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IWM Global Work Experience and Alliances

Areas of IWM Services

- Integrated Water Resource Management
- Climate Change Impact Modelling
- Wetland and Lakes Management
- Irrigation Management
- Groundwater Management
- Urban Water Management
- Water Quality and Ecology
- Fluvial Hydraulics
- Water Supply and Sanitation
- River Engineering
- Flood Management
- Integrated Coastal Zone Management
- Coastal Hydraulics and Morphology
- Port and Coastal Structure Management
- Estuary and Marine System Management
- Offshore Structure and Pipelines Design
- Water Quality Investigation
- Software Development and IT Solutions
- Geographic Information Services (GIS)
- Hydrogeological Investigations
- Topographic, Bathymetric & Hydrographic Survey
- Sediment Transport, Water Quality and Hydrological, Meteorological Field Measurements,
- Necessary Laboratory analysis, Data Management and Digital Mapping;
- Any other field or area which may be conveniently and beneficially done through the facilities of IWM.

ABOUT IWM

IWM was established in December 1996 as an independent Trust through a Cabinet decision by the Honorable Prime Minister Sheikh Hasina. The geographical location of Bangladesh at the tailend of three great river basins has compelled it to develop high level analytical capabilities in the state-of-the-art mathematical water modelling to support its water resources management. To function as a Centre of Excellence and learning in the field of Computational Hydraulics, Water Modelling and Allied Sciences. IWM owes its genesis to the three phases of UNDP-DANIDA aided Surface Water Simulation Modelling Programme (SWSMP) carried out during 1986-1996.

IWM offers a wide range of specialist services in the fields of water resources planning and management as well as hydrometric measurements, hydrographic bathymetric & topographic surveys and monitoring. IWM functions as a non-profit organization on cost recovery basis.

Historical Development of IWM

SWSMP-I 1986-1989

- UNDP Aided
- 1D River Model Development for 2 Region-SERM. General Model

SWSMP-II 1990-1993

- DANIDA Aided
- 1-D Morphological and Salinity modeling
- 4 More Regional Models Development NWRM, NCRM, NERM, SWRM

SWSMP-III 1994-1996

- DANIDA Aided
- Morph. WO, GW, UD and 2-D Modelling 2-D Hydrodynamic
- Commercial Application
- GIS Integration

SWMC TRUST 1997-2001

- Institutionalization Self sustaining non-profit organization under Trust Act
- Command Area Development
- Coastal Zone Management
- Quasi 2-D Morphology. Waves
- 2-D Curvilinear Model

IWM TRUST 2002- to Date

- Regional Training Hydroinformatics
- Climate Change Impact Assessment
- Flood Forecasting & Disaster Management
- Environment & Social Impact Assessment
- Urban Water Resources Assessment & WS Network Modelling
- GW & SW Resources Integrated Assessment
- River Erosion Forecasting
- TOM
- Software Development and IT Solutions
- Geographic information Services (GIS)

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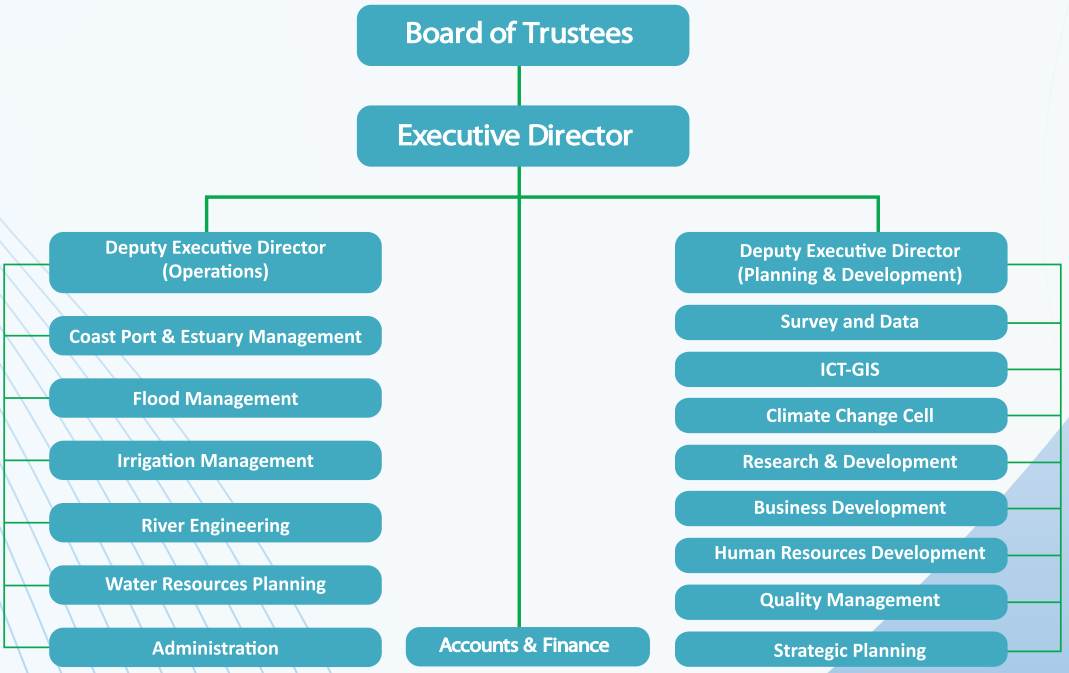

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Messages From Chairperson

Kabir Bin Anwar
Senior Secretary
Ministry of Water Resources
Government of the People's Republic of Bangladesh

I am very happy to convey my best wishes to Institute of Water Modelling (IWM) on the eve of publishing their Annual Report 2020. As the chairperson of the Board of trustees, I have been observing with keen interest the activities and development of this organization from the day I took the charge of the Board. It has come a longway in establishing itself as a reference center of Excellence in Asia in the field of water management and water modelling.

The Institute is contributing to the journey of Bangladesh towards a prosperous nation by delivering world class solution in water resources, computational hydraulics, climate, environmental management, and other related fields, for efficient and effective planning, design and implementation of infrastructure projects of different ministries.They have the most sophisticated state-of-the-art survey equipment and skilled professionals to undertake any complex survey projects. They havealso diversified their activities in other fields like urban planning, master plan preparation and extending GIS-ICT support to different Government agencies of the country.

IWM has skilled professionals and latest modelling tools at its disposal to evaluate changing environmental situation of Bangladesh and elsewhere through Mathematical Modelling. As a matter of fact, Mathematical Modelling technic is helping the implementation of Bangladesh Delta plan 2100 to a great extent.

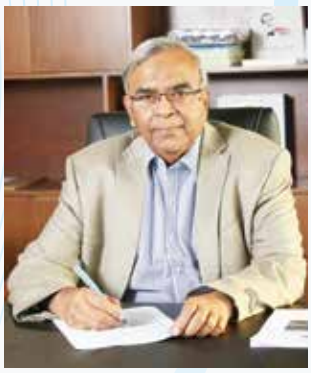
IWM has been addressing numerous water-related problems not only in Bangladesh but also in other countries. It has ventured beyond the territory of Bangladesh by establishing linkages with international consulting houses and research institutions. In this way IWM has commenced in new frontiers of collaboration in Asia, America, Australia and Europe. One of IWM's ongoing overseas projects is "Management support to the Mathematical Modelling Center (MMC) for Water Resources Research & Development" under Water Resources Department of Government of Bihar, India.

During this period of Covid-19 Pandemic, where the economic and development growth of the world has suffered significantly, IWM strived to continue its advancement. Its dedicated work force continued to support the organization by working in the office & in the field which kept the pace of development unhindered. Thus, IWM has successfully witnessed years of challenging growth in attaining great heights of accomplishment through dynamic business strategies, technological capabilities, and better organizational strength.

Before conclusion, I would like to extend my heartfelt appreciation to the members of the Board of Trustees of IWM for their wholehearted support over the years. They provided continued support for the development of the institute as a successful entity in addressing the challenging need of the country. I also wish to extend my best wishes to the staffs and professionals of IWM for their untiring effort in strengthening the institute for their commitment and dedications in enhancing the image of the country.

As the Chairperson of the Trust, I wish IWM prosperous bright future.

Kabir Bin Anwar
Senior Secretary
Ministry of Water Resources
Government of the People's Republic of Bangladesh
&
Chairperson, IWM Board of Trustees



Messages From Executive Director

Abu Saleh Khan, PEng.
Executive Director
Institute of Water Modelling (IWM)

It is my pleasure to present the Annual Report 2020 of Institute of Water Modelling (IWM) to our valued clients, partners and well-wishers. This report presents a consolidated picture of our business and operations in 2020-21.

2020-21 had been a very challenging year for IWM. The Covid-19 pandemic has hit the economies worldwide and the livelihood of the people to the core. Bangladesh being no exception. This unprecedented hazard caught us very unprepared. By the grace of the Almighty Allah and support from our government, well-wishers and clients we could pull out of the crisis quite well. In fact, IWM could finish the year on a stronger footing. I wish to take this opportunity to highly appreciate all staff of IWM for their dedicated and sincere efforts during the crisis, without which it would have been impossible for IWM to salvage the institute from the crisis. I also thank the Chairperson of IWM BoT and other Board members for their continued support and patronage in the advancement of IWM.

The pandemic has been somewhat a blessing in disguise for IWM. We could test our resolve and resilience in such crisis situation. We have taken significant lessons during the time. We have not stopped our work for a single day. Our staffs worked remotely using online technologies, maintained regular communication with clients and partners, conducted field works by taking precautions as per Covid-19 protocols. Thus, we could fulfill our commitment to the clients. Infact, in 2020-21, our revenue earning surpassed that of the previous years. We provided our services to around 21 different clients in 77 projects successfully. Some of the notable achievements of IWM in 2020-21 are as follows.

- IWM shifted to its new headquarter building at Uttara, Dhaka in 2020. IWM Bhaban, as it is named, is a modern office premise with green features like wastewater treatment, rainwater harvesting, solar power, three layered low-emissivity glass panels for acoustic control and improved energy efficiency. It has indoor and outdoor green plantations to improve the work environment and aesthetics.
- 2020 marked a way forward to digital transformation of IWM. We are in the process of developing and operationalizing an online management and financial system which will make operations and financial management at IWM more transparent, efficient and allowing less paper works. We have established an advanced data Centre for centralized secured data storage, servers, connected to IWM network infrastructure, multi-layered physical security, real-time monitoring system and environmental sensors.
- IWM signed an agreement with the Esri South Asia Pte Ltd aiming at to setup A Digital Bangladesh Development Lab using the ArcGIS platform to design and develop solutions to important work of users and clients of IWM.
- Survey and data acquisition capacity of IWM has greatly enhanced by acquisition of advanced equipment like Multi-beam eco-sounders with motion sensors, 3D Terrestrial Laser Scanners, UAV (Drone), ADCP Profiler, Survey vessels etc. in line with current practice worldwide.
- In addition to MIKE ECO Lab, IWM acquired noise and air quality modeling systems that are now being routinely used in environmental assessment. IWM also enhanced the capacity of it's environmental and sediment labs.
- IWM is maintaining up-to-date advanced modelling suites including 1D, 2D and 3D hydrodynamic and morphological modelling systems, salinity models, river basin and groundwater modelling systems. These are routinely being used in various cliental projects.
- IWM conducted a number of R&D projects mainly aiming at innovating new technologies, data assimilation and flood forecasting techniques
- IWM made concerted effort to develop it's staff and that of clients by arranging comprehensive training courses on computational hydraulics, mathematical modelling, ICT-GIS, advanced surveys techniques, business communication, climate change adaptation and vulnerability assessment. Thirteen such training courses were completed with 113 participants.

IWM must keep and continue all those transformations and momentum that we have achieved, but most importantly we need to upgrade our business model in this changing environment. All these initiatives will help a lot to disseminate the knowledge of IWM to different stakeholders of the national and international arena.

Abu Saleh Khan

Abu Saleh Khan, PEng.
Executive Director
Institute of Water Modelling (IWM)

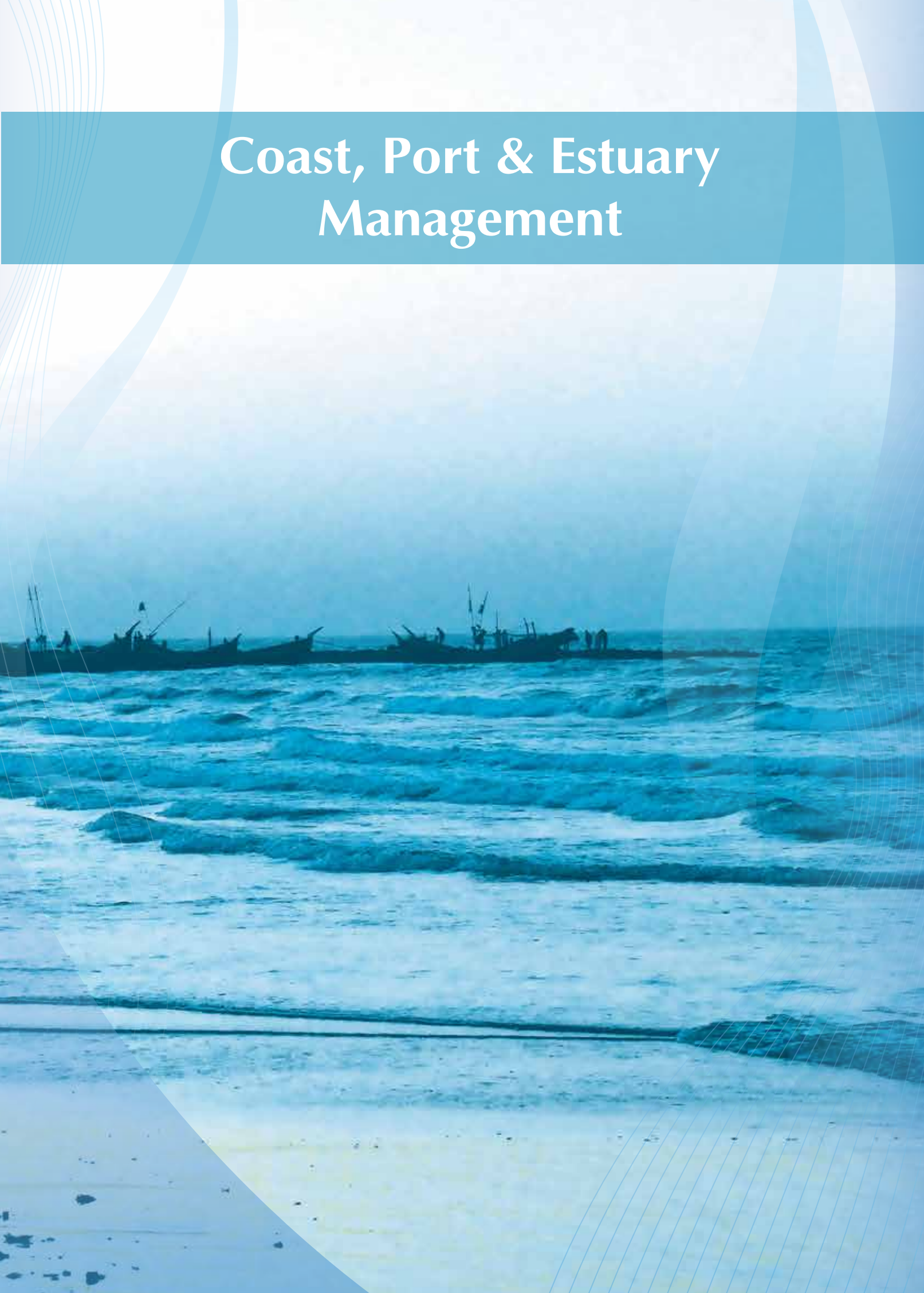
IWM Success 2020: At a glance

We are steadily growing to provide sustainable solutions to the water sector of not only in Bangladesh but also in the neighboring countries which extend up to the region of Asia, Australia, Europe and USA. Since its inception in 1986, IWM has been continuing to thrive in an extraordinary manner and is growing day by day. In 2020, IWM had taken several challenging projects of great national interest and experienced a steady growth. We have provided our services in around 77 projects and to more than 21 clients. Maintaining our strong pursuit in modelling, we are exploring some adjacent sectors to meet the pressing demand of our valuable clients. Services of IWM were requested from different international agencies from various countries and thus IWM is getting recognition at a global scale.

IWM Major Completed and Ongoing Projects in 2020-21

1.	Supervision and Monitoring the Performance Dredging, Morphological and Environmental Impacts,Detailed design and Assessment of Effectiveness of Dredging for Restoration of Dry Season Flow,Improvement of Navigability and Flood Management of Four River Routes including Hydrographic and Bathymetric Survey Services, **BIWTA**
2.	Preparation of Master Plan, Architectural Design, Detail Design, Drawings, BoQ, Tender Documentation & Construction Supervision of Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU) Permanent Campus at Chattogram, **BSMRMU**
3.	Consultancy Services for Preparation of GIS Maps (City & Ward) for **Chattogram City Corporation (CCC)**
4.	Long Term Monitoring, Research and Analysis of Bangladesh Coastal Zone, **BWDB**
5.	Feasibility Study for Restoration of Sangu and Matamuhuri River Basin, **BWDB**
6.	Feasibility Study for Providing Irrigation facilities through Construction of Hydraulic Elevator DAM (HED) across Maeinee River at Dighinala, Khagrachari; Shrimai Khal at Patiya, Chattogram & Kasalang River at Sajek Valley, Rangamati, **BWDB**
7.	Feasibility Study for the Development and Management of Karnafuli River Basin (with Halda river), **BWDB**
8.	Consultancy Services on Surface Water Hydrology study for "Probable Site Selection for Construction of Nuclear Power Plant in the Southern Part of Bangladesh", **BAEC**
9.	Management Support to the Mathematical Modelling Centre (MMC) for Water Resources Research & Development under Water Resources Department, Government of Bihar, **India**
10.	Detailed Feasibility Study for Flood Control, Drainage, Irrigation and Dredging of Bakkhali River in Cox'sbazar District (Phase-1), **BWDB**
11.	Study on Aquifer and Mapping and Groundwater Resource Assessment for Management of eco-friendly Sustainable Agricultural Development in Bangladesh, **BADC**
12.	Comprehensive Feasibility Study for Sustainable Restoration and Protection of Wetlands (Haor, baor, beel,and connected rivers etc.) in different Hydrological Regions of Bangladesh, **DBHWD**
13.	Development of Upazila Land Suitability Assessment and Crop Zoning System of Bangladesh, **BARC**
14.	Monitoring and Supervision of Water Supply and Sanitation Schemes including review, update of existing drawing and design, EIA and SIA, **DPHE**
15.	Monitoring of Hydraulic & Morphological Conditions of the Jamuna River for the safety of the River Training Works of the Bangabandhu Bridge during the year 2018 to 2022 (Five Years), **BBA**
16.	Hydrological and Hydraulic Mathematical Modelling Study for Bridges along the Nasirnagar R&H-Bholakot Bazar-Chatalpara GC-Aruail Road, **LGED**
17.	Detail Topographic Survey and Hydrological & Morphological Study using Mathematical Model for Construction of railway line from (i) Chapainawabganj to Sonamasjid, (ii) Panchagarh to Banglabandha, (iii) Domar to Votemari via Jaldhaka and (B) Construction of new railway bridge on Teesta river beside the existing railway bridge, **Bangladesh Railway**
18.	Consulting Services for Project Development Facility (PDF) Consultants (Package No. DWSNIP/PDF/03.5), **DWASA**
19.	Water Network Analysis and Optimization of Chittagong City Water Supply System – Study, Design and Construction Supervision under Chittagong Water Supply Improvement & Sanitation Project (CWSISP), **CWASA**
20.	Hydro-morphological Modelling and Survey of the Jamuna River for the Proposed Bangabandhu Rail Bridge, **Bangladesh Railway**
21.	Morphological Study of Different River Crossing (Padma River for one line and Jamuna River for two lines)for Infrastructure Development for Power Evacuation Facilities of Rooppur Nuclear Power Plant, **PGCB**

Coast, Port & Estuary Management



IWM has Developed an Integrated Holistic Plan For Development and Management of Karnafuli River Basin Including Halda River

Karnafuli is the largest and most important river in Chattogram and the Chattogram hill tracts region of Bangladesh. The total area of the Karnafuli river basin is about 14008 sq. km. out of which about 10163 sq. km. is situated in Bangladesh. At the upstream of the Kaptai dam, the major tributaries of the Karnafuli river are Kasalong, Maini, Chengi, Cholok, and Rainkhiang rivers. At the downstream of Kaptai Dam, the main tributaries at its left bank are Kaptai, Shilok, Chondaria, Raikhali, Boalkhali, and Shikalbaha and its right bank are the Ichamati and Halda river along with the Chaktai Khal and Mohesh Khal. Bangladesh Water Development Board (BWDB) entrusted the Institute of Water Modelling (IWM) to devise an integrated holistic plan for the development and management of the Karnafuli river basin including the Halda River. The major problems of the river basin are deforestation, river sedimentation, navigability during the dry season in the rivers situated upstream of the Kaptai dam. Moreover, riverbank erosion, flooding, the impact of natural and manmade causes on fisheries resources of the river are major reasons of concern in the basin, including the Halda River Halda River is famous as the only tidal river in the world that houses the breeding of pure Indian carps. As such Halda river is designated as 'Bangabandhu Fisheries Heritage'.

The main interventions recommended for development and management of the Karnafuli river basin are dredging/excavation of rivers/khals , riverbank erosion protection, dismantling of regulators and weir and replacing them with Hydraulic Elevator Dams (HED), fish-friendly regulators, construction of embankment/flood wall, tourism development, development of fish sanctuary in the connecting khals/loop of Halda river and implementation of creek aquaculture at the upstream of Kaptai dam, afforestation along the bank of Chengi, Maini, Karnafuli, Halda, Kasalong, Rainkhiang, and Cholok rivers.

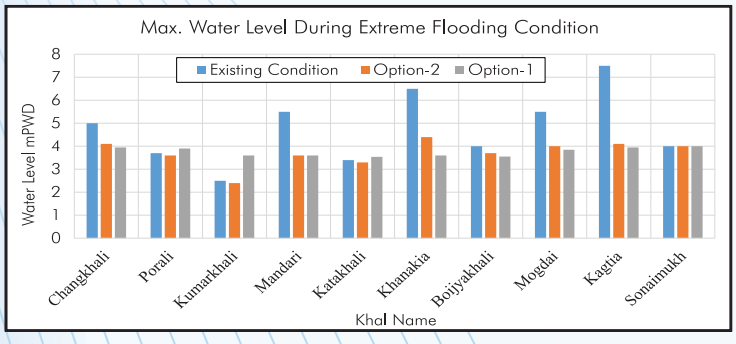
The effectiveness of different options has been assessed considering the issues of improvement of fisheries resources and enhancement of irrigation facility, drainage, and navigability improvement.

The study also carried out a detailed Environmental Impact Assessment (EIA) with a comprehensive Environmental Management Plan (EMP), social consultations as well as economic and financial analysis to recommend the option that is technically feasible, socially acceptable, environment friendly, and economically viable.

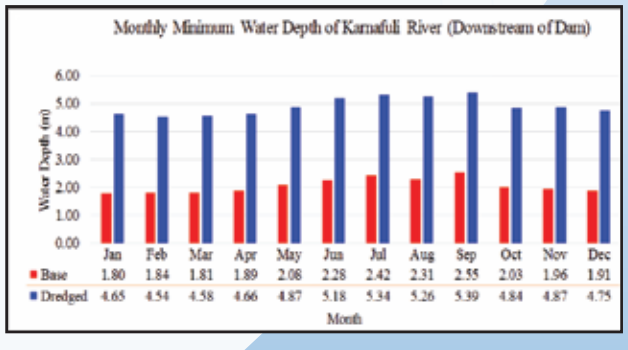
Kornafuli River Basin


Karnafuli Hilly River and Evergreen forest near Boro Horina, Borkal, Rangamati


Fish egg collection in Halda River (Bangabandhu Fisheries Heritage)



Drainage improvement in different khals of Halda river



Comparison of least available depth of Karnafuli River

Long Term Monitoring, Research and Analysis of Bangladesh Coastal Zone (Sustainable Polders Adapted to Coastal Dynamics)

The aim of this study is to create a framework for polder design, based on understanding of the long-term and large-scale dynamics of the delta and on sustainable polder concepts.

Coastal zone of Bangladesh with Polders

The Coastal Embankment Project (CEP) was initiated in the 1950s and 1960s to build polders surrounded by embankments in order to prevent the spilling of saline water onto the land at high tides. The disasters resulting from two major cyclones; Sidr (2007) and Aila (2009) and the subsequent unexpected high value of the damages caused by these natural calamities, provoked the World Bank and the Government of Bangladesh to initiate the Coastal Embankment Improvement Programme (CEIP-1) which was to redesign and rebuild the entire polder system, in several phases, to resist the long term challenges of climate change and other natural phenomena such as Storm Surges, wind and wave attack, Sea level rise, Land subsidence, Changing tidal hydrodynamics and channel network system, Long term challenges to drainage, Increasing threats from cyclones and storm surges, Maintenance and Management failures.

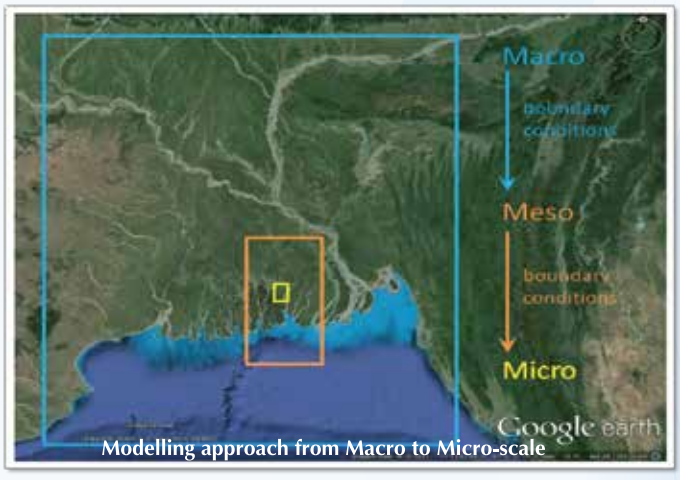
The implementation of the first 17 polders of CEIP-1 brought into stark relief several shortcomings and gaps in our knowledge and understanding of many of the physical phenomena that govern major processes in and the evolution of the Bengal Delta. Recognition of these gaps resulted in the inclusion of this research study as a component project to support the phased Coastal Embankment Improvement program which was to bring in massive investments over many decades. The following activities are being carried out under the Long Term Research Study.

- Research to create an understanding of the long term and large-scale dynamics of the delta including responses to human and climate interventions.
- Apply a more complete understanding of delta processes to devising improved and more sustainable polder designs and management strategies.
- Create a framework for environmentally sustainable polder design
- Develop a long term investment plan for implementation in the Coastal Zone leading to Safety and IWRM
- Build the analytical foundation and technical capacity of BWDB and other stakeholders including local communities, to deal with future challenges.

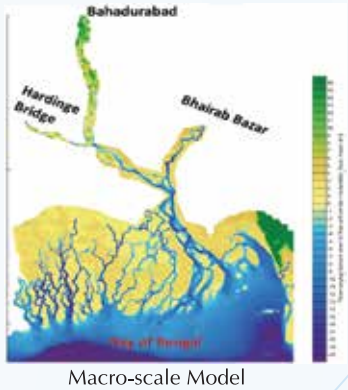
The following are the expected outputs from the proposed Research:

- ❑ Bank erosion prediction tools
- ❑ Annual sediment load & pathway
- ❑ Long-term Morphology
- ❑ Subsidence rate & Relative Sea Level Rise
- ❑ Polder Development Plan
- ❑ Conceptual Polder Design and Management
- ❑ Investment Plan
- ❑ Capacity Building

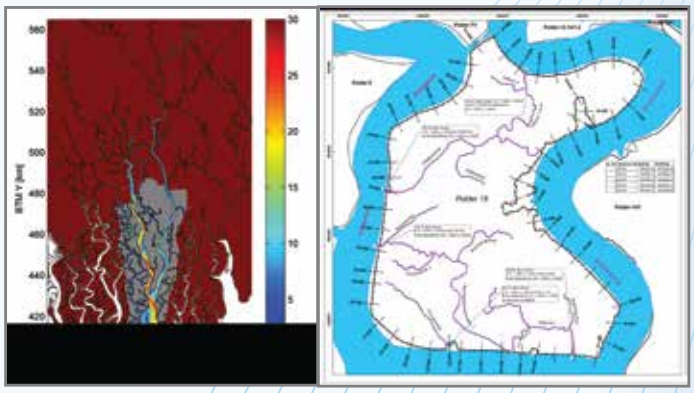
To achieve this goal, a range of modelling tools and advanced measurement techniques are used to investigate the macro-, meso- and micro-scale behavior of the delta system. Macro-scale Model will provide sediment budget in GBM delta. Meso-scale Model will give ideas including prediction on river and coastal erosion. Micro-scale Model will deal with Polder management plan, sediment management plan including design parameters for future changes of the coastal polders.



Modelling approach from Macro to Micro-scale



Macro-scale Model



Meso-scale and Micro-seale Model

Flood Management

A Long-awaited Solution to Rejuvenate and Protect Shuvadya Khal is Planned

Shuvadya Khal connects Buriganga River to Dhaleshwari River. This very important khal passes through large commercial/industrial areas as well as settlements of Keraniganj Upazila of Dhaka District. Shuvadya had long lost its water quality, carrying capacity, and width due to indiscriminate dumping of wastes and sewage by local people and factories. Bangladesh Water Development Board (BWDB) assigned IWM to carry out a feasibility study for "Re-Excavation of Shuvadya Khal along with Development and Protection of its Both Banks.

The main objective of the study is to assess the feasibility of the re-excavation of Shuvadya Khal from a technical point of view and find out suitable options for the development and protection of both banks. Improvement of navigability in the study area considering technical, economic, social, and environmental aspects are also a matter of concern. Both primary & secondary data collection program has been conducted which includes field visits, hydro-meteorological data collection, geo-spatial data collection, topographical data collection, etc. Collected data has been analyzed for consistency checking, statistical analysis for the design year selection and water availability, etc. detailed level hydrological model, hydrodynamic model, and water quality model has been developed for the study. The developed model has been applied to assess water retention capacity and availability of surface water resources of the Khal, improvement of drainage situation and navigability, to determine hydraulic design parameters and design of re-excavation of the Shuvadya khal.

Proposed plan of Shuvadya Khal

Landscape view of Chairman math, Shuvadya Khal

3D view of Eco Landscaping in Ghat Area

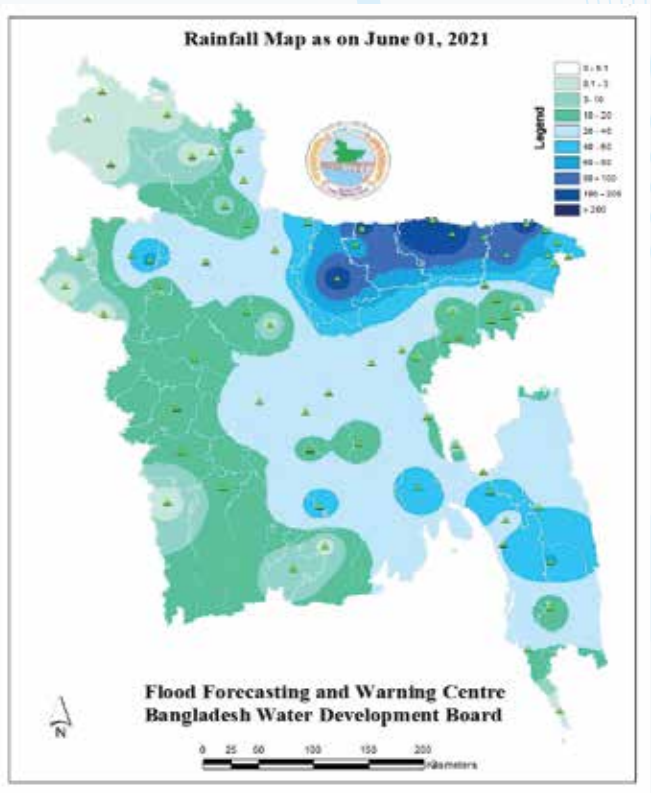
Present scenario of Shuvadya Khal in Bird's eye view

3D view of the walkway

Project Benefits: Protect bank lines of the Khal from encroachment, Save the Khal from Environmental Pollution, Ensure Navigation through, along and across Shuvadya Khal, Create recreational opportunity.

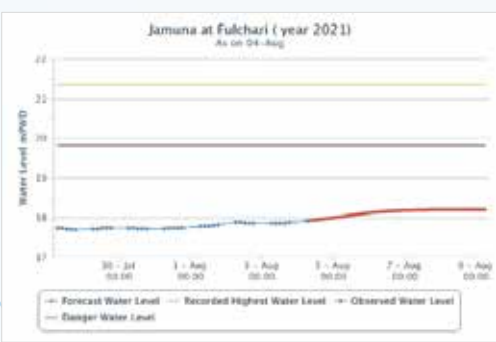
FFWC Now Covers More Flood Prone Areas of Bangladesh

Flood Forecasting and Warning Center (FFWC) of Bangladesh Water Development Board (BWDB) is the country's only mandated center for providing real-time flood forecast and warnings to the peoples of Bangladesh using a mathematical model-based flood forecasting system. IWM, being a center of excellence and long-term partner of this system development, provides technical supports to update and expand its functions and this happened as well in this recent project titled as "Updating and Maintenance of Flood Forecasting & Warning System of Flood Forecasting and Warning Center (FFWC) of BWDB". This project has been completed in June 2021. The flood forecast model works based on two basic models: Rainfall-Runoff Model (NAM) and Hydrodynamic (HD) Model. The Rainfall Runoff model has been updated by redistribution of catchment contribution (Northeast Region) as well as incorporating additional 30 more rainfall stations. The hydrodynamic model has been updated through adding 463 nos. new cross-sections (in 32 rivers) made available from Hydrology, BWDB, updating alignment of major rivers, incorporating one new river (Dudkumar River) and optimizing parameters (mainly resistance parameter). The updated flood forecast model has been calibrated against hydrological event of 2019, and validation has been checked for hydrological events of 2017, 2018 and 2020. Flood inundation maps have been updated using information of flood protection embankment and real time water level records at more monitoring stations. About 650 km of additional flood protection embankment has been added in the flood map preparation system. In the updated system, flood inundation feature has improved in several area like Pabna Irrigation and Rural Development Project (PIRDP), Chalan Beel, and Gaibandha area. As an alternative of existing FLOOD WATCH, a new tool named "FLOOD VIEW" has been developed using C-Sharp and Python programming language to avoid risk of malfunctioning of FLOOD WATCH at any time.



Before monsoon 2021, FFWC disseminated flood forecast at 54 stations. Seven additional stations have been added under this updating program. From now, FFWC will be able to prepare flood forecast at a total of 61 stations. As a part of the gradual advancement of FFWC forecast stations, 7 stations have been chosen as new forecast stations covering some district headquarters and important business points. Out of 7 stations, 3 stations i.e., Fulchari on Jamuna, Shiimulbari on Bangali, Mathura on Jamuna, are on the Northwest Region, Kaliakoir on Turag, Porabari on Jamuna are on the North Central Region and Madaripur on Arial Khan, Barisal on Kirtonkhola and Haridaspur (Gopalgonj) on Madaripur Beel Route are in the Southwest Region. These stations have been selected from existing water level measurement network of Hydrology, BWDB. These updates have enabled FFWC to cover more flood prone areas of Bangladesh with enhanced flood warnings.

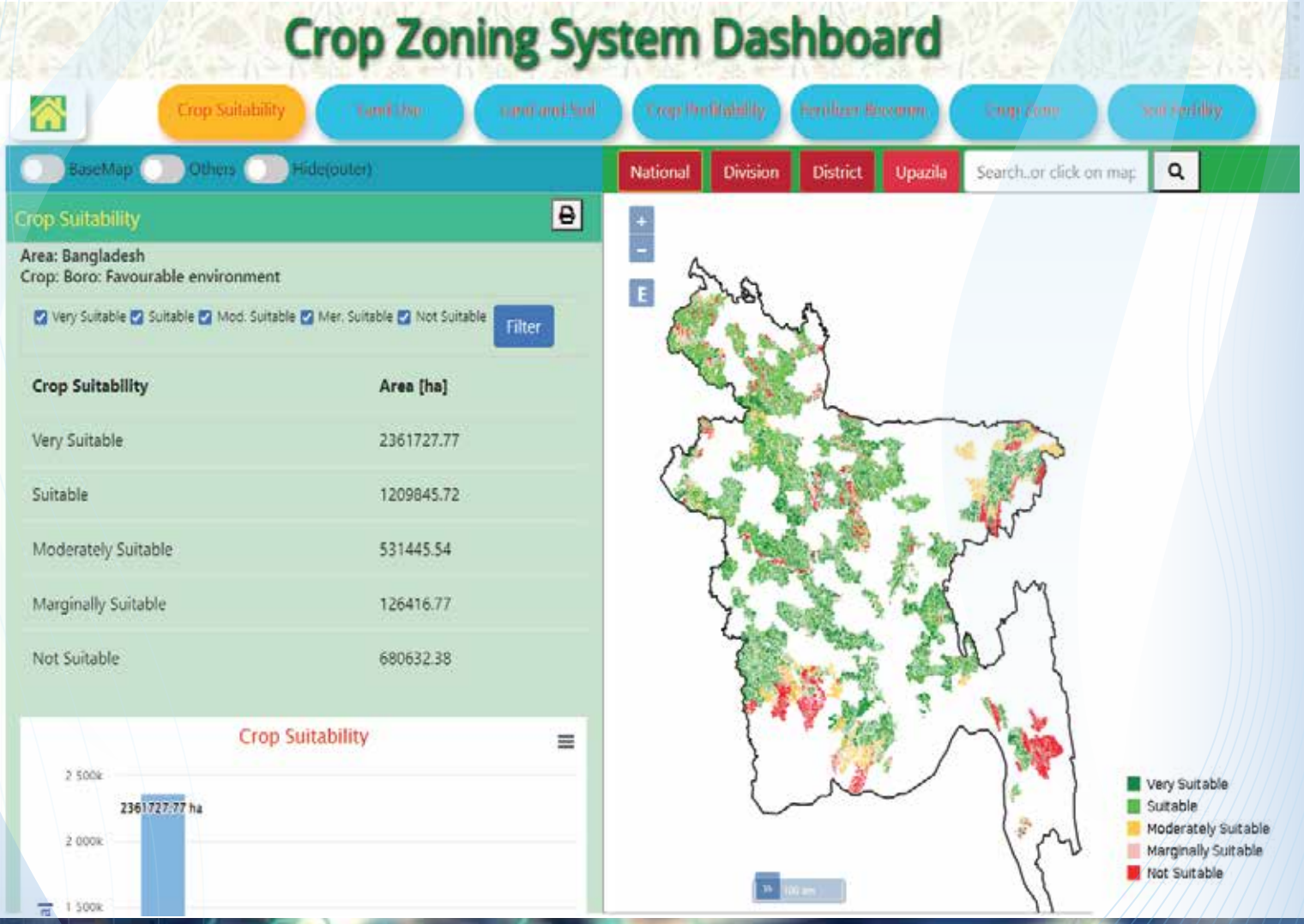
Gopalganj FF Station



Flood Hydrograph at Fulchari

Kaliakoir Gauge Visit

ICT-GIS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Developing Site Specific Planning with Index Maps for Bangladesh Forest Department

Bangladesh Forest Department (BFD) under the Ministry of Environment, Forest and Climate Change has been implementing a 5-year (01 July 2018 to 30 June 2023) project entitled 'Sustainable Forests & Livelihoods (SUFAL) Project'. The overall aim of the project is to strengthen collaborative forest and protected areas management for enhancing forest restoration, wildlife protection, biodiversity conservation and ecosystem services, increase access to alternative income generation activities for forest-dependent communities in targeted sites.

The project will cover the SSP related data collection with GPS enabled android devices from the concerned beats (200). This will also include the Index Mapping for Site Specific Plans. The duration for the project is from the 21st January to 21st September 2021 (8 months) while the field data collection is planned for 5 months within this stipulated time frame.

OBJECTIVE OF THE STUDY

1. To collect SSP data and develop Index Maps of 200 beats under 15 forest divisions covering three (3) Landscapes (Hill, Sal and Coastal);
2. To develop Web based Dashboard and SSP Reporting Interface which will facilitate the visualization and simple editing with approval functions for the collected data for preparing Index Map.
3. To support in organizing SSP field data which have already been collected and incorporated with new raw data.
4. To provide Hands-on Training for data collection of the BFD field staffs.

The Web GIS based application will help BFD user in developing Site Specific Plan (SSP) for necessary plantation.

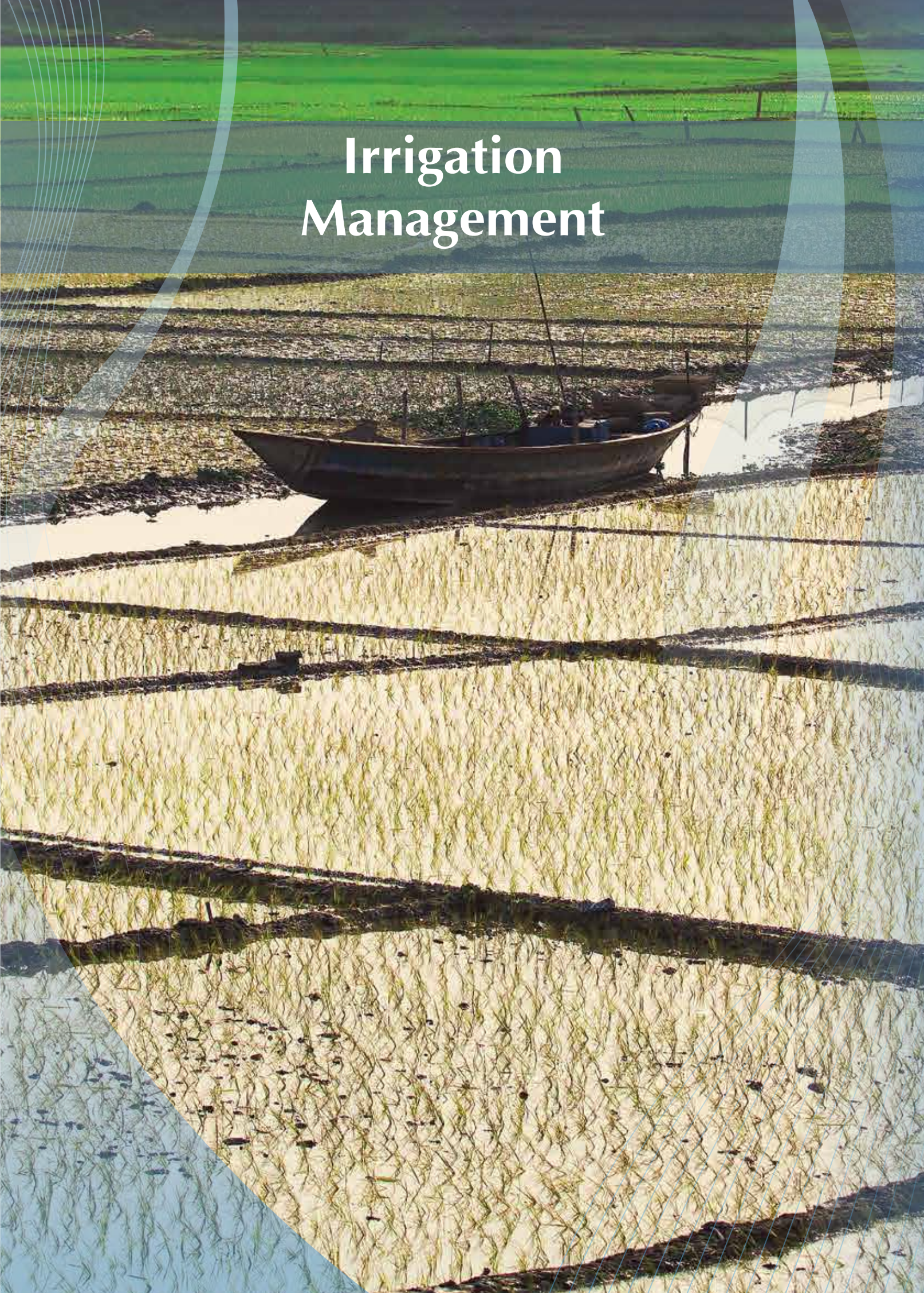
Contract Signing between IWM and SUFAL Project at BFD

Residential Training for the GIS Surveyors

Field Data Collection in Khuniapalong Beat, Cox's Bazar South Forest Division

Web-GIS based Interactive Dashboard for Site Specific Planning (SSP)

Irrigation Management



Supporting WARPO in Operationalizing IWRM in Barind Area as per the Bangladesh Water Rules, 2018 by Baseline Survey

WARPO conceived a project to put the Bangladesh Water Act 2013 into practice and to understand local economics and social dynamics related to water management in line with the IWRM concept, named 'Operationalizing Integrated Water Resources Management (IWRM) in Compliance with the Bangladesh Water Rules, 2018' partnered with the Swiss Development and Cooperation Agency. The main objective of the project is to pilot operationalizing of the Bangladesh Water Rules, 2018 through integrated water resources management in the Barind region to protect water sources and aquifers and develop sustainable water resources management.

The major activities to accomplish the study objectives are

(a) perform the baseline study, identify the water sources, present water use scenario and sectoral water demand up to mouza level through participatory rural appraisal (PRA) process;

(b) conduct focus group discussion (FGD) at mouza level,

(c) identify the current location and status of monitoring wells and irrigation borehole logs for each mouza of the Barind region,

(d) establish baseline conditions concerning population, natural resources, land use and farming system, agricultural practices and their constraints and opportunities,

(e) incorporate people's needs, views, and preferences regarding water availability, water demand, and water use in the study area through people's participation,

(f) prepare all physical features of land use inventory using GIS application and satellite image processing,

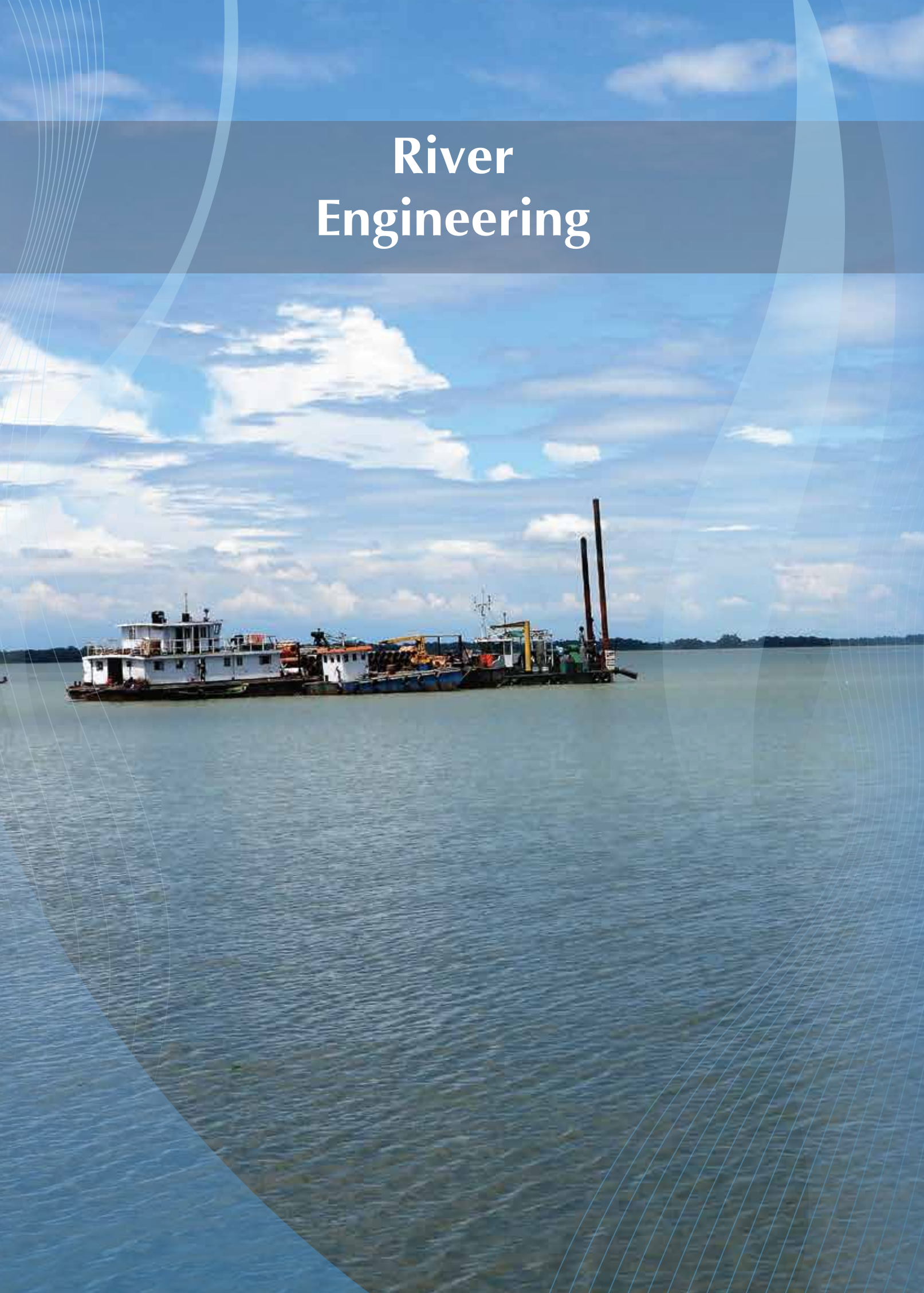
(g) validate the PRA report at upazila level for each upazila in the Barind region,

(h) prepare a detailed PRA report with comprehensive maps for water availability, water use, water demand, water-scarce areas, water zoning, aquifer formation, and location and status of monitoring wells in the Barind region.

Institute of Water Modelling (IWM) in a joint venture with Bangladesh Centre for Advanced Studies (BCAS), IWM as the lead firm, was awarded for this study in the month of February 2021. Following the agreement, IWM mobilized the study team for preparatory works and necessary primary and secondary data collection.

Contract signing ceremony (left) and FGD at Baghmaraupazila of Rajshahi (right)

River Engineering



Hydrographic Survey and Mathematical Modelling for Hydrological and Morphological Studies in connection with Feasibility Study, Detailed Design and Tendering Services for Construction of Broad-Gauge Rail Line from Madhukhali to Magura via Kamarkhali

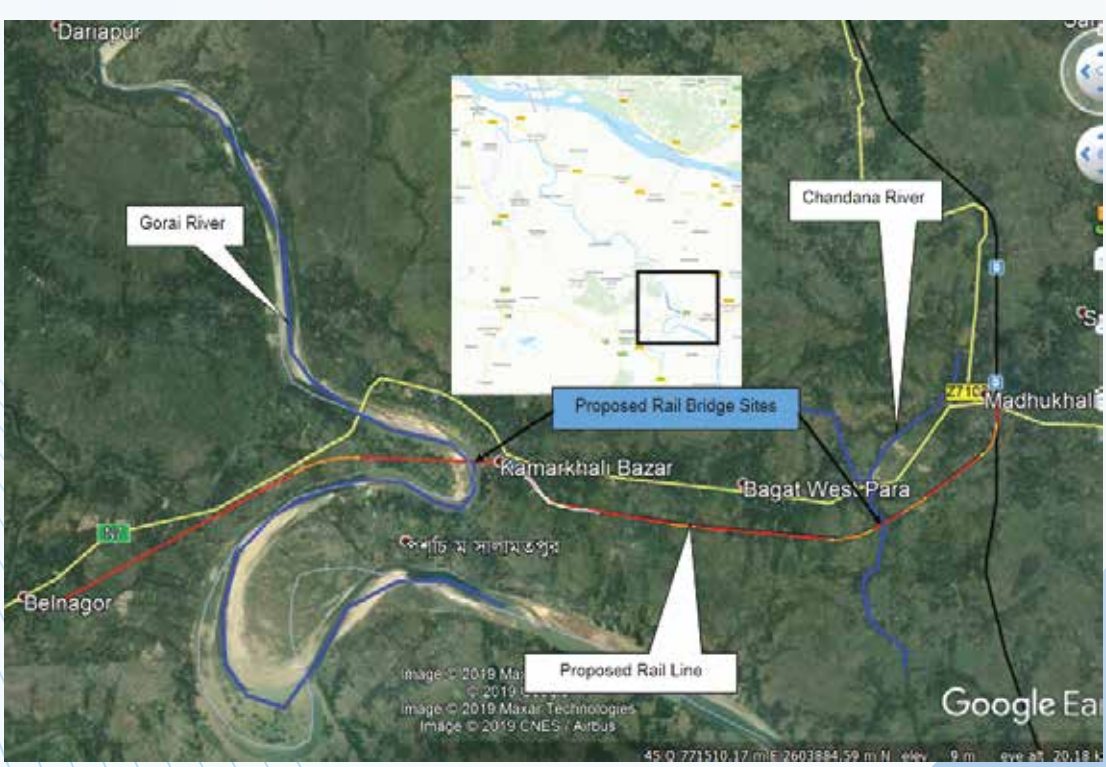
The South-West region of Bangladesh is crisscrossed by many large/ small rivers outfall at the Bay of Bengal. The communication system of the South-West region is mainly based on road transport with rail tracks covering few parts of the region - mostly on the western part covering Kushtia, Chuadanga, Jessore and Khulna districts. At the northern part, some areas of Faridpur, Rajbari and Gopalganj districts have rail tracks whereas Barisal Division has no rail transport system. Between Faridpur and Jessore, there is also a large gap of railway network around Magura and Jhenaidaha districts.

Under the circumstances, Bangladesh Railway (BR) has planned to construct a broad gauge rail line from Modhukhali to Magura via Kamarkhali. The Joint Venture (JV) consortium of DDC-DPM has been contracted by BR for Feasibility Study, Detailed Design and Tendering Services for Construction of the Broad Gauge Rail Line. As the proposed rail line will have number of major river crossings on its way, provision of morphological study including numerical morphodynamic modelling is included in the Feasibility Study. The JV Consortium (the Main Consultants) contracted IWM to carry out the Hydrological & Morphological Mathematical Modelling Study.

To connect Magura district with Modhukhali Upazila of Faridpur, two rail bridges are required to be constructed over the Chandana and Gorai-Modhumati rivers.

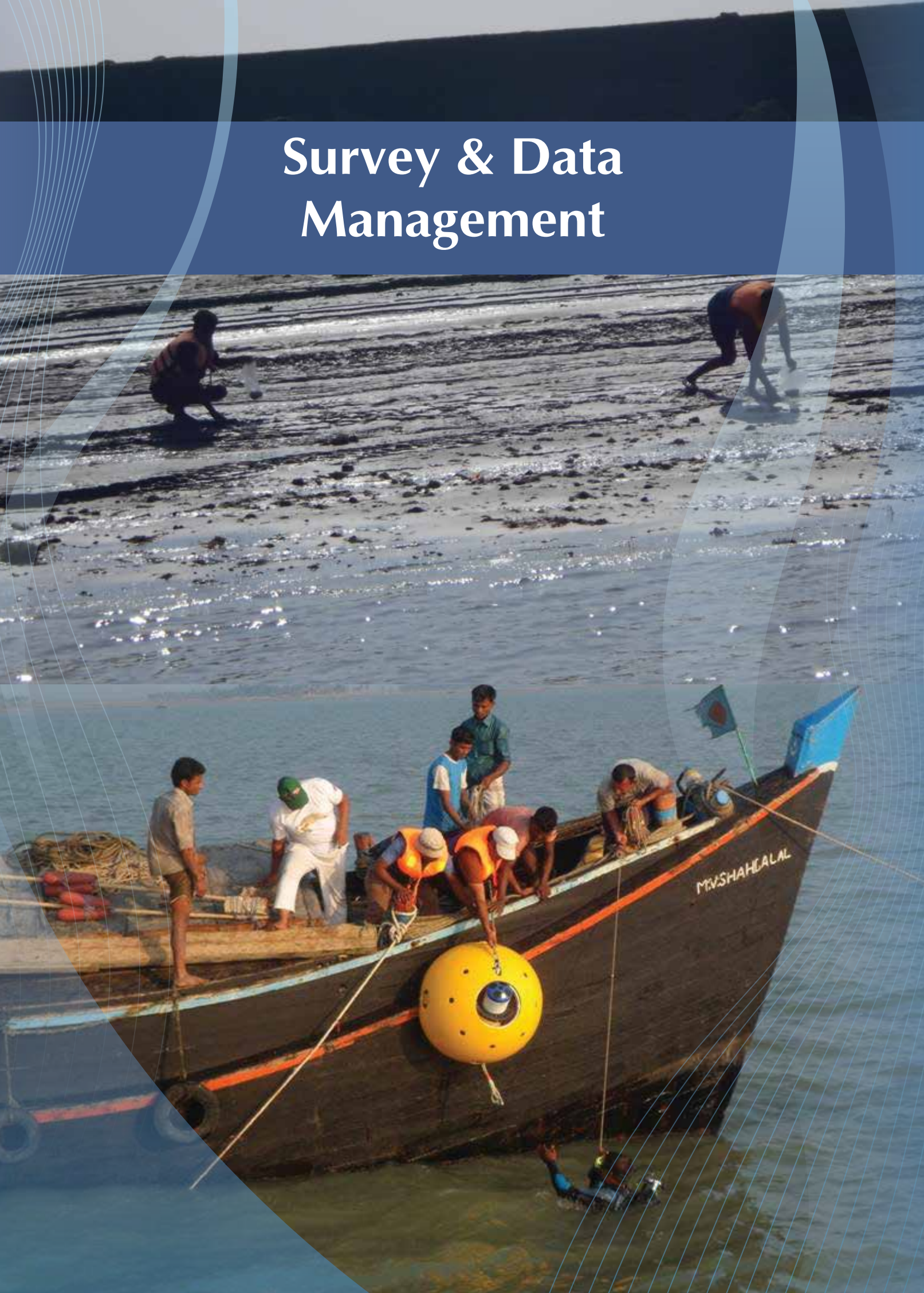
The major items of tasks of the assignment are:

- Collection of satellite images and any sort of data/ information (primary and secondary) required to complete the study;
- Statistical analysis of water levels and discharges of the proposed bridge sites to determine the highest and lowest water levels and discharges for different return periods;
- Development of 2D hydrodynamic, hydrological and morphological models using physically based fully dynamic modelling system MIKE 21C;
- Assessment of suitable bridge locations from hydro-morphological point of view;
- Assessment of impacts on the bridges due to hydro-morphological processes of the rivers including river bed and bank erosion;
- Prediction of morphological changes of the rivers in the vicinity of the bridges.



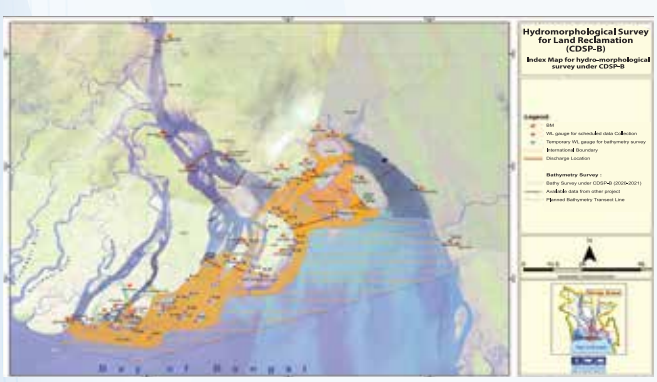
Proposed Rail Line from Madhukhali to Magura via Kamarkhali

Survey & Data Management



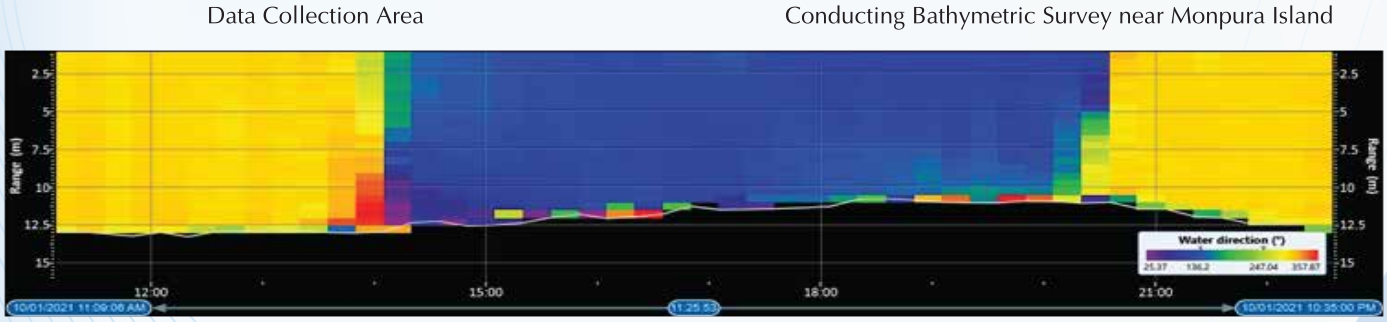
Hydro morphological Survey in the Meghna Estuary

The hydro morphological survey under Char Development and Settlement Project (CDSP) is jointly financed by the International Fund for Agricultural Development (IFAD) and the government of Bangladesh. The government of the Netherlands is providing technical assistance to CDSP-B. Mott Euroconsult MacDonald has been appointed by The Embassy of the Kingdom of The Netherlands in Dhaka as technical advisor for the Project. CDSP had previously selected sites for development relying on the assumption of prevailing patterns of erosion and accretion during earlier studies, and these patterns have now changed in many dimensions. To ensure that future investments are made by the Government of Bangladesh, international partners, and by the people living and working in this area; it is essential to have reliable predictions of how the morphology of the Meghna estuary region is behaving now and is likely to change in the coming decades. IWM conducted a survey/study in part of the Meghna Estuary Area during recent years. These data will be useful for planned modelling study but not adequate for the proposed modelling study (contract under process). Mott MacDonald entrusted the Institute of Water Modelling (IWM) to carry out the survey needed for modelling study during 2020-21. Major works include around 6,000km-transect bathymetry in the Meghna Estuary, water level observation at 26 locations, 40 Tidal Discharge observations in the Meghna Estuary (Meghna River, Shahbazpur Channel, East & West), Tentulia Channel, Hatiya Channel, Sandwip Channel, and other locations (shown in the Figure below) suspend sediment sampling for the total sediment concentration and Riverbed Material Sampling and analysis. IWM mobilized the survey team during August 2020 and completed the fieldwork successfully during February 2021. Survey team has made a tremendous effort to work in the difficult areas during monsoon and during the dry season. Final Report on the data collection has been submitted during June 2021 which is now being used for modelling study and will also be used for planning process by the Client.



Data Collection Area

Conducting Bathymetric Survey near Monpura Island

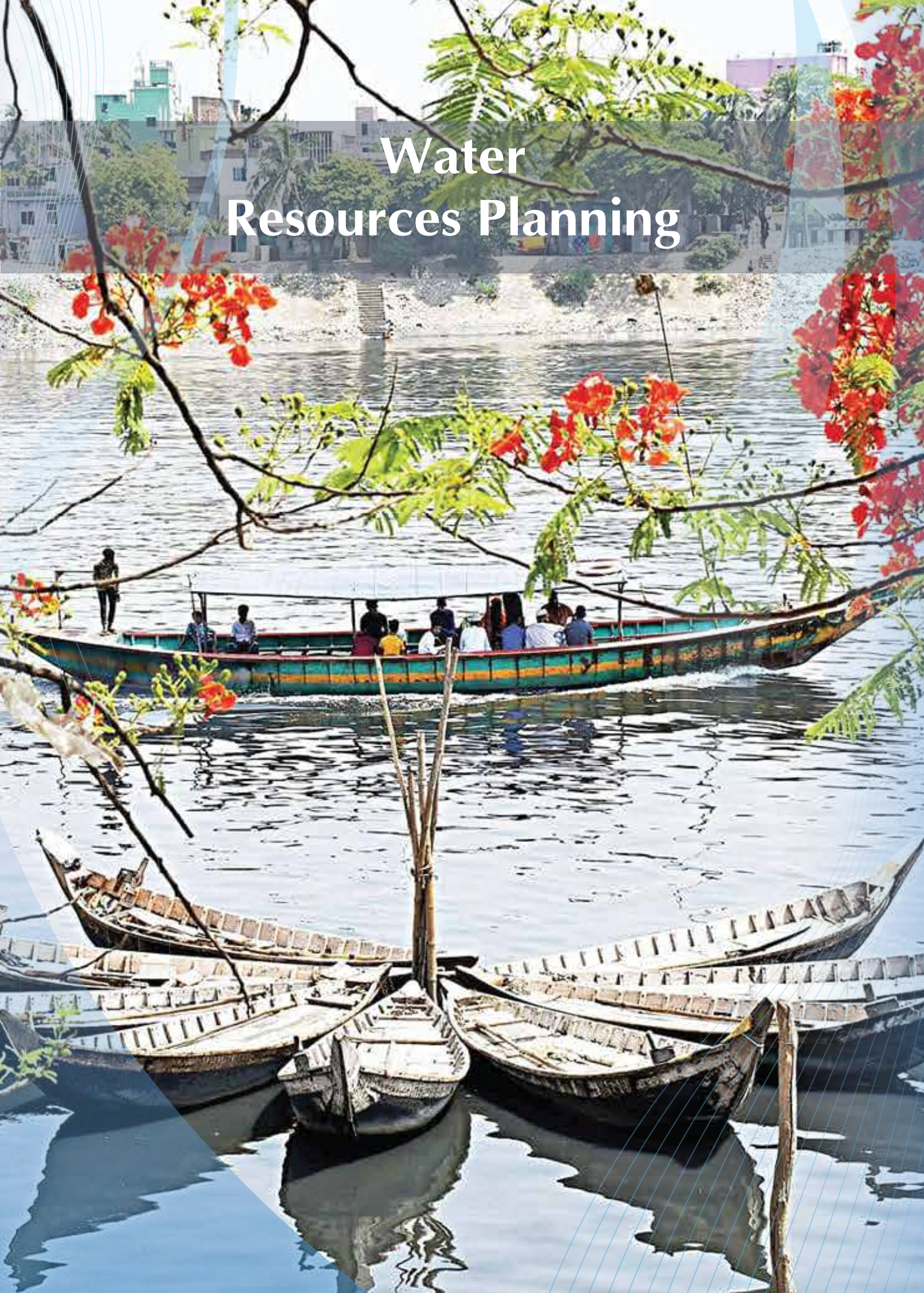


Current Speed Measurement from Stationery Boat in the East Shahbazpur Channel

Discharge observation in the Sandwip Channel

Suspended Sediment Sampling at Hatiya Channel

Water Resources Planning



Water Supply Network in Naf & Sabrang Economic Zone

For encouraging rapid economic development, Bangladesh Economic Zones Authority (BEZA) has selected Naf and Sabrang area in Teknaf Upazila of Cox's Bazar district to develop as economic zones for recreational and tourism purposes. The proposed Sabrang Tourism Park comprises an area of 1048 acres. The proposed Naf Tourism Park is an Island to be designated as an economic zone covering an area of 271.93 acres.

BEZA engages IWM to prepare a Water Supply Master Plan to fulfill water demand for Naf & Sabrang Tourism Park. Under the study the following analysis has been done:

- Water demand estimation;
- Resources assessment of groundwater;
- Identified suitable water sources;
- Water quality analysis of Naf River;
- Water zoning and phasing plans ;
- Water Management Plan (WMP);
- Topographic and Engineering survey;
- Sub-soil investigation;
- Outline design of transmission main and distribution system;
- Cost estimation

The water demand of Naf Tourism Park is about 1.61 MLD to serve 4,200 nos. tourist and 1,700 nos. workforce daily. Whereas water demand for Sabrang Tourism Park is about 15.46 MLD to serve 61,360 nos. tourist and 14,600 nos. workforce daily. To fulfill water demand conjunctive use of different water sources and different options have been analyzed. The main water sources are:

- Groundwater
- Rooftop rainwater harvesting
- Dam-reservoir water in Teknaf
- Desalination plant
- Rainwater harvesting in the proposed lake area

The development of Naf Tourism Park is planned to be completed in 2031 and of Sabrang Tourism Park in 2036. Accordingly, the water supply and development of different infrastructures have been planned in four phases: Phase1 (2021-24), Phase 2 (2024-26), Phase 3 (2026-31), and Phase 4 (2031-36). SWOT analysis for different options has been prepared and the most suitable option has been selected. The tentative project cost for the suitable option is about 5,153 million BDT which is in four-phase up to full development in 2036. It is recommended to use the building rooftop of area >300m2 for rooftop rainwater harvesting. Moreover, a metering system is proposed for easy maintenance of the supply system and BEZA should develop its own O&M mechanism.

Base map of Naf and Sabrang Economic Zone

Sewerage Master Plan for Sylhet City Corporation

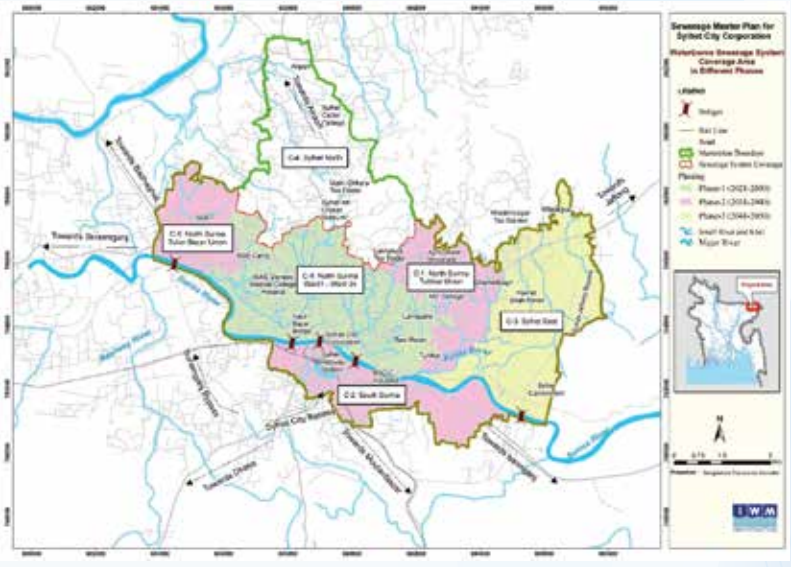
Sylhet city has fairly progressed in the water supply sector and is expected to improve further by 2030. However, it lacks in the sector of sanitation and wastewater management. In absence of a formal/comprehensive system, sewage generated in the Sylhet city is directly disposed to the surrounding rivers and water bodies creating and immense threat to the environment. As an effort to tackle this, the Sylhet City Corporation has taken initiatives to formulate a Sewerage Master Plan for the Sylhet Metropolitan. The master plan with a planning horizon of 2050 aims to achieve the long-term national goals in the context of safe sanitation in Sylhet Metropolitan area.

The master plan area is about 85.18 sq. km which includes entire Sylhet City Corporation area of 26.50 sq. km and an extended part of 58.68 sq. km covering five union areas namely Tukerbazar, Tultikar, Khadimnagar, Khadimpara and Kuchai. Population in the master plan area is expected to increase from 592,320 in 2011 to 2,298,117 in 2050.

A sanitation strategy has been formulated prior to the formulation of the sewerage master plan. Guiding principles of the national sanitation strategy (2005) and national strategy for water supply and sanitation (2014) have been incorporated into the sanitation strategy. Besides, existing situation of water supply, sanitation, solid waste management facilities, geography & topography, demography, topography, socio-economic condition, land availability for construction of sewerage infrastructures have been duly considered.

While formulating the sewerage master plan a decentralised approach has been adopted. The total area has been segregated into four (4) catchments. Catchment C-1 (North-Surma) includes ward no. 1 to ward no. 24 of SCC and parts of Tuker Bazar &Tulitkar unions. Catchment C-2 (South Surma) comprises ward no. 25 to ward no. 27 of SCC and parts of Kuchai union. Catchment C-3 (Sylhet-East) comprises mostly Khadim para union and a part of Tultikar union whereas catchment C-4 (Sylhet North) includes parts of Khadimnagar and Tuker Bazar unions.

Sewerage infrastructures including sewage treatment plant, sewer network and sewage lift stations have been planned for the catchments C-1, C-2 and C-3 considering 70% connectivity rate until the planning horizon. On-site sanitation or simplified sewerage system has been proposed for catchment C-4. Overall, three (3) sewage treatment plants, about 400 km of sewer network and 10 sewage lift stations have been proposed.



Coverage of Waterborne Sewerage System in Sylhet by 2050

These planned sewerage infrastructures have been proposed to implement in three phases. Apart of SCC area where there is adequate water supply (at least 130 lpcd) at present, has been proposed to be facilitated with water borne sewerage system by 2025. Depending on the availability of adequate water supply, the remaining part of the SCC has been proposed to be facilitated with water borne sewerage system by 2030. Areas of catchment C-1 which falls outside the SCC area and catchment C-2 (South Surma) has been proposed to be facilitated with water borne sewerage system by 2040 after ensuring adequate piped water supply. Subjected to future development of road network and water supply in catchment C-3, its areas have been proposed to be facilitated with water borne sewerage system by 2050.

The implementation of the water borne sewerage system particularly outside the SCC is expected to take considerable time, as such as an interim approach emphasis has been given for implementing improved onsite sanitation facilities like septic tanks, communal septic tanks, small bore sewerage system, septic tank sludge management etc.

Indicative capital costs and O&M costs for implementing sewerage systems in different phases have been estimated as present values. It has been estimated that capital investment of about 13050 million BDT will be required for sewerage development under Phase-1. And about 9800 million BDT and 5500 million BDT will be required for sewerage development under Phase-2 and Phase-3 respectively.

Based on the estimated costs, detailed economic & financial analysis has been carried out. Proposed sewerage development work is expected to bring huge economic benefits. However, to make this investment financially feasible, assistance from the Government of Bangladesh (GoB) is required. It is anticipated that the capital investment under phase-1 shall be provided by the GoB as grant. SCC is likely to manage the funding for investments under phase-2 and phase-3 through imposing sewer tariff. Upon conducting legal & institutional analysis it has been proposed that SCC needs strengthening both in terms of manpower and logistics to cope up with the responsibilities of developing and managing the water borne sewerage systems and on-site sanitation services. Besides, a proper rule/regulation shall be formulated by SCC to facilitate sewer tariff collection and address the likely offences of faulty sanitation practices once water borne sewerage system is implemented.

To make Sylhet metropolitan a model city, securing environmental safeguard by minimizing pollution is of enormous importance. The formulation of sewerage master plan is the founding stone towards that. Implementing the proposals of the master plan will not only ensure substantial health and economic benefits to the local inhabitants but also will supplement towards attaining the long-term national goal of securing safe sanitation for all.

Climate Change Cell (CCC)

Understanding the Sea Level Rise Dynamics-Bangladesh Coast

The Climate Change Cell (CCC) of IWM is conducting "Understanding the Sea Level Rise Dynamics of Bangladesh along the Coast", a two-year project and in partnership with the UK Met Office under ARRCC (Asia Regional Resilience to a Changing Climate) Programme funded by the UK Foreign Commonwealth and Development Office (FCDO). This study project will focus on the zone-wise and seasonal relative sea-level rise along the coast of Bangladesh with future climate scenario projection. The study area covers the whole coastal zone of Bangladesh. The specific objectives are:

- Investigate zone wise variation of sea level along the coast (for the three coastal zones separated as West, Central, and East)
- Find a seasonal variation of sea level along the coast
- Simulate sea level rise in the near future (2035-2065, 2070-2100) in different scenarios (RCP 4.5 & 8.5)
- Simulate sea level rise including local influences such as subsidence, tidal modulation, ENSO, etc.
- Investigate polder inundation extent and overtopping due to sea-level rise and increased storm surge

The following major works are being carried out to achieve the objectives:

- Collection and review of past study reports/maps relevant to the study.
- Collection of required data available from relevant secondary sources and primary sources
- Development of detailed methodology through consultation meeting with Stakeholders and Experts
- Analysis of tidal gauge data
- GCM downscaling, bias correction, and data preparation
- Updating and calibration of GBM basin model, river model, and Bay of Bengal model
- Simulation of GBM, river, and BOB model for present and future scenarios of local sea-level rise by the inclusion of updated Digital Elevation Model (DEM)
- Sea-level Rise Assessment in different Climate scenarios (RCP 4.5, RCP 8.5, the year 2050, the year 2100) – including ENSO, Subsidence and Tidal Modulation
- Assessment of polder overtopping for selected polders due to increased storm surge
- Development of Database and Web application
- Video documentary creation from field visits and survey

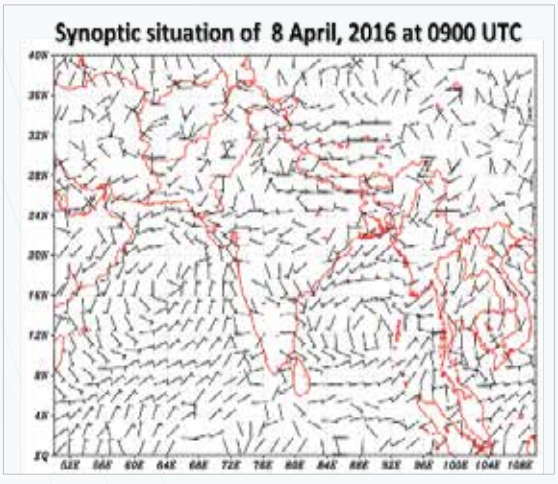
Under this ongoing project, the 1st stakeholder consultation workshop was held in February 2021 on virtual platform zoom. It brought together the researchers, providers, organizations, and users of future sea-level rise information and experts to discuss and identify needs, gaps, and issues related to sea-level rise information available for the coastal areas of Bangladesh. Based on the comments and suggestions, the methodology of the study has been fine-tuned. A detailed inception report has been submitted to the UK Met Office including an extensive literature review on global and regional sea-level rise and the different dynamics of it playing in the Bay of Bengal. The inception report also includes a detailed methodology focusing on data collection plan and survey plan, climate model downscaling and bias correction methods, numerical model development- calibration and validation methods (GBM basin model, River model, and Bay of Bengal model), and sea-level rise assessment methods including subsidence, impact from El Nino-La Nino effect on local sea level and tidal modulation.

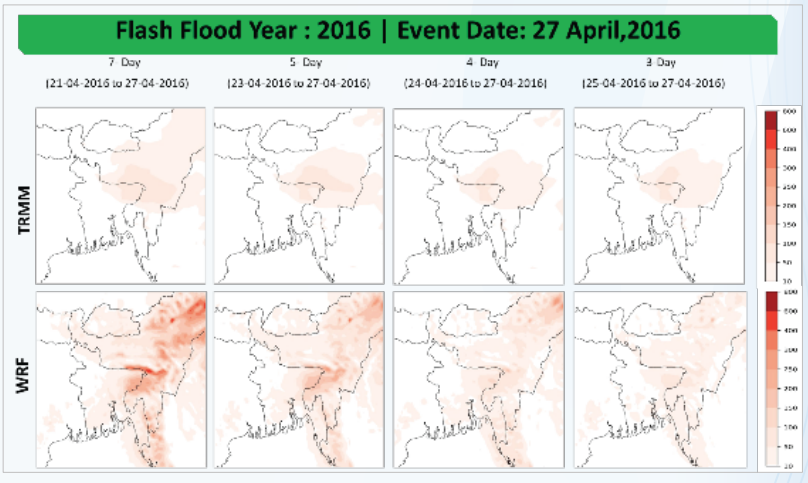
Stakeholder consultation workshop, held on Zoom platform

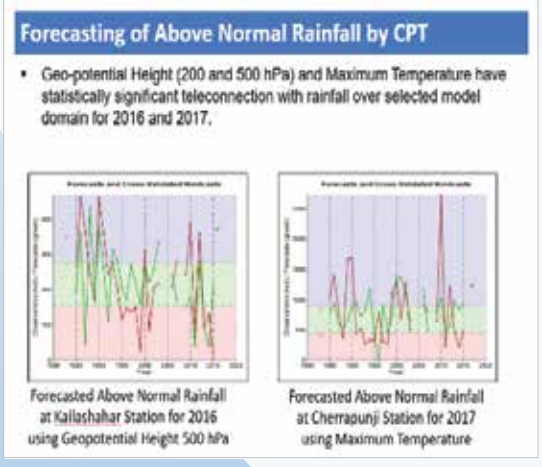
Research on Two-stage Hydro-meteorological Pre-monsoon Flash Flood Forecast Over North-east Haor Region of Bangladesh

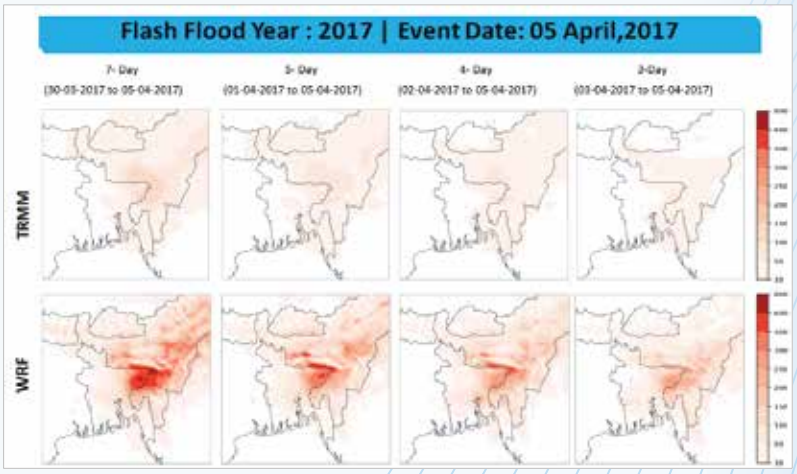
The physical setting and hydrology of the haor region have created innumerable opportunities as well as constraints for the inhabitants of the haor. The region has distinctive hydrological characteristics. Annual rainfall ranges from 2200 mm along the western boundary to 5800 mm in its northeast corner and is as high as 12000 mm in the headwaters of some catchments extending to India. The region receives water from the catchment slopes of the Shillong Plateau across the borders in India to the north and the Tripura Hills in India to the southeast. Flash flood is the one of the major disaster in the haor area, which engulfs the primary production sector of agriculture and thus threatens the lives and livelihoods of the people. The main objective of this study is to develop two-stage hydro-meteorological pre-monsoon flash flood forecasting for the north-east haor region of Bangladesh.

The probabilistic flash flood prediction has been developed using Climate Predictability Tool (CPT) for one-month lead time. Monthly rainfall has been predicted on observed station for a suitable predictor from GCM model output that provides good correlation with the predictand. And the later part of the development of the flash flood forecasting has been done with the application of GFS and WRF numerical modelling technique for seven-days lead time over the haor region to reduce the vulnerability of the people in terms of livelihood, poverty and food security.



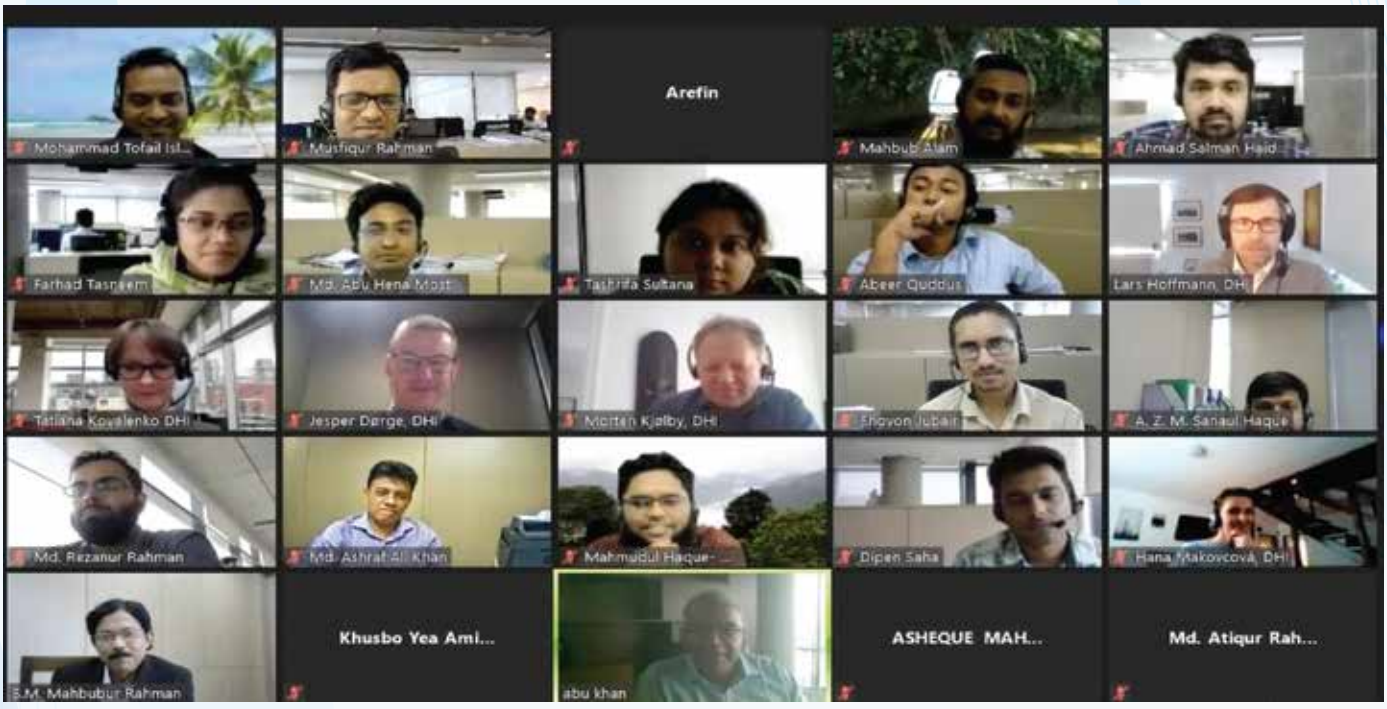






Training & Capacity Development

Training and Technology Transfer is a regular activity of IWM aims at updating the human resources of the Institute as well as the service users with the new knowledge and technology and to cope with the new challenges in water sector. Following is the brief on the HRD programmes conducted in 2020-21



Closing ceremony of the online training program conducted by DHI Academy participated by IWM and DHI Academy management and the participants.

JAN	FEB	MAR	APR	MAY	JUN
Training on Business Communication by British Council Computational Hydraulics by BUET Training under EMCRP : Rohingya Project	River Hydraulics by BUET Hydrology by BUET Coastal Engineering by BUET	Statistical Methods in Hydrology BUET Hydraulic Structure by BUET Modelling urban drainage using MIKE+ Collection System (MIKE 1D) by DHI Water Supply Network Design, Construction and Maintenance by IEB	Modelling water distribution networks using MIKE+ WD by DHI Modelling urban integrated flooding using MIKE+ Urban Flood by DHI Modelling seawater intrusion by DHI	Modelling sediment transport & morphology in rivers using MIKE 21C by DHI Monthly webinar by IWM professional	Modelling sediment transport & morphology on coastlines: Littoral Processes FM (LPFM), M21 Shoreline Morphology FM (MIKE 21 SM FM) by DHI Advanced three-dimensional hydrodynamic modelling using MIKE 3 Flow Model FM#02 - Advanced three-dimensional hydrodynamic modelling using MIKE 3 Flow Model FM by DHI

Training program organized by IWM at Rohingya Camps in Cox's bazar under EMCRP (Rohingya Project)

JUL	AUG	SEP	OCT	NOV	DEC
Training on Professional Software Testing	Online training on AEROMOD Inception Workshop for the Green Climate Fund (GCF)	4 days Training Programme for BWDB Officials on Survey in connection with Implementation support service for on-going projects of BWDB for the year 2020-21.	Training to IWM Professionals for ISO Certification (Management Review Committee) Knowledge sharing scheme under Monday Talaks.	Building Capacity for Climate Change adaptation and climate change vulnerability Training to IWM Professionals for ISO Certification Internal Audit Team)	Computational Hydraulics, Hydrology and Statistics, Training Course on River Hydraulics, Coastal Engineering and Hydraulic Structures Training to IWM Professionals for ISO Certification (Management Review Committee)

IWM Major Events

New Executive Director and Deputy Executive Directors of IWM Pay Homage to Bangabandhu Mausoleum at Tungipara

The newly appointed Executive Director and Deputy Executive Directors of the Institute of Water Modelling (IWM) pay homage to the Father of the Nation Bangabandhu Sheikh Mujibur Rahman at the Mausoleum at Tungipara, Gopalganj. Mr. Abu Saleh Khan, Executive Director, IWM was accompanied by Deputy Executive Director (Operations), IWM, Mr. Zahirul Haque Khan and Deputy Executive Director (Planning & Development) Mr. S. M. Mahbubur Rahman and Head of Business Mr. M. Samiun Nabi. They paid homage by placing floral wreaths at the mazar of the Father of the Nation at Tungipara.

After placing the wreath, Mr. Khan and his team of IWM stood there in solemn silence for some time as a mark of profound respect to the memory of Bangabandhu Sheikh Mujibur Rahman, the architect of the country's independence.

Mr. Khan and his team, then, offered Fateha and joined a munajat seeking eternal peace of the departed soul of Bangabandhu and his parents and those martyred on 15th August 1975. Prayers were also offered for the well-being of Honorable Prime Minister Sheikh Hasina, the country's continued peace, progress and prosperity.

After that. Mr. Abu Saleh Khan signed the guest book at the Mausoleum.

It may be mentioned that the Institute of Water Modelling (IWM), a Trust organization affiliated with the Ministry of Water Resources, Government of the People's Republic of Bangladesh, was established by the Honorable Prime Minister Sheikh Hasina in 1996 by a cabinet decision.

Executive Director and Deputy Executive Directors of IWM paid homage by placing floral wreaths at the Mazar of the Father of the Nation

Honorable Chairperson of IWM Board of Trustees (BOT) & Senior Secretary Ministry of Water Resources Mr. Kabir Bin Anwar Visits IWM Bhaban

The Executive Director of IWM Mr. Abu Saleh Khan welcomes Honorable Chairperson, IWM BOT with flower bouquet

Inspecting the development of construction work of IWM Bhaban

Bangabandhu Corner at IWM Bhaban

Honorable Chairperson discussing with the top Management of IWM at IWM Bhaban

Some of the Major Events and Contract Signing Ceremony

A contract signing ceremony for the project titled, “Prepare the master plan to protect Meghna River from pollution and increase navigability," was held on 23rd January, 2021 at Pan Pacific Sonargaon Hotel between the a High level Committee of Local Government Division (LGD) and IWM. In this program Hon'ble Minister of Local Government, Rural Development and Cooperatives Mr. Md. Tajul Islam, MP; Mr. Helal Uddin Ahmed, Senior Secretary, LGD; Engineer Taksem A Khan, Managing Director, Dhaka WASA, Mr. Abu Saleh Khan, Executive Director, IWM, and many other local and foreign dignitaries were present. The program was broadcasted online.

A contract signing ceremony between Water Resources Planning Organization (WARPO) and IWM, for the project titled, “Hydrological investigation and modelling of the state of surface and groundwater resources in the Barindregion," was held on 1st February, 2021 at WARPO Conference Room, Green Road.In this program Director General of WARPO Md. DelwarHossain; Md. Alamgir Hossain, Director (Planning), WARPO; Md. RezaulKarim, Principal Scientific Officer (Engineering), WARPO; Mr. Abu Saleh Khan, Executive Director of IWM, Mr. Zahirul Haque Khan, DED (Opn.), IWM; Mr. Goutam Chandra Mridha, Director of IRM division of IWM and many other senior-level officials were present.

IWM has signed a contract with 24 Engineer Construction Brigade of Bangladesh Army for the project titled, “Hydrological Monitoring and Implementation Support Service in connection with Dredging/Re-Excavation of Bangali- Karotoa- Fuljor-Hurasagor River System with Bank Protection” on 17th June, 2021. In this program Lt. Colonel Kismat Hayat,Project Director of this Project and Md. Amirul Islam Director of SDT division signed the contract on behalf of IWM. Major Muhammad Shah Alam from Bangladesh Army, Mr. Pankaj Kumar Maitra,Associate Specialist, M Samiun Nabi, Manager & Strategy Development of IWM, andother senior level officials were also present there.

Dr. Craig Meisner,former International Technical Adviser at Food and Agriculture Organization (FAO), Visits IWM on 23 June 2021. Mr. Abu Saleh Khan, Executive Director of IWM, greeted Dr. Meisner with a crest of IWM in the presence of Mr. Zahirul Haque Khan DED (Opn.), Dr. Mollah Md. Awlad Hossain, Director ICT-GIS division; Mr. Goutam Chandra Mridha, Director, IRM division.

IWM Observing Different National Days

IWM pays homage to celebrate The Victory Day at National Monument, Savar on 16 December, 2020

IWM Bhaban was illuminated with decorative lighting to celebrate the Victory Day 16 December 2020

IWM Observes International Mother Language Day 2021

IWM Tribute to the National Memorial for the celebration of Independence Day, March 26, 2021

IWM Observes National Mourning Day 2020

IWM Participate in a Dua-Mahfil on the National Mourning Day, 15 August, 2020

IWM Celebrates the Birth Centenary of the Father of the Nation, Bangabandhu Sheikh Mujibur Rahman

IWM paid homage by placing floral wreaths at Banganadhu Memorial at Road 32, Dhanmondi

IWM Bhaban was illuminated with decorative lighting and banner to celebrate the Birth Centenary of the Father of the Nation, 17 March, 2021

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Water Environment & Climate

INSTITUTE OF WATER MODELLING

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