জমান চৌধুরী,
৪। তোহিদুল ইসলাম চৌধুরী ৫। মিজানুর রহমান চৌধুরী, পিতা: মৃত বদিয়র জামান চৌধুরী, সাং- বন্দুয়া
দৌলতপুর, ফুলগাজী, ফেনী

স্মারক নং- ৩১.২০.৩০০০.০২২.১৪.০০১.২০-১৬

তারিখঃ ৩১/০৫/২০২০ খ্রি.

অনুলিপিঃ

০১. নির্বাহী প্রকৌশলী, ফেনী পওর বিভাগ, বাপাউবো, ফেনী।
০১. গোপনীয় সহকারী, জেলা প্রশাসক/অতিরিক্ত জেলা প্রশাসক (রাজস্ব), ফেনী মহোদয়ের সদয় অবগতির জন্য।
০২. অফিস কপি।

তারিখঃ ০৫/০৬/২০২০	তারিখঃ ০৫/০৬/২০২০
* নির্বাহী প্রকৌশলী (পরিচালনা)	* অতি জরুরী / জরুরী।
* নির্বাহী প্রকৌশলী (মেকনিক)	* আপাত করণ।
* উপ-প্রধান (সম্পদসংরক্ষণ)	* মতামত দিন।
* উপ-প্রধান/সহকারী প্রধান (অর্থনৈতিক)	* প্রয়োজনীয় ব্যবস্থা দিন।
* উপ-পরিচালক (হিসাব/অর্থ)	* পূর্ব মুহুরী সহ নথীতে পেশ করণ।
* উপ-বিভাগীয় প্রকৌশলী (সংগ্রহ)	* নথীতে রাখুন।
* উপ-বিভাগীয় প্রকৌশলী (সিপিপি)	* জালাদা পত্র দিন।
* সহকারী প্রধান (সমাগা বিভাগ)	
* সহকারী পরিচালক (প্রশাসন)	
* সহকারী প্রকৌশলী (এম আই এস এজপার্ট)	
* হিসাব রক্ষক	

৩১-৫
৩১-৫

(মোঃ কমরুজ্জামান)
ভূমি অধিগ্রহণ কর্মকর্তা
ফেনী।

ANNEX-IV: ENVIRONMENTAL CLEARANCE CERTIFICATE (ECC) OF MIP



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Government of the People's Republic of Bangladesh
Department of Environment
www.doe-bd.gov
Head Office, Paribesh Bhaban
E-16 Agargaon, Dhaka-1207

Memo No: DOE/Clearance/5287/2014/ 333

Date: 30/11/2014

Subject: Environmental Clearance for Irrigation Management Improvement Project (IMIP) (for Muhuri Irrigation Project) at Feni Sadar, Sonagazi, Phulgazi, Pursuram and Chhagayal Niyyia Upazila of Feni District & Mirsari Upzila of Chittagong District.

Ref: Your application dated 30/06/2014 and 23/09/2014.

Dear Sir,

Please refer to your application of 30th June 2014 and 23rd September, 2014, I have the pleasure to convey the approval of Environmental Clearance to the proposed Irrigation Management Improvement Project (IMIP) (for Muhuri Irrigation Project) at Feni Sadar, Sonagazi, Phulgazi, Pursuram and Chhagayal Niyyia Upazila of Feni District & Mirsari Upzila of Chittagong District.

A copy of the said Environmental Clearance Certificate is attached herewith for your kind information and necessary action at your end.

স্বাক্ষরিত নং
প্রকৌশলী (পরিকল্পনা) * অতি জরুরী/ জরুরী।
প্রকৌশলী (নকশা) * আলাপ করুন।
উপ-প্রধান (সম্প্রসারণ) * মতামত দিন।
উপ-প্রধান/সহকারী প্রধান (অর্থনীতি) * প্রয়োজনীয় ব্যবস্থা নিন।
উপ-পরিচালক (হিসাব/অর্থ) * পূর্ব মূল্য সহ নথিতে পেশ করুন।
উপ-বিভাগীয় প্রকৌশলী (সংগ্রহ) * নথিতে রাখুন।
উপ-বিভাগীয় প্রকৌশলী (পিপিপি) * তাগাদা পত্র দিন।
সহকারী প্রধান (সমাজ বিজ্ঞান) ৩০/১১/১৪
সহকারী পরিচালক (প্রশাসন)
সহকারী প্রকৌশলী (এম আই এস এস সফটওয়্যার)

Yours Sincerely,

30.11.2014

(Syed Nazmul Ahsan)

Deputy Director (Environmental Clearance)
and

Member-Secretary

Environmental Clearance Committee

Phone: 8802-8181778

Project Director

Irrigation Management Improvement Project (IMIP)
Muhuri Irrigation Project
Bangladesh Water Development Board (BWDB)
Hasan Court (8th Floor), Motijheel, Dhaka-1000.

Copy Forwarded to :

- 1) Private Secretary to the Hon'ble Secretary, Ministry of Environment and Forests, Bangladesh Secretariat, Dhaka.
- 2) Director, Department of Environment, Chittagong Division, Chittagong.
- 3) Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.

Government of the People's Republic of Bangladesh
Department of Environment
Head Office, E-16 Agargaon
Dhaka-1207

Environmental Clearance Certificate

Section 12 of the Environment Conservation Act, 1995 (Amended 2002)

Clearance Certificate Number: 333

File number: DOE/Clearance/5287/2014

Clearance Certificate Issue Date: 30 November 2014

Renewal date not later than: 29 November 2015

A. Clearance Certificate Type

Environmental Clearance Certificate

B. Clearance Certificate Holder

Project Director

Irrigation Management Improvement Project (IMIP)
(For Muhuri Irrigation Project)
Bangladesh Water Development Board (BWDB)
Hasan Court (8th Floor), Motijheel, Dhaka-1000 .

C. Premises to which this Clearance Certificate Applies

Irrigation Management Improvement Project (IMIP) for Muhuri Irrigation Project at Feni Sadar, Sonagazi, Phulgazi, Pursuram and Chhagayal Niyyia Upazila of Feni District & Mirsari Upzila of Chittagong District.

D. Activities for which this Clearance Certificate Authorizes and Regulates

The following activities will be implemented through this project :

- a. Coastal Flood Protection
 1. Rehabilitation of Coastal Embankment Polder 60
 2. Rehabilitation of Coastal Protection/Drainage Structure
 3. New Coastal Protection/Drainage Structure
- b. Main River System
 1. Repair to Water and Flood Control Structure
 2. New Water and Flood Control Structure
 3. New River Bank Protection at Bhulukia
- c. Excavation of Khals
- d. Repair of BWDB Offices, Stores
- e. Modernization of Farmer Canal Systems
- f. Upgrading of Electrical Distribution Systems.

E. Terms and Conditions for Environmental Clearance Certificate

1. **Limit Condition for Discharges to Air and Water:** The Environmental Clearance Certificate must comply with schedule 2 and 10, rule 12 of the Environment Conservation Rules, 1997 (Annex-I & II).
2. **Noise Limit:** The Environmental Clearance Certificate must comply with the Noise Pollution (Control) Rules, 2006

In case of non-coverage of ECR 1997, the World Bank Environment, Health and Safety Guideline shall be adhered to.

3. Operating Conditions:

- 3.1 Activities must be carried out in a competent manner. This includes:
 - (a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
 - (b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.
- 3.2 All plants and equipments installed at the premises or used in connection with the Environmental Clearance activity:
 - (a) must be maintained in a proper and efficient condition; and
 - (b) must be operated in a proper and efficient manner.
- 3.3 Construction works shall be restricted to day time hours so as to avoid/mitigate the disturbance of local lives as well as implementation schedules of the works shall be notified in advance to nearby residents.
- 3.4 Storage area for chemicals and other construction materials shall be carefully selected to avoid disturbance of the natural drainage. To avoid soil contamination at labor camp and work-site chemical, cement and petroleum derivatives shall be handled cautiously.
- 3.5 Sufficient number of culverts, bridges, sluice and other drainage/inlet facilities shall be installed properly to ensure sufficient cross drainage capacity.
- 3.6 During site preparation, piling work, construction/re-construction of land embankments, regulators, approach roads and temporary access roads, top soil shall be kept aside and shall be restored after completion of the said activities.
- 3.7 The open areas that are grasslands can be used for construction but with appropriate safeguards to maintain material and dump sites from contaminating river waters.
- 3.8 This shall be ensured that soil is not obtained from agricultural land and it should be obtained nearby river/khal/beel areas, which are free of invasive plants. The construction equipment and vehicles shall be cleaned regularly.
- 3.9 Re-vegetation and replanting shall be undertaken if rehabilitation works involve extensive vegetation clearance.
- 3.10 Vegetation clearance shall be minimizing at the construction phase as to minimize soil erosion. Soils for embankments shall be properly tested and compacted to ensure stability.
- 3.11 Soil erosion caused by removal of vegetative cover and excavated loose soil shall be checked by adequate protective works and plantation with local vegetation as soon as possible; loose soil shall be covered and stored away from the edge of the sea/river.

- 3.12 Proper construction practices shall be followed that minimize loss of habitats and fish breeding, feeding and nursery sites.
- 3.13 Necessary steps shall be taken to protect flooding of local areas due to restricted flow at the project sites.
- 3.14 Proper and adequate sanitation facilities shall be ensured in labor camps throughout the proposed project period.
- 3.15 In order to control noise pollution, vehicles & equipment shall be maintained regularly; working during sensitive hours and locating machinery close to sensitive receptor shall be avoided.
- 3.16 No solid waste can be burnt in the project area. An environment friendly solid waste management should be in place during whole the period of the project in the field.
- 3.17 Proper and adequate on-site precautionary measures and safety measures shall be ensured so that no habitat of any flora and fauna would be demolished or destructed.
- 3.18 Any heritage site, ecological critical area and other environmentally and/or religious sensitive places shall be avoided during project construction phase.
- 3.19 To control dust vehicles and equipment to be used for this project shall be maintained properly, water trucks shall be used, stockpiles to be located away from sensitive receptors and vehicle speed limits shall be enforced.
- 3.20 Resettlement plan should be properly implemented and people should be adequately compensated, where necessary.
- 3.21 Climate Change effects and maximum storm surge height shall have to consider at the design phase.
- 3.22 Construction material should be properly disposed off after the construction work is over.
- 3.23 Appropriate permission would be required to obtain from the forest department in favor of cutting/felling of any plant/tree/sapling forested by any individual or government before doing such type of activity.
- 3.24 The mitigation measures described in the Environmental Impact Assessment (EIA) report along with the emergency response plan shall strictly be implemented and kept functioning on a continuous basis.

4.1 Monitoring and Recording Conditions:

- 4.1.1 The results of any monitoring required to be conducted by this Clearance Certificate must be recorded.
- 4.1.2 The following records must be kept in respect of any samples required to be collected for the purposes of this Clearance Certificate:
 - (a) the date(s) on which the sample was taken;
 - (b) the time(s) at which the sample was collected;
 - (c) the point at which the sample was taken; and
 - (d) the name of the person who collected the sample.

4.2 Requirement to Monitor Concentration of Pollutants Discharged

For each monitoring, the Clearance Certificate holder must monitor (by sampling and obtaining results by analysis) the following parameter: water

invasive species, the changes in aquatic habitats before, during and after construction, fish catch during and after construction.

5. **Reporting Conditions:** Environmental Monitoring Reports shall be made available simultaneously to Head quarters and Chittagong Divisional office of the Department of Environment on a quarterly basis during the whole period of the project.
6. **Notification of environmental harm:** The Clearance Certificate holder or its employees must notify the Department of Environment of incidents causing or threatening material harm to the environment as soon as practicable after the person becomes aware of the incident.

F. Recording of Pollution Control:

The certificate holder must keep a legible record of all complaints made to the certificate holder or any employee or agent of the certificate holder in relation to pollution arising from any activity to which this Environmental Certificate applies. The record must include details of the following:

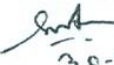
- (a) the date and time complaint;
- (b) the method by which the complaint was made;
- (c) any personal details of the complaint which were provided by the complaint or, if no such details were provided, a note to that effect;
- (d) the nature of the complaint;
- (e) the action taken by the certificate holder in relation to the complaint, including any follow-up contact with the complaint; and
- (f) if no action was taken by the certificate holder, the reasons why no action was taken.

The record of a complaint must be kept for at least 4 (four) years after the complaint was made. The record must be produced to any authorized officer of the DOE who asks to see them.

G. Validity Of The Clearance Certificate:

This Environmental Clearance is valid for one year from the date of issuance and the Project authority shall apply for renewal to the Chittagong Divisional office of DOE with a copy to Head Office at least 30 (thirty) days ahead of expiry.

Violation of any of the above conditions shall render this clearance void.


30-11-2019

(Syed Nazmul Ahsan)
Deputy Director (Environmental Clearance)
and
Member Secretary
Environmental Clearance Committee

ANNEX-V: PARTICIPANT LISTS OF PCM CONDUCTED IN THE SURROUNDING VILLAGE OF THE
PROPOSED ELECTRICAL SUBSTATION ON MAY-JUNE, 2021

Irrigation Management Improvement Project (IMIP), BWDB

Public Consultation Meeting (PCM)

Place: Village- Bondhura, Union parishad- Daulatpur, Upazila- Fulga
District- Feni, Date- 01.06.2021, Time- 10:30

Issues discussed in the meeting-

Social & Environmental issues

- (a) A 33/11 KVA Electrical substation will be installed in this area for supplying electricity to the irrigation pumps under MIP. What do you think about the substation going to be installed? Is it beneficial or harmful for this locality, peoples, agricultural lands, crops, domestic/wild animals and environment & how?
- (b) What are your suggestions to enhance the beneficial impacts and/or reduce the harmful impacts if any?

Resettlement & Grievance issues

- (c) Have you lost your agricultural lands for proposed Electrical Substation? If yes, then what losses, you expect, should be compensated?
- (d) How your losses can be compensated?

Note- the questions will be open ended and asked & discussed in local language. The responses will be also recorded in local language but be composed in English

Irrigation Management Improvement Project (IMIP), BWDB

Public Consultation Meeting (PCM) Participants' list

Venue: Bondhua Village, Daulatpur Union, Fulgazi Upazila, Feni

Date- 01.06.2021

Sl. No. (ক্রমিক নং)	Name of the participant (নাম)	Age (Years) (বয়স)	Profession (পেশা)	Education (শিক্ষা)	Contact Number (ফোন নম্বর)	Signature (স্বাক্ষর)
1	নাসির উদ্দিন	৫৩	রাজনৈতিক	এইচএসসি	০২৬৬০২৬৭৭	নাসির উদ্দিন
2	মো. জাহর উল্লাহ	৪৫	কৃষক	কামিল	০২৬৭৬৬০৬২৩	জাহর উল্লাহ
3	ইমদাদ আলী	৪২	চাকুরী	BSC	০২৬২০১৫৪০৬৪	ইমদাদ আলী
4	আবদুল ওয়াহিদ	৪৫	চাকুরী	এমএসসি	০১৭১২৬৬৬২২১	আবদুল ওয়াহিদ
5	ইনজামা	২৭	হাট	এমএসসি	০২২২৭২৬৬৬৬	ইনজামা
6	নূরুল হুদা	৫০	কৃষক	এমএসসি		নূরুল হুদা
7	ফারুক	৪৫	কামা	বিএ	০১৭১১৪৪৩২৪৪	ফারুক
8	আবুল তালেব	৫৫	কামা	চম প্রোগ্রাম	০২৬৬০৪৬৬৪২৫	আবুল তালেব
9	আবদুল হালেক	৬৬	কৃষক	এইচএসসি	০২৬৭২২২৬৬০	আবদুল হালেক
10	জুয়েল হুসৈন	৩০	ইঞ্জিনিয়ার	বিএসসি	০১৭১৩২৪৫৬৩০	জুয়েল হুসৈন
11	আমান উল্লাহ	৬২	ড্রাইভার	চম প্রোগ্রাম	০২৬২৭০২৫২২	আমান উল্লাহ
12	জিয়াউর রহমান	৪৪	চাকুরী	এমএসসি	০১৭১৩০৫০৩৩	জিয়াউর রহমান
13	কামাল আলী	৫৭	কৃষক	পঞ্চম প্রোগ্রাম	০২৬৫৫৭২২২৫	কামাল আলী
14	মো. জাহর উল্লাহ	৪২	কামা	অসম প্রোগ্রাম	০২৬২৬৭৫২৬৬	মো. জাহর উল্লাহ
15	আবদুল কাদের	৭০	কৃষক	পঞ্চম প্রোগ্রাম	০২৬৬৬৬৬৬৬৬	আবদুল কাদের
16	মো. মোস্তফা	৬৬	কৃষক	অসম প্রোগ্রাম	০২৬৬৬৬৬৬৬৬	মো. মোস্তফা
17	সাকিল চৌধুরী	২৬	কামা	বিএ	০১৪৫৬৭৫৭৭৭	সাকিল চৌধুরী
18	আবু তাহের	৭০	চাকুরী	অসম প্রোগ্রাম	০২৬৬৬৬৬৬৬৬	আবু তাহের
19	জাহর আলী	৬৭	কৃষক	পঞ্চম প্রোগ্রাম		জাহর আলী
20	জাহর আলী	৬৬	কৃষক	অসম প্রোগ্রাম	০২৬৬৬৬৬৬৬৬	জাহর আলী
21	আবুল হাফিজ	৬০	কৃষক	পঞ্চম প্রোগ্রাম		আবুল হাফিজ
22	মো. ইউনুস	৬৪	কৃষক	পঞ্চম প্রোগ্রাম	০২৬৬৬৬৬৬৬৬	মো. ইউনুস

23	ନୁନୁ ନୀ	୮୦	ହସକ	ଜାହେ (ଆସ)	୦୫୨୭୦୭୩୮୮	ନୁନୁ ନୀ
24	ରମିନା ପାଣି	୫୦	ହାତୀ	ମ.ସ.ସ.	୦୧୫୨୫୩୦୦୫୧	ନୁନୁ ନୀ
25	ଆହମ୍ମଦ୍ ହୁସେନ	୭୦	ହସକ	ଆହମ୍ମଦ୍ (ଆସ)	୦୫୨୦୨୦୦୦୫୮	ଆହମ୍ମଦ୍ ହୁସେନ
26	କା.ମୁନିରା	୭୦	ଗଞ୍ଜାବୀ	ମାମୁନା	୦୨୨୨୨୨୭୭୭୭	ମାମୁନା (HB)
27	କା.ମୁନିରା	୫୦	ଗଞ୍ଜାବୀ	ମାମୁନା	୦୧୫୨୫୩୦୦୫୧	ନୁନୁ ନୀ
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Irrigation Management Improvement Project (IMIP), BWDB

Public Consultation Meeting (PCM) Participants' list

Venue: Bondhuya Village, Daulatpur Date- 31.05.2021
Feni Sadar, Feni.

Sl. No.	Name of the participant	Age (Years)	Profession	Education	Contact Number	Signature
(ক্রমিক নং)	(নাম)	(বয়স)	(পেশা)	(শিক্ষা)	(ফোন নম্বর)	(স্বাক্ষর)
1	ফরাস চৌধুরী	২৭	ড্রাইভার	মাস্টার	০১৬৮৫৫৩৫০২	ফরাস
2	নূর আনছ	৪০	ড্রাইভার	অস্ট্রেলিয়া	০১৬৮৬২৮২৬৬২	নূর
3	নূর করিম	৪০	মাসুরীকণি	নবহ	০১৬৮৬২৪০৭৮৪	নূর
4	নূরুল আফজার	৪০	মাসুরীকণি	কোচিং	০১৬৮৬২৭৭৭৪৪	নূরুল
5	নাহিদুল ইসলাম	২৫	ছাত্র	নবহ	০১৬৮৬২৭৭৭৪৪	নাহিদুল
6	নূর ইসলাম	৪৫	ড্রাইভার	মাস্টার	০১৬৮৬০০৫০০	নূর ইসলাম
7	নূরুল হক	৫২	কৃষক	বি.এ	০১৬৮৬০২০২০২	নূরুল হক
8	আব্দুল হক	৭০	কৃষক	মাস্টার		আব্দুল হক
9	আব্দুল হক	৭০	কৃষক	মাস্টার	০১৬৮৬০০৫০০	আব্দুল হক
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ANNEX-VI: ADB'S INTERIM GUIDELINES FOR DMCs TO COMBAT COVID-19

Sl No.	Preventive measures	Detailed measures to be taken according to ADB Guidelines	Measures to be taken by the Project
COMMON MEASURES FOR ALL WORKPLACES			
1	Hand hygiene	<ul style="list-style-type: none"> Regular and thorough hand washing with soap/alcohol-based hand-rub especially after contact with co-workers or customers; potentially contaminated objects. protective equipment but before touching eyes, nose, or mouth. Hand hygiene stations, such as hand washing and hand rub dispensers, in the workplace and accessible to all staff, contractors, clients or customers, and visitors 	<ul style="list-style-type: none"> Hand sanitizer like soap, hand wash and alcoholic hand rubs should be provided to only the management /supervising personnel of German contractors and also to the labors in work sites and in residence in limited scale. Local contractors have not been found to provide any hand washing facilities. Hand hygiene facilities must be provided to the participants of training, workshops, official meetings and demonstration fields.
2	Respiratory hygiene	<ul style="list-style-type: none"> Promote respiratory etiquette and provide medical face masks and paper tissues for all people at the workplace along with bins with lids for hygienic disposal. Develop a policy on wearing a face mask or cover in line with national or local guidance. When a worker is sick, they should not be allowed to come to work and when the workers feel unwell while at work, they should provide a medical mask so that they may get home safely. 	<ul style="list-style-type: none"> Contractors workers, supervisors, IMO and BWDB officials must be trained to maintain the respiratory etiquette for preventing transmission of Covid-19 infections by C-IMO, DCEO and PIU, Feni <p>No mask no service” and “Stay home during Covid-19 symptoms” policy of national government should be followed in PMU, PIU, C-IMO and office of Contractors &workplace of local/foreign contractors.</p>
3	Physical distancing	<ul style="list-style-type: none"> Maintain a safe physical distance of at least 1 meter between people and avoid direct physical contact i.e., hugging, touching, shaking hands), strict control over external access, queue management (marking on the floor, barriers). Reduce density of people in the building (no more 	<ul style="list-style-type: none"> A safe physical distance should be maintained in all indoor and outdoor workplace and direct physical contact i.e., hugging, touching, shaking hands) must be avoided. A strict control over external access, to the offices should maintain.

		<p>than one person per 10 square meters), physical spacing at least 1 meter apart for workstations and common spaces, such as entrances /exits, lifts, pantries /canteens, stairs, and other areas congregation or queuing of employees or visitors /clients might occur.</p> <ul style="list-style-type: none"> • Minimize the need for physical meetings, e.g., by using teleconferencing facilities. • Avoid crowding by staggering working hours to reduce congregation of employees at common spaces such as entrances or exits. 	<ul style="list-style-type: none"> • Reduction of people's density in the building (no more than one person per 10 square meters) should maintain but physical spacing at least 1 meter apart for workstations and common spaces, such as entrances /exits, lifts, pantries /canteens, stairs, and other areas congregation or queuing of employees or visitors /clients are already being maintained. • Physical meetings should be minimized and online meeting, by using teleconferencing facilities like zoom and Microsoft cloud meeting soft wires, needs to be enhanced in almost all offices.
4	Reduce and manage work-related travels	<ul style="list-style-type: none"> • Cancel or postpone non-essential travel to areas with community transmission of corona virus disease (COVID-19), provide hand sanitizer to workers who must travel, advise workers to comply with instructions from local authorities where they are traveling as well as information on whom to contact if they feel ill while traveling. Workers returning from an area where COVID-19 transmission is occurring should monitor themselves for symptoms for 14 days and take their temperature twice a day; if they are feeling unwell, they should stay at home, self-isolate, and contact a medical professional. 	<ul style="list-style-type: none"> • All sorts of long-distance travel to areas with community transmission of corona virus disease (COVID-19) has to cancel/postpone except some short travel to the demonstration plots calling lead farmers from the nearby villages by maintain Covid-19 preventive measures. • Workers returning from Sona Gazi, Feni where COVID-19 transmission occurred at community level have to monitor by labor leaders for symptoms and those who will have feelings of fever and/or coughing should not allow to work.
5	Regular environmental cleaning and disinfection	<ul style="list-style-type: none"> • Clean surfaces by brushing or scrubbing thoroughly using soap or a neutral detergent with disinfectants to remove dirt, debris etc and to kill pathogens and other micro- organisms on the high-touch surfaces like commonly used area (door and window handles, light switches, kitchen and food preparation areas, bathroom surfaces, 	<ul style="list-style-type: none"> • Office room, kitchen, toilets and sitting furniture, working appliances and other common spaces with their fittings should be disinfected regularly and the contractors should provide disinfectants to the labors for disinfecting their sheds/kitchen and toilets.

		<p>toilets and taps, touch screen personal devices, personal computer keyboards, and work surfaces).</p> <ul style="list-style-type: none"> • Prepare and use disinfectant solutions according to the manufacturer's instructions, including instructions on how to protect the safety and health of disinfection workers and how to use personal protective equipment (PPE); avoid mixing different chemical disinfectants. • Avoid spraying or fogging disinfectants to environmental surfaces of indoor workplaces or in a tunnel, cabinet or chamber as it can cause eye, respiratory, and skin irritation and other toxic effects. 	<ul style="list-style-type: none"> • PMDC/IMO should provide trainings to contractor's personnel, IMO personnel, WUA members on Health and Safety issues to combat Covid-19 pandemics. • Contractors or IMO should set spraying or fogging tunnel/cabinet/chambers in the field or offices.
6	Risk communication, training, and education	<ul style="list-style-type: none"> • Provide posters, videos, and electronic message boards to increase awareness of COVID-19 among workers, and promote safe individual practices at the workplace. • Special attention should be given to reaching out to and engaging vulnerable and marginalized groups of workers, such as those in the informal economy as well as migrant workers, domestic workers, subcontracted and self-employed workers, and those working under digital labor platforms. 	<p>Awareness of Covid-19 should be raised among the workers and WMO members by posters "No mask no service" and providing training /discussion in each training sessions and demonstration programs</p> <ul style="list-style-type: none"> • Special attention has to be taken for the vulnerable, marginalized groups of workers by either C-IMO or the contractors.
7	Management of people with suspected COVID-19 or their contacts	<ul style="list-style-type: none"> • Urge workers who are unwell or who develop symptoms consistent with COVID-19 to stay at home, self-isolate, and contact a medical professional or the local COVID-19 information line for advice on testing and referral. • Where local community transmission is high, and work continues, allow for a telemedicine consultation where available, or consider waiving the requirement for a medical note for workers 	<ul style="list-style-type: none"> • Workers should allow to stay home in self isolation after feeling unwell and developing Covid-19 symptoms. Proper arrangement must be ensured to help the workers to access Covid-19 test and treatment.

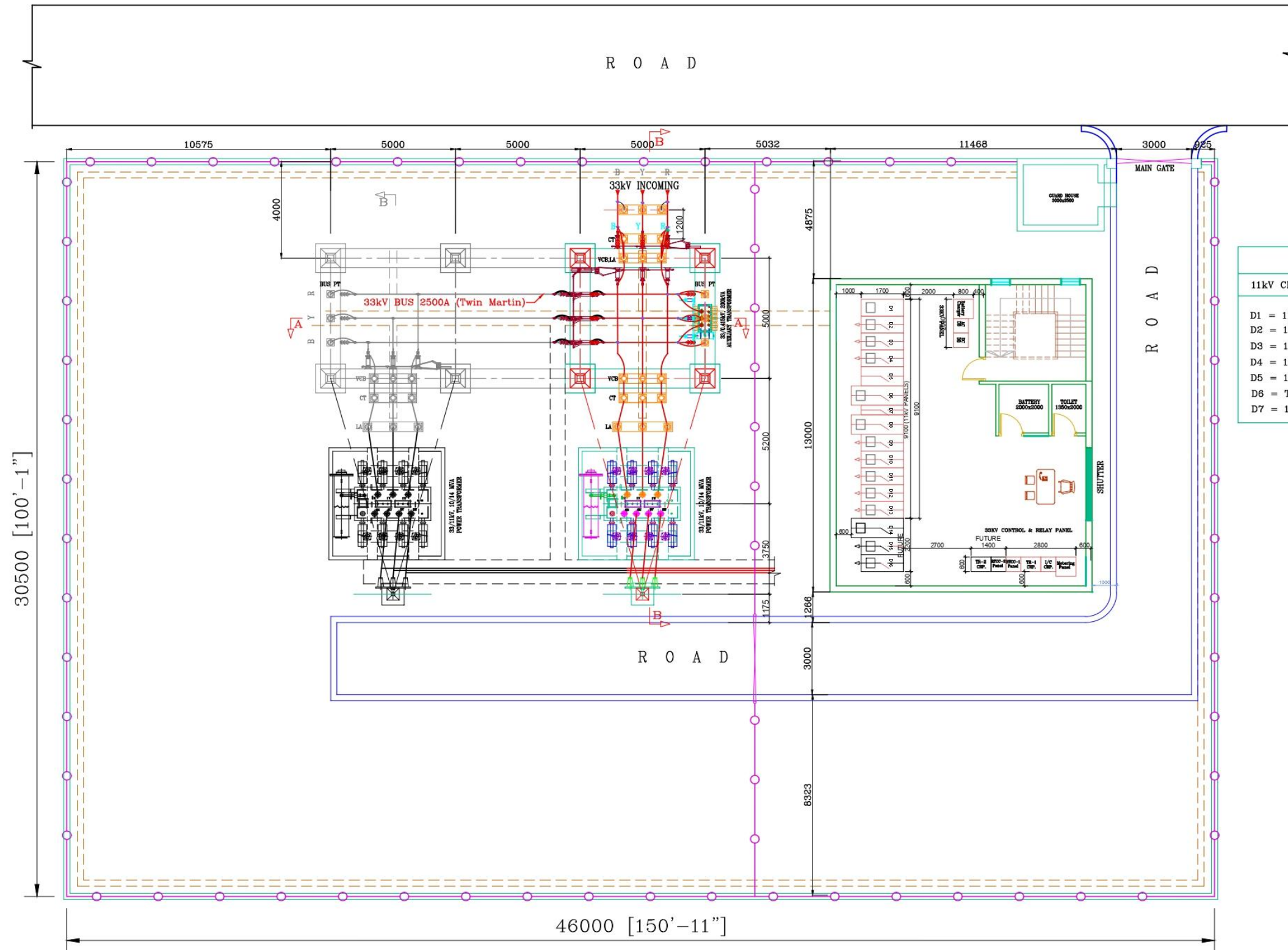
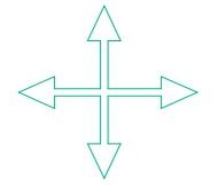
		who are sick so that they may stay home.	
SPECIFIC MEASURES FOR WORKPLACES AT MEDIUM RISK			
8	In addition to the measures for all sites	<ul style="list-style-type: none"> • Take all the mitigating actions possible to reduce the risk of transmission between workers, clients or customers, contractors, and visitors such as scheduling staggered activities, minimizing face-to-face and skin-to-skin contacts, placing workers side-by-side or facing away from each other rather than face-to-face, assigning staff to the same shift teams to limit social interaction, and installing Plexiglas barriers at all points of regular interaction and cleaning them regularly. • Enhance hand hygiene—regular hand washing with soap and water or use of alcohol-based hand rub— before entering and after leaving enclosed machinery, vehicles, confined spaces, and before putting on and after taking off PPE. • Provide PPE and training on its proper use—e.g., masks, disposable gowns, and disposable gloves or heavy-duty gloves that can be disinfected. Provide face or eye protection (medical mask) during cleaning procedures that generate splashes. 	<ul style="list-style-type: none"> • Sitting arrangement in the office of PMU, PIU, C-IMO and contractors must be rearranged to ensure minimum safe physical distance (minimum 1 m apart) • Sanitizers and disinfectants must be provided to the offices mentioned. • PPE with H&S training should be provided to the labors/workers/managers /supervisors

ANNEX-VII: DESIGN OF PROPOSED ELECTRICAL SUBSTATION COMPONENT

The layout plan and design of the proposed 33/11 KV Electrical substation for MIP under IMIP, BWDB is attached below.

FOR APPROVAL

ALL DIMENSIONS ARE IN mm



LEGEND

11kV CIRCUIT BREAKER PANEL

- | | |
|-----------------------------|-----------------------------------|
| D1 = 11kV BUS PT-1 | D8 = 11kV BUS COUPLER |
| D2 = 11kV OUTGOING FEEDER-1 | D9 = 11kV OUTGOING FEEDER-5 |
| D3 = 11kV OUTGOING FEEDER-2 | D10 = 11kV OUTGOING FEEDER-6 |
| D4 = 11kV OUTGOING FEEDER-3 | D11 = 11kV OUTGOING FEEDER-7 |
| D5 = 11kV OUTGOING FEEDER-4 | D12 = 11kV OUTGOING FEEDER-8 |
| D6 = TRANSFORMER-1 | D13 = 11kV BUS PT-2 |
| D7 = 11kV BUS RISER | D14 = TRANSFORMER-2 (FUTURE) |
| | D15-16 = 11kV O/G FEEDER (FUTURE) |

- = SCOPE OF SUPPLY
- = FUTURE PROVISION

CLIENT : BANGLADESH WATER DEVELOPMENT BOARD (BWDB).

PROJECT: TURNKEY CONTRACT (A) CONSTRUCTION OF 1X10/14MVA, 33/11kV INDOOR TYPE SUBSTATION AND (B) UPGRADING OF ELECTRICAL DISTRIBUTION (HT, LT, OVER HEAD LINE) SYSTEM FOR MUHURI IRRIGATION PROJECT UNDER IRRIGATION MANAGEMENT IMPROVEMENT PROJECT (IMIP)

CONTRACT NO: Contract Package No. CW-04 (NCB) ADB Load No.3135 BAN (SF) Date: 15/11/2018

CONTRACTOR : ENERGYPAC ENGINEERING LTD.

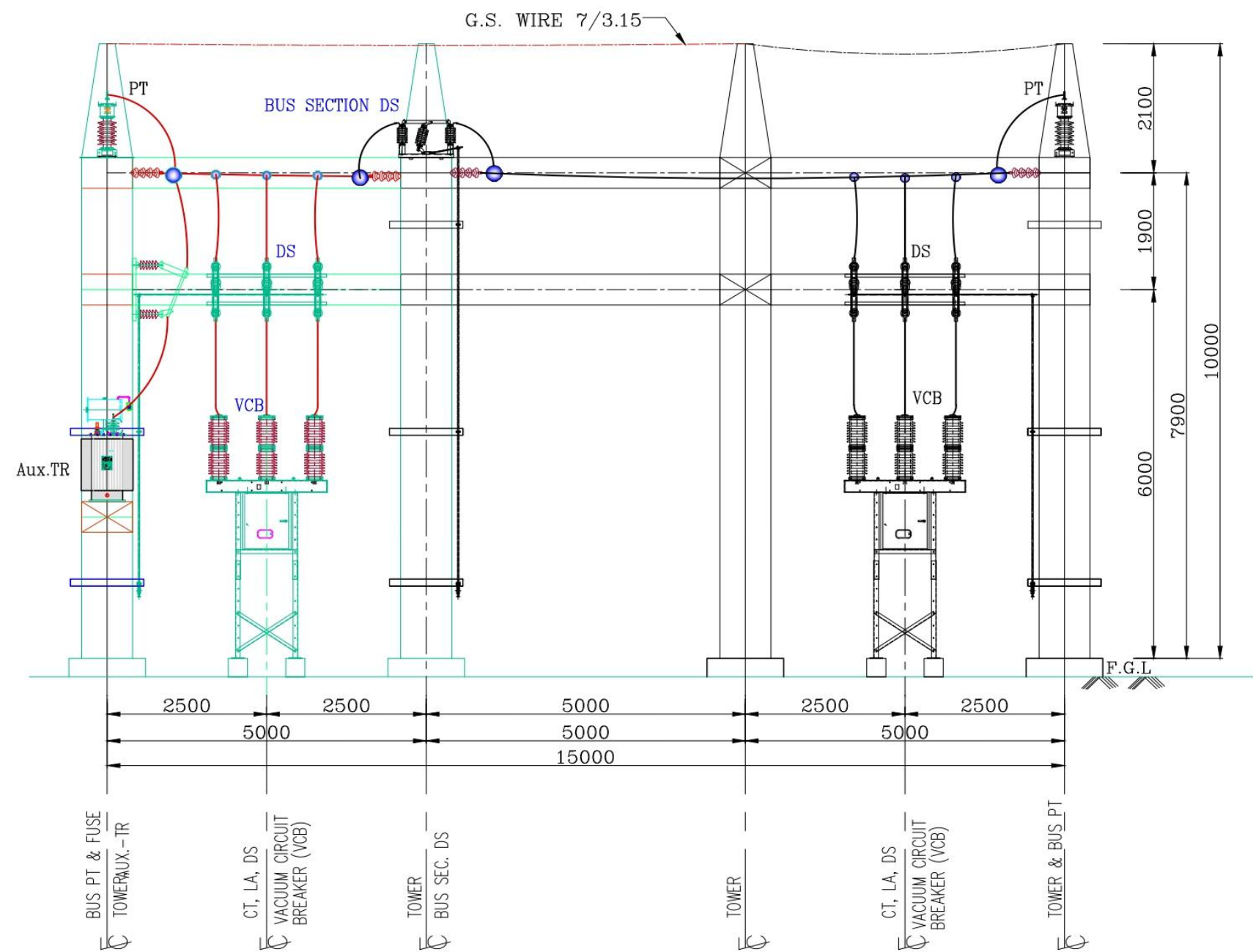
NAME OF SUBSTATION : MUHURI IRRIGATION PROJECT UNDER SUBSTATION

SCALE	NTS	TITLE :
DRAWN	J. F.	PROPOSED LAYOUT PLAN OF
CHECKED	T.I.	33/11kV, 1x10/14MVA SUBSTATION.
DESIGNED	T.I.	
DATE	03.12.2018	DRAWING NO. : BWDB/PENI (IMIP)/LAYOUT

REV: 2/1

FOR APPROVAL

ALL DIMENSIONS ARE IN MM



SECTION : A-A

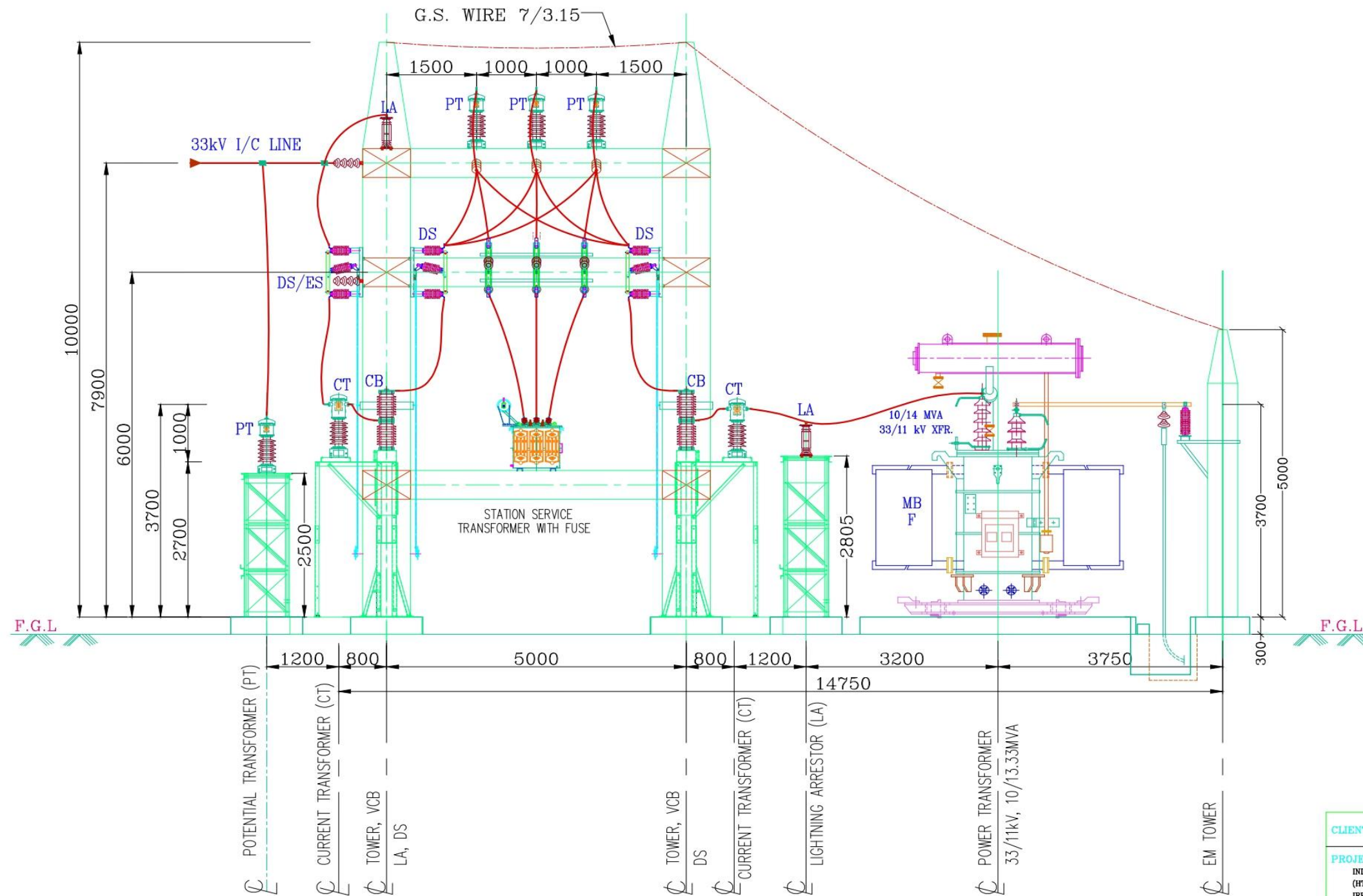
= SCOPE OF SUPPLY
 = FUTURE PROVISION

FOR APPROVAL

CLIENT : BANGLADESH WATER DEVELOPMENT BOARD (BWDB).		
PROJECT: TURNKEY CONTRACT (A) CONSTRUCTION OF 1X10/14MVA, 33/11kV INDOOR TYPE SUBSTATION AND (B) UPGRADING OF ELECTRICAL DISTRIBUTION (HT, LT, OVER HEAD LINE) SYSTEM FOR MUHURI IRRIGATION PROJECT UNDER IRRIGATION MANAGEMENT IMPROVEMENT PROJECT (IMIP)		
CONTRACT NO: Contract Package No. CW-04 (NCB) ADB Load No.3135 BAN (SF) Date: 15/11/2018		
CONTRACTOR : ENERGYPAC ENGINEERING LTD.		
NAME OF SUBSTATION : MUHURI IRRIGATION PROJECT UNDER SUBSTATION		
SCALE	NTS	TITLE : SECTION A-A 33/11kV, 1x10/14MVA SUBSTATION.
DRAWN	J. F.	
CHECKED	T.I.	
DESIGNED	T.I.	
DATE	03.12.2018	
DRAWING NO. : BWDB/FENI (IMIP)/BUIL/SEC-A-A		REV:

FOR APPROVAL

ALL DIMENSIONS ARE IN MM



SECTION : B-B

= SCOPE OF SUPPLY

= FUTURE PROVISION

CLIENT :		BANGLADESH WATER DEVELOPMENT BOARD (BWDB).	
PROJECT :		TURNKEY CONTRACT (A) CONSTRUCTION OF 1X10/14MVA, 33/11kV INDOOR TYPE SUBSTATION AND (B) UPGRADING OF ELECTRICAL DISTRIBUTION (HT, LT, OVER HEAD LINE) SYSTEM FOR MUHURI IRRIGATION PROJECT UNDER IRRIGATION MANAGEMENT IMPROVEMENT PROJECT (IMP)	
CONTRACT NO:		Contract Package No. CW-04 (NCB) ADB Load No.3135 BAN (SF) Date: 15/11/2018	
CONTRACTOR :		Energypac ENERGYPAC ENGINEERING LTD.	
NAME OF SUBSTATION :		MUHURI IRRIGATION PROJECT UNDER SUBSTATION	
SCALE	NTS	TITLE : SECTION B-B 33/11kV, 1x10/14MVA SUBSTATION.	
DRAWN	J. F.		
CHECKED	T.I.		
DESIGNED	T.I.		
DATE	03.12.2018	DRAWING NO. : BWDB/FENI (IMP)/BUIL/SEC-B-B	REV: 01