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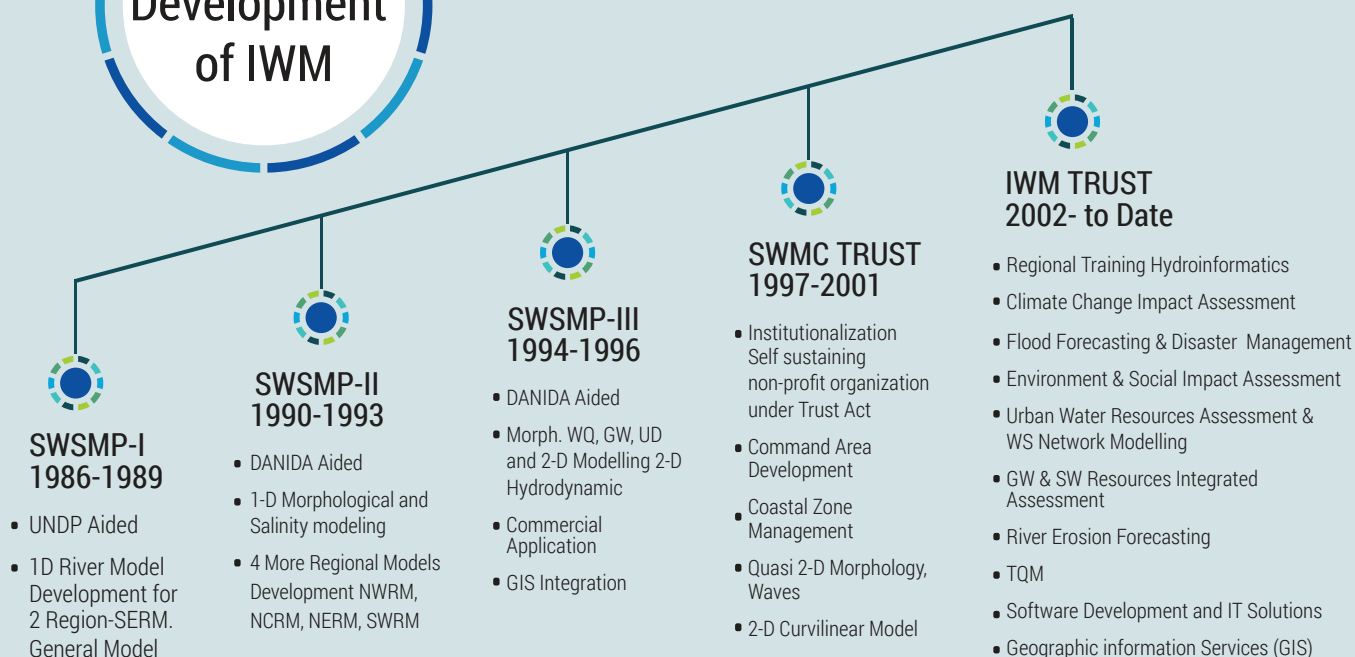
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- Irrigation Management
- Groundwater Management
- Urban Water Management
- Water Quality and Ecology
- Fluvial Hydraulics
- River Engineering
- Flood Management
- Integrated Coastal Zone Management
- Coastal Hydraulics and Morphology
- Port and Coastal Structure Management
- Estuary and Marine System Management
- Offshore Structure and Pipelines Design
- Water Quality Investigation
- Software Development and IT Solutions
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- Hydrogeological Investigations
- Topographic, Bathymetric & Hydrographic Survey
- Discharge Measurement
- 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 as an independent organization under Trust Act by the Government of the People's Republic of Bangladesh in December 1996 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



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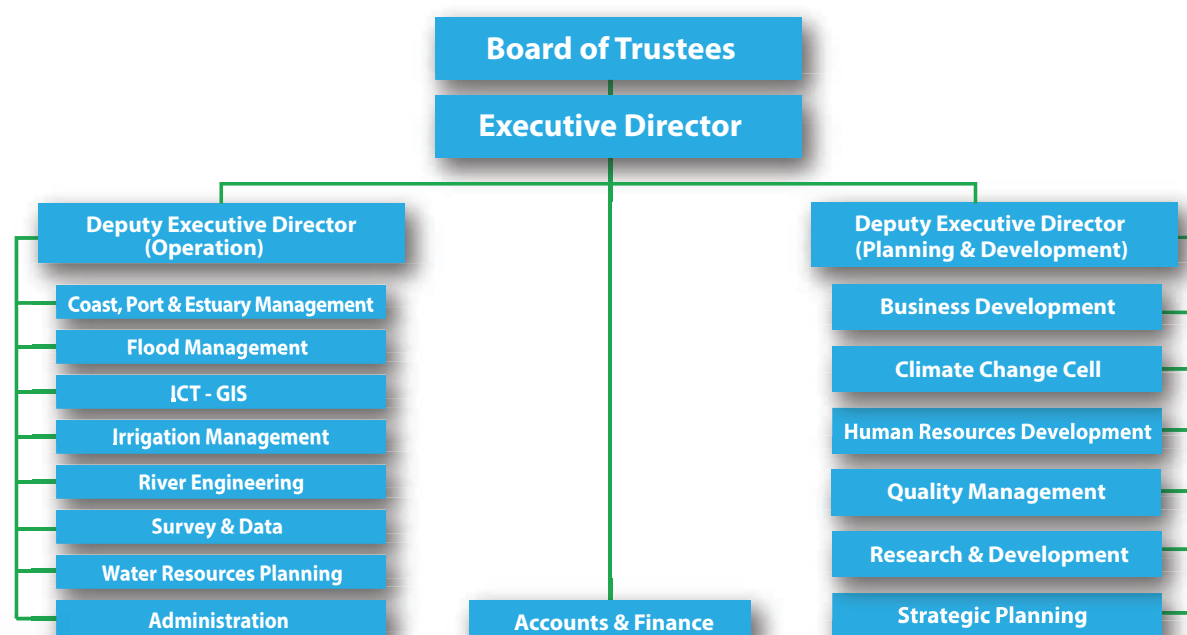
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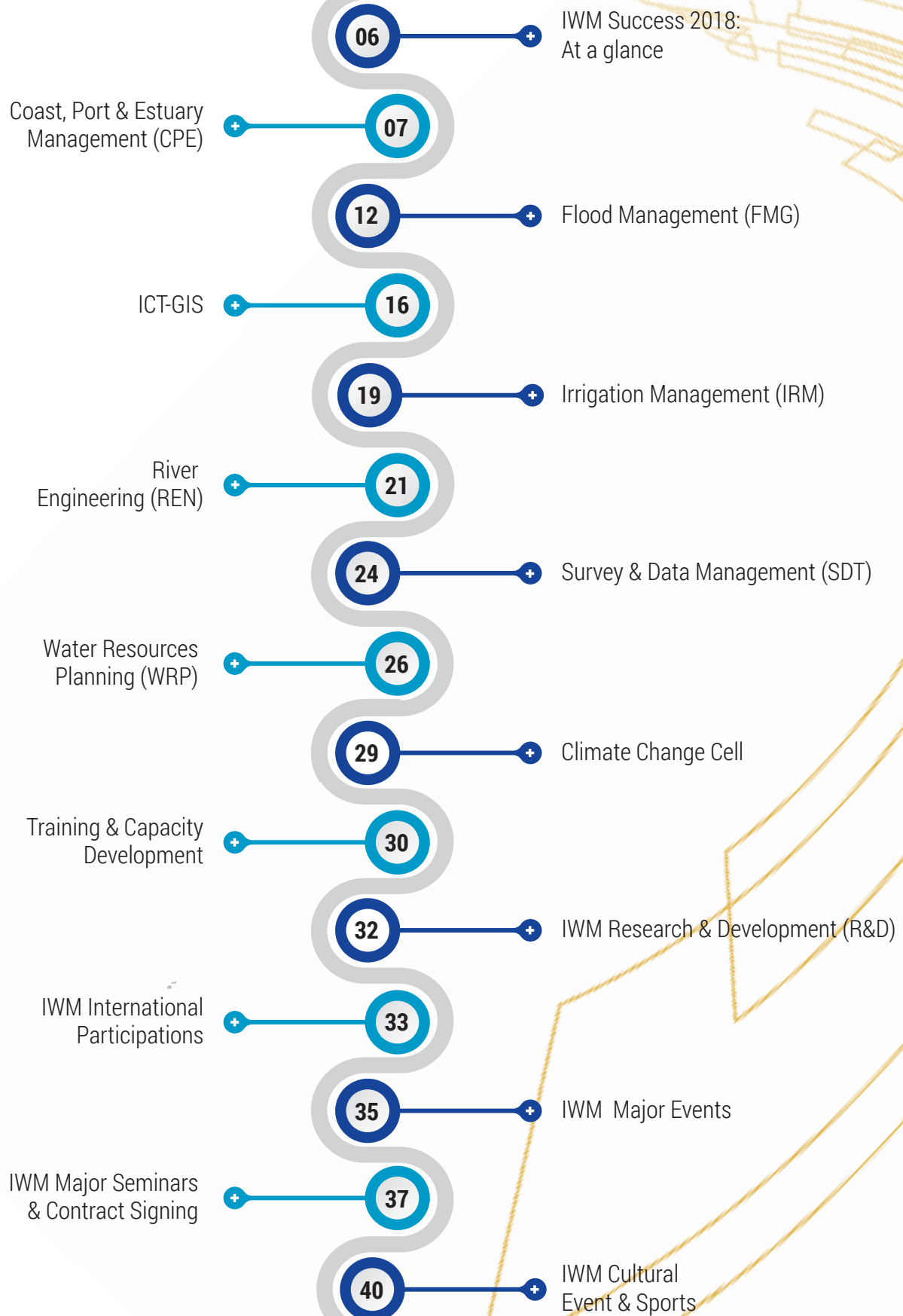
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Kabir Bin Anwar
 Secretary
 Ministry of Water Resources
 Government of the People's Republic of Bangladesh

MESSAGES FROM CHAIRPERSON

It gives me immense pleasure to convey my best wishes to Institute of Water Modelling (IWM) on publication of its Annual Report 2018. I am delighted to observe that IWM has come a long way in establishing its accomplishment as a Reference Centre in Asia and a leader in the field of water management and modelling.

IWM was established in December 1996 as a Trust through a Cabinet decision chaired by the Honourable Prime Minister Sheikh Hasina. Since then, IWM is contributing in the prosperous journey of emerging Bangladesh by delivering world class solutions in water resources management, environmental and climate related studies, with its excellent skills on state-of-the-art technology of mathematical modelling, computational hydraulics and allied sciences. It is addressing numerous water-related problems of the country and abroad. I am very happy to know that IWM has expanded its vision to Water, Environment & Climate with a special attention on ecological perspectives. This will definitely provide important insights regarding impact of development works on our socio-economic and environmental ecosystems. IWM has become a centre of repute as an independent entity and is venturing into new opportunities with foreign Institutes and Universities. Previously we needed to hire expensive foreign consultant for different studies. But centres like IWM has come forward and successfully reduces the dependence on foreign experts, thus is saving millions of important foreign exchanges.

I am really happy and proud to know that success of IWM has gone beyond the territory of Bangladesh as now they are providing groundwater and flood forecasting solutions to India, Malaysia and other countries. This is indeed a benchmark of success and development of Bangladesh. Thus, IWM has successfully witnessed another year of challenging growth in attaining great heights of accomplishments through dynamic business strategies, better organizational strength and structured training of its own staffs as well as that of its clients, both at home and abroad.

Finally, I would like to extend my heartfelt appreciation to the members of the Board of Trustees of IWM for their whole-hearted contributions and continuous support over the years. They provided continued support for the development of the Institute as a successful entity in addressing the challenging needs of the country. I also wish to extend my best wishes to the staffs of IWM for their tireless efforts 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 a prosperous and bright future.



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





MESSAGES

FROM Executive Director



Prof. Dr. M. Monowar Hossain
Executive Director

INSTITUTE OF WATER MODELLING

It is my honor to present the year-round activity of IWM in the Annual Report 2018. It summarizes an overall status of IWM to our valued clients, well wishers, stakeholders and other fellow professionals on our activities. The year 2018 has been yet another year of continued success in the milestone of our accomplishments, depicting the completion of number of significant projects. This year we have provided our services to around 52 different clients and number of projects was over ninety. It reflects IWM's activities in a credible manner for its services to its valuable clients and development partners. I would like to provide a brief account of activities division wise:

CPE division has been involved in number of diversified projects in 2018. Mentionable are: Morphological and Environmental Impacts, Detailed Design and Assessment of Effectiveness of Dredging for Restoration of Dry Season Flow, Consultancy Services for Long Term Monitoring, Research and Analysis of Bangladesh Coastal Zone, Feasibility Study for Navigation Improvement and Landing facilities, Water Management and Knowledge Innovation Program etc.

FMG division has been involved in few projects such as Management Support to the Mathematical Modelling Centre for Water Resources Research & Development under Water Resources Department, Government of Bihar, India, Water Resources Vulnerability and Security Assessment of the YarlungTsangpo-Brahmaputra Transboundary River Basin, Modelling Study and Statistical Analysis for Determination of Hydrological Parameters at Selected Locations on Rivers etc.

ICT-GIS Division of IWM carried out several projects such as Development of Upazila Land Suitability Assessment and Crop Zoning System of Bangladesh, GIS based Interactive Election Assessment System (GIEAS) & Development of Web-GIS Applications etc.

IRM division completed the projects on National Water Balance Management System (NAWABS) bagi Lembangan Sungai Muda, Malaysia, Detailed Feasibility Study with ESIA for Restoration of Water Resources around Baral River Basin under Rajshahi & Natore Districts, Study of Interaction between Haor and River Ecosystem including Development of Wetland Inventory under etc.

REN division was involved in projects such as: Four Large Road Bridges in the SW Region of Bangladesh - Hydro-morphological Study, Hydro-morphological Study of Bhanga to Payra Port Rail Line Construction, Monitoring of the Jamuna River for the Safety of RTWs of Bangabandhu Bridge during 2018-2022.

SDT division was involved in different projects during reporting period. Notable ones are: Monitoring Kalni-Kushiyara (Phase-II), Dredging of Surma-Baulai River System Improvement of existing Embankment & Drainage Channel by using Mathematical Model & State-of-the Art Survey Technique & Kutubdia Energy Hub-Bathymetric and Met Ocean Monitoring Survey. This division provides support in survey activities for all other divisions of IWM.

WRP division carried out projects such as Water Resource Potential Assessment of Ukhia and Teknaf Upazila Area, Cox's Bazar, Feasibility Study with Detail Design of Surface Water Treatment Plant for Sylhet City Corporation & TA for Detailed Design, Development of Service Option & Modality and Preparation of Detailed Project Report of Water Supply Scheme to Implement in Thirty Towns of Bangladesh, Feasibility study of development of safe Water Supply Systems in the newly added unions of DNCC & DSCC etc.

IWM has quite a number of Units which supports the activities of various divisions and play a strong pivotal role in running the day to day business and operational activities. These are Finance & Accounts, Human Resources Development, Administration, Business Development and Quality Management. Climate Change Cell and R&D Units are playing key roles in conducting higher level research on delta and climate change related issues involving foreign Universities. IWM has developed strong working relations with its in-country clients as well as overseas clients and partners. Professionals of IWM have received international as well as national recognitions in their respective areas of expertise which is a testimony of IWM's business expansion in international arena.

Prof. Dr. M. Monowar Hossain
Executive Director
INSTITUTE OF WATER MODELLING

IWM Success 2018: At a glance

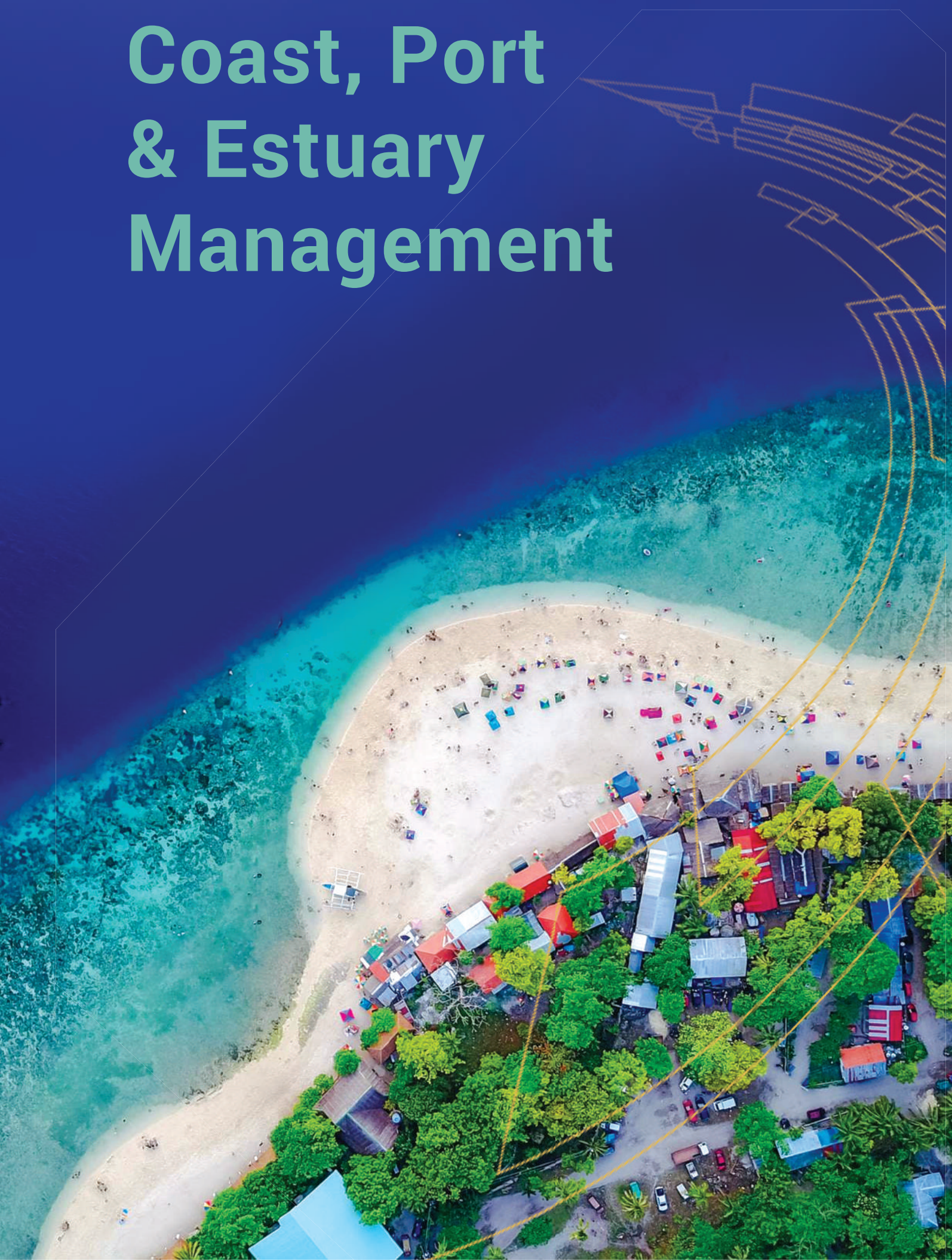
We are steadily growing to provide sustainable solutions to the water sector of not only in Bangladesh but also in the neighboring countries which extends upto the region of Asia, Australia, Europe and USA. Since its inception in 1986, IWM continues to thrive in an exceptional manner and grow day by day. In 2018, IWM had taken several challenging projects of great national interest and experienced a steady growth. We have provided our services in around 90 projects and to more than 50 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 2018-19:

1	Feasibility Study for Restoration of Bhadra and Salta River along with Adjacent Polder to Removal of Drainage Congestion of Khulna District Including Environmental and Social Impact Assessment (ESIA), BWDB
2	Mathematical Modelling and Topographic Survey Under Consultancy Services for Management, Design, Supervision and other Related Services of Haor Flood Management and Livelihood Improvement Project, BWDB
3	Implementation Support Services for Kalni- Kushiara River Management Project by State-of-the Art Survey Technique, BWDB
4	Study of Interaction Between Haor and River Ecosystem including Development of Wetland Inventory and Sustainable Wetland Management Framework, DBHWD
5	Study for Investigation and Expansion of GW Irrigation in Habiganj, Moulavibazar and Sylhet Districts, DBHWD
6	Management Support to the Mathematical Modelling Centre (MMC) for Water Resources Research & Development under Water Resources Department, Government of Bihar, India
7	Feasibility Study for Improvement and Restoration of Navigability of Buriswar-Payra, Old Brahmaputra, Dharala, Dudhkumar, Punarbhaha, Tulai and Showa River, BIWTA
8	Development of Upazila Land Suitability Assessment and Crop Zoning System of Bangladesh, BARC
9	Study on Aquifer Mapping and Groundwater Resource Assessment for Management of Eco-friendly Sustainable Agricultural Development in Bangladesh, BADC
10	Hydrological and Morphological Mathematical Modelling Study for Construction of Four Bridges of Eastern & Southern Region of Bangladesh, BBA
11	Detail Topographic Survey, Hydrological and Morphological Study using Mathematical Model for Proposed Rail Line Construction from Bhanga to Payra Port, Bangladesh Railway
12	Met Ocean Data Collection for Feasibility Study for New Port on the Sandwip Channel at Sitakunda, Chattogram, WMKIP
13	Detail Study on Total Water Demand & Water Availability Assessment for Bangabandhu Sheikh Mujib Shilpa Nagar (BSMSN), BEZA
14	Preparation of Master Plans and Feasibility Studies for Dhaka South City Corporation (DSSC)
15	Kutubdia Energy Hub-Bathymetric and Met Ocean Monitoring Survey, BexPetro
16	Supervision Consultancy Project for Pagla Sewerage Treatment Plant (STP), DWASA
17	Feasibility Study of Development of Safe Water Supply System in the newly added 16 unions of DNCC and DSCC
18	Technical FS of Boro Char in the Meghna River at Ikhlaspur Union under Matlab North Upazila in Chandpur District, BADC
19	Long Term Monitoring, Research and Analysis of Bangladesh Coastal Zone, BWDB

Among the major clients of IWM; BBA, BIWTA, BMDA, BWDB, BADC, CPA, PPA, MPA, CAAB, PDB, DBHWD, CWASA, KWASA, RWASA, DPHE, DWASA, LGED, RHD, WARPO, BR, DOE, DOF, Atomic Energy Commission, WB, ADB, UNICEF, etc. stand big to seek IWM services. These agencies play significant role regarding taking large projects which involve development of the country and the people. With IWM's services of modelling and survey our clients can ensure optimum performance and outcome of these projects and thus save resources of the country in terms of millions of dollars. The vision of IWM is aligned with the Perspective Plan of Bangladesh, Vision 2021. IWM is also relentlessly working with Delta Plan 2100 with other partners of the consortium.

Coast, Port & Estuary Management



Feasibility Study for Restoration of Bhadra and Salta River along with Adjacent Polder to Removal of Drainage Congestion of Khulna District Including Environmental and Social Impact Assessment (ESIA)

Polder-26, 27, 25, 28 and 29 are experiencing severe water logging problem due to siltation in its peripheral river system. Middle Bhadra, Upper Salta, Hamkura and Joykhali/ Bhadra rivers are the main drainage route of these Polders. The river siltation causes deterioration of drainage capacity and dying of these rivers that results in prolong drainage congestion in the project area. The long-term solution of severe water-logging problems is required for reducing substantial loss of agricultural production, degradation of social, environmental and economic conditions in the project area. The main objective of the study is to devise a drainage improvement plan for solution of long standing drainage congestion of the study area.

Several Focus Group Discussions (FGD) and stakeholder consultations were carried out for problem analysis and devising water management improvement options. The available hydrological, social and environmental data, field surveyed data and updated models are applied to analyse the present problems and assessing the effectiveness of four alternative drainage improvement options. River excavation is common in all four options. Option-1 (Regulator Option) includes excavation of Hamkura, Upper-Salta, Middle Bhadra & Joykhali river, construction of new regulator and permanent closures. Drainage improvement is considerable compared to all other options. However, sedimentation occurs at the down-stream of the regulator and regular maintenance dredging is required. Free tidal movement and natural fish migration are interrupted in this Option.

In Option -2, free tidal movement is considered. A circular flow phenomenon occurs through the river systems since free tidal movement is allowed but simulation result shows that four tidal meeting zones are very likely to occur in this option. The main challenge of this option is to manage sediment due to tidal meeting. Moreover, Polder-25 might



Major river system of the study area



Siltation in the Upper Salta river

experience severe drainage congestions due to significant sedimentation & water stagnation for 5 hours in Upper-Solmari river.

Option- 3 (only Excavation) includes excavation of four rivers, no regulator at Deghali and Middle prevents the additional flow from Hamkura river to Upper Salta and Upper Solmari respectively.



Water Logging Problem at Hamkura River

The drainage improvement is better than Option-2 and like Option-4. This option allows free tidal movement and is environmentally sound. Excavated earth management is a great challenge in this option. A regular maintenance dredging will be required in this option for sediment management.

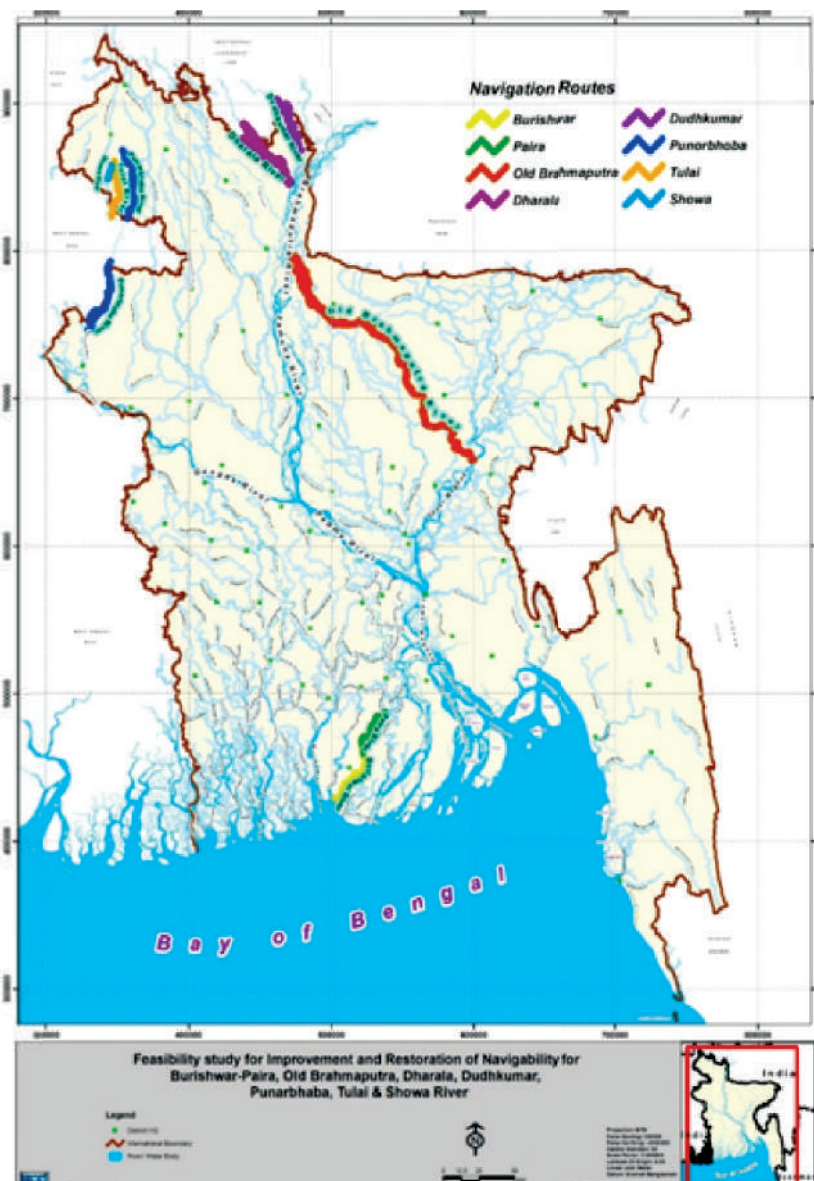
Option-4 includes all the interventions of Option-3. In addition to that a TRM basin is considered at Madhugram beel for sediment management and enhancement of tidal prism in the river systems. Tidal prism (indicator of sustainability of tidal river) of Hamkura, Middle Bhadra and Joykhali river is assessed from TRM model and compared with the required tidal prism of design condition and it is seen that tidal prism of Hamkura and Joykhali river is higher than that of required tidal prism but the tidal prism of Middle-Bhadra river is slightly lower compared to the requirement. However, experience suggest that after operation of one to two years, the tidal prism of these rivers will be increased further. It indicates that the river system dose not experience any siltation if TRM is operated. In consultation with local community and field survey, four TRM basins are identified for sequential operation. The maintenance dredging is not required in this option. Drainage performance is better compared to Option-2 and Option-3. Thus, it appears Option-4 is a better option compared to others since it is nature based, environment friendly and socially acceptable. The main challenge of this option is to obtain land for TRM basin and compensation of crops to land owners for the whole project period. It has huge social and institutional challenges for implementation and takes time.

Considering all issues, Option-3 is suggested to implement for drainage improvement and sediment management keeping the provision of free tidal movement without any interventions. Maintenance dredging is required for sustainable drainage management based on the monitoring results. A TRM basin can be added in future with this suggested option for better sediment management

Feasibility Study for Improvement and Restoration of Navigability of Buriswar-Payra, Old Brahmaputra, Dharla, Dudhkumar, Punarbhaba, Tulai and Showa River

The waterway in Bangladesh is a precious gift of nature and the cheapest mode of transport. There are many areas in the country where no other alternative mode of transport is available except waterways. Innumerable rivers, canals, creeks and beels are distributed over the country as spider net that help comfortable access to the remotest areas where other mode of transports are not available. Every year 1 to 1.1 billion tons of sediment is being transported through the river system and a considerable portion of it deposits on the river bed before it is released into the sea. This results in gradual dying of the rivers due to rising of the riverbeds siltation and causing problems in river transportation. This deteriorating trend has been continuing for long and the navigable length available today is much less than before. In order to restore the inland waterways network irrespective of navigability, the program of capital dredging of the waterways is essential to be undertaken. In this respect the river Dharla, Dudhkumar, Buriswar-Payra, Old Brahmaputra, Punarbhaba, Tulai and Showa are proposed under the Project for dredging to improve their navigability, ensure dry season flow also for flood control and erosion management. It is an essential part of any development work to carry-out feasibility study including the impacts on environmental conditions to devise environmental management plan for avoiding environmental degradation.

IWM carried out a feasibility study for improvement of the seven selected navigation routes based on the physical characteristics, present navigability and importance of the navigational routes of the seven selected rivers. Different navigational class are proposed for different rivers. Class II navigational route for Old Brahmaputra, class I for Payra-Buriswar, class III for Dharla, Dudhkumar and



Punarbhaba and class IV for Showa & Tulai were proposed. Dredging is one of the options often applied to deepen and/or widen a navigation channel on rivers, especially when short river sections need to be improved. River stretch for improvement is identified based on bathymetry data and LLW of the stretch. Dredging alignment is selected considering available depth, dominant current direction, erosion vulnerability, safe clearance from the bank. Dredging alignment for the seven rivers is identified and required capital dredging for each of the rivers is computed. Maintenance dredging is required to maintain designated channel and berth depths to ensure the continued efficient passage of vessels movement. Considering the morphological characteristics and amount of incoming sediment. Maintenance dredging is considered 50%-70% of capital dredging for Old Brahmaputra and Payra-Burisdwar. The other rivers do not carry huge silt from the upstream during monsoon and it implies less resiltation rate. Maintenance dredging is considered 10% -15% for other rivers. In order to store the water in dry season four rubber dams , one for Punarbhaba river, one for Showa river and two rubber dams for Tulai river are suggested. This will play a vital



Cargo boat at Toke Ghat



Domestic use of water

role in enhancement of irrigation capacity and multiple use of water. River bank erosion protection measures are required for Old-Brahmaputra (11.8km), Dharla (15.6km) and Dudkumar (7km) rivers for the safety of social infrastructure, homesteads and productive land. The vulnerable location of bank erosion is identified considering recent bankline shifting characteristics, position of deep channel, location of outer bank and magnitude & direction of water flow velocity.



Off-take of old Bramaputra River

Environment Impact Assessment shows that the proposed project will have positive impacts in respect of environmental friendly and cheaper transportation of goods and overall socio-economic development. The restoration of dry season flow will enhance the agricultural production, fisheries, the inland water transport and social-wellbeing of local communities. The project will also reduce flooding and drainage problems during monsoon. Economic analysis shows that the project is economically viable.

Flood Management



Mathematical Modelling and Topographic Survey Under Consultancy Services for Management, Design, Supervision and other Related Services of Haor Flood Management and Livelihood Improvement Project (BWDB Part)

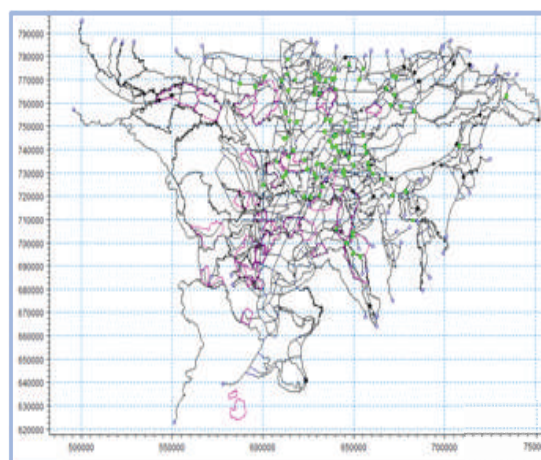
The Northeast region of Bangladesh has special natural features called the Haors which are large bowl-shaped flood plain depressions. There are altogether 373 Haors comprising of an area of about 8,600 km² distributed in the Northeast region. Bangladesh Water Development (BWDB) implemented water/flood management projects to save Boro rice against the damage caused due to pre-monsoon flash floods. In 2011 and 2012, with a partnership with IWM, JICA conducted two studies namely 'Preparatory Survey on Cooperation Program for the Disaster Management in Bangladesh' and 'Data Collection Survey on Water Resources Management in Haor Area of Bangladesh' respectively focusing the haor areas of the country. As a follow up of the earlier studies, an agreement between Nippon Koei Co., Ltd. and Institute of Water Modelling was signed on May 2015 to carry out the study for reviewing the earlier planning and supporting the detail design phase of the project. The consultancy service aims to construct/rehabilitate and reconstruct flood management infrastructure in 29 haor sub-projects (14 Nos. new sub-projects, and 15 Nos. existing sub-projects to be rehabilitated) of greater north-east region.



The specific objectives of the study component are as follows:

- To obtain primary and secondary information needed to update the existing models of IWM.
- To provide regional model output for fixing crest level of the embankments (proposed or existing) of the project considering confinement effect.
- To provide subproject wise detailed model output for finalizing design of canals (khals) and hydraulic structures considering integrated river/ channel network.
- To conduct survey to support land acquisition planning and estimating volume.

Under the study detailed field survey has been conducted which includes land level survey, river /khal cross-section, embankment cross-section, information of existing structure, survey for site plan preparation, water level and river flow measurement etc. the haor flood model has been updated utilizing the collected data and utilized for establishing pre-monsoon flood level for designing submersible embankment of proposed haor sub-projects considering confinement effect. Individual haor models have been utilized



Schematized rivers/Floodplains/haors in JHS Project Model' in base condition

for providing design parameters of drainage structures (regulator/ causeway) considering post-monsoon drainage and filling haors after pre-monsoon. The proposed physical interventions are as follows:

Table: List of physical works to be implemented in the 29 Nos haor sub-projects.

Item of Physical Works	Total
Construction of new Submersible embankment (km)	282
Construction of new regulators (Nos.); (1.5 m × 1.8 m)	58 (130 vents)
Construction of new RCC pipe sluices (Nos.); 0.90 m dia.	48
Construction of Causeway; 3 m - 6 m wide (Nos.)	39
Construction of Irrigation Inlets (Nos.)	115
Rehabilitation of existing regulators (Nos.)	46 (116 vents)
Rehabilitation of existing SDO (Nos.)	28
Rehabilitation of existing Irrigation Inlets (Nos.)	242
Rehabilitation of existing submersible embankment (km)	173
Rehabilitation of existing full flood embankment (km)	78.4
Re excavation of peripheral rivers/khals (km)	160
Re excavation of internal khals (km)	389.4



Photographs of field visits and stakeholder consultation



Proposed intervention Map for Naopara Haor Sub-project

Data Collection and Updating of Regional Models

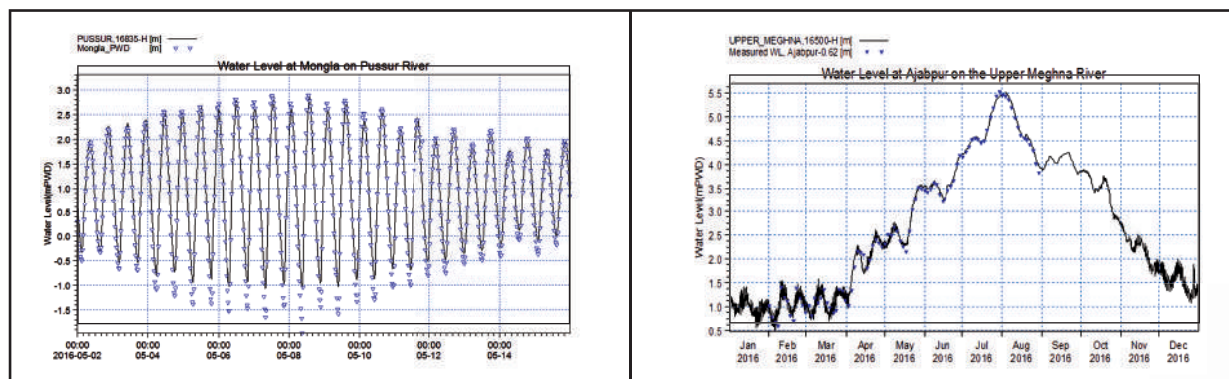
The general and six regional models comprise all the river systems of Bangladesh and the models are capable of generating data (water level, discharge & velocity) at any un-gauged locations. The results are also used for assessment of water resources of flood risk assessment using the facilities of GIS tools. Combining the regional models, the Supermodel is developed which is dedicated for flood forecasting services of Bangladesh. Moreover, the regional models provide the basis for planning of all important water sector projects of Bangladesh. The regional models are one-dimensional river model developed with MIKE 11 software of DHI, Denmark.

Regional Models are the main strength of IWM services which serve the backbone of client based project models. Considering the facts, it is important to update the Regional models with recent hydro-morphological data and information collected over the periods. The six regional models namely Northwest Region Model (NWRM), Northeast Region Model (NERM), North-central Region Model (NCRM), Southeast Region Model (SERM), Southwest Region Model (SWRM) and Eastern Hill Region Model (EHRM) cover the river system of the whole country. The General and six regional models were originally developed at IWM during the period 1986-93, except the model of eastern hilly region, which developed during 1994-95. Since the original development, the models have been regularly updated and validated with annual hydrological and recent topographic data. Earlier the model activities under the contract updates were carried out in connection with flood forecasting between BWDB and IWM. Later on, IWM authority approved to continue model updating utilizing internal resources. The study program of model validation for 2016 started on August 2017 and ended on September 2018.



Hydrological Regional Models

During the validation of 2016, hydro-meteorological data namely rainfall, evaporation, groundwater level, water level & discharge from secondary sources (BWDB & BIWTA) has been collected and utilized in the model after proper checking and processing. Around 4000 nos of river cross-sections has been updated in the models covering 6000km river reaches; 31 nos. rating curves have been updated utilizing recent data. Model performance have been evaluated of each region comparing simulated data with observed water level and discharge data. Probable causes of bad model performance have been identified for each region. It was decided to carryout comprehensive data collection program in each region during coming years. A comprehensive data collection program for SERM has been recommended to be carried out as priority. Gradually data collection for all other regions will be carried out. It can be expected that regular updating and validation of regional models will ensure quality support for data generation as well as assessment of different aspects related to water resources of Bangladesh.



Comparison of model simulated water level with observed data of Pussur river (left) and Upper Meghna river (right) (model simulated- black line, observed- dots)



ICT-GIS

Development of Upazila Land Suitability Assessment and Crop Zoning System of Bangladesh

Bangladesh Agricultural Research Council (BARC) has taken a research project entitled “Development of Upazila Land Suitability Assessment and Crop Zoning System of Bangladesh” where IWM is working as development partner for GIS based interactive web application for visualization of crop suitability map. The project is funded by Krishi Gobeshona Foundation(KGF).

The objective of the project is to provide crop suitability information to different stakeholders including farmers on the choice of rotation of their crops that ensures the increase of food production and maximizes the farmer's income. More specifically the project objectives are:

- Creating, updating and validation of land/crop suitability databases in order to derive appropriate farming practices for sustainable socio-economic condition.
- Development of an online GIS based software for cropland suitability assessment

The development of crop zoning system used Open Source Web GIS technologies where data for land type, edaphic, agro-climatic, socio-economic etc. are utilized.

The system also consists an agricultural portal which will facilitate an online solution to provide spatial and non-spatial information relevant to crop production.

The developed web GIS based application will facilitate location specific information on land type, soil group, soil properties, agro-climatic information, hydrologic, bio-physical, socio-economic information and thus provide crop suitability. This will help farmers, decision makers, planners and agriculture researchers to find most suitable crops for specific locations and periods.

Approach and Methodology

The development of crop suitability assessment application is based on the conceptual framework of crop suitability assessment. The conceptual framework is based on the multi-criteria analysis concept using different physical, climate, inundation and economic factors. The framework consists of different processes such as Land type updating, Edaphic suitability analysis, Agro-climate suitability analysis, Bio-Physical suitability, Hydrologic suitability, Economic indicators, and Overall economic suitability of cropping patterns.

The detail diagram of the land/crop suitability assessment framework is presented in the following Figure 1. The Web GIS based Crop Suitability software is being developed based on the framework to handle spatial variability of bio-physical properties and others and has applied the principles, suitability classification and land suitability ratings set out by the experts from BARC.

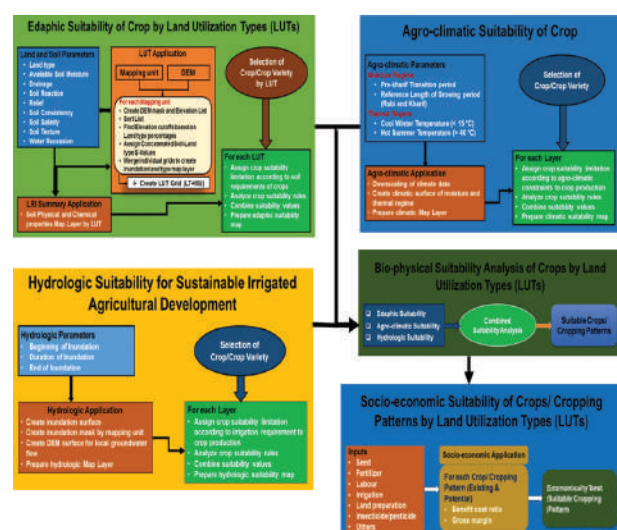


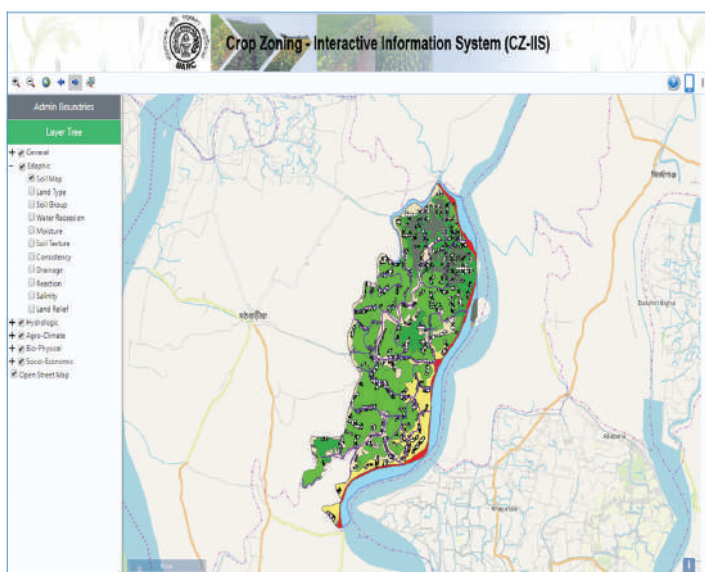
Diagram of Land/crop suitability assessment framework

Modules and Tools

The Web GIS based crop suitability assessment software is being developed with the following modules:

- (a) Land Type Updating
- (b) Edaphic Suitability Analysis
- (c) Agro-climate suitability analysis
- (d) Bio-Physical analysis
- (e) Benefit cost ratio (BCR) of individual crop/cropping pattern

In addition to the core functionalities the software will consist Search/Query, GIS Mapping, Data Entry, Data Export/Import, Metadata and Report Modules. A role-based user provision is available to interact with the software, and also a Login authentication page, a dashboard for accessing different menus and tools in the application are available.



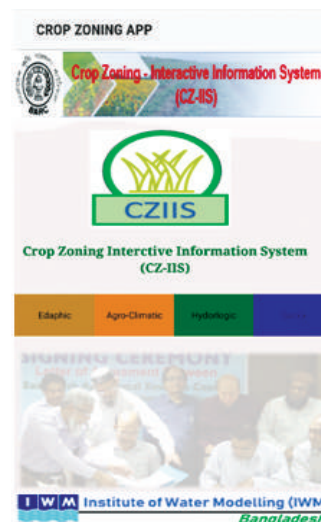
Sample Web Interface of Crop Suitability Assessment Software in Bamna Upazila

The application generates suitability maps and suitable cropping patterns on selection of Upazila, Crop, Season, Varieties interactively.

A sample web interface of the developed crop suitability assessment software is shown the following Figure 2.

Mobile Apps

With the expansion of high band-width internet, the use of smart-devices in project monitoring opened a new dimension towards the real-time visualization, faster data capture and communication, informed activities and providing information on near-real time for decision making. A Mobile Application Program is developed which operates in Android-based hand-held smart devices. Using this mobile app, user will be able to visualize the information on crops, suitable cropping pattern based on land, water, climate potential economic values. This mobile app has been developed with a view to the main stakeholders – the local level farmers who is providing their efforts to the agricultural products to the nation. The operations of this mobile app are very simple, a farmer could easily operate the app. The app could recognise the place that a farmer is standing on the cropping field and could provide the suitable crops for that particular land type. Also there would be provision to select most suitable crop based bio-physical suitability and economic suitability. Future and final version will be developed with Bangla interfaces



Use and Benefits of the product

The developed online Crop Zoning Interactive System (CZ-IIS) would facilitate broadly two groups. Agriculture officers will be able to identify and estimate the potential suitable cropping maps for each upzila and the potential production. And the farmers, they can use the mobile app to find the most productive and profitable crops for their lands. Ultimately, the government will have the tool to administer the agriculture sector for optimal production and to plan the fertilizer, electricity, pesticides etc at national level to Upazila level.

Irrigation Management



Study on Aquifer Mapping and Groundwater Resource Assessment for Management of Eco-friendly Sustainable Agricultural Development in Bangladesh

Bangladesh Agricultural Development Corporation (BADC) has undertaken a study on “Aquifer mapping and groundwater resource assessment for management of eco-friendly sustainable agricultural development in Bangladesh” which spreads over 25 districts in the two hydrological regions (NW and NC) of Bangladesh. IWM has been appointed as consultant with the main objective of developing aquifer maps with an assessment of groundwater resources for acceptable agricultural development of the study area using mathematical modelling techniques. An Interactive Information System (IIS) will also be developed for proper management and utilization of groundwater resources. Assessment and management of water resources can be done considering surface water and groundwater in isolation, but this isolated approach fails to address the integrated behavior of the land and water ecosystem, interaction between the surface water and groundwater within the water ecosystem as well as water environment. To ensure the integrated management of water resource, a physically based distributed mathematical modelling system would be more realistic and appropriate over the traditional analytical approach. Mathematical model enables better understanding of the river-aquifer interaction, as well as, providing a tool that can be used to manage the water resources in the best possible way considering the relative contribution of the components on the water balance in the area. The best option of future surface water and groundwater developments which will effectively utilize all available water resources with no or minimum of negative environmental impacts is possible to find out through the surface water groundwater interaction modelling technique and accordingly, integrated MIKE 11-MIKE SHE modelling system has been adopted in this study.



Map of the Project Area

To achieve the study objectives the following hydrogeological investigations will be performed:

- Exploratory drilling up to 200m to 240m depth at 100 locations
- Long term (3 days) aquifer tests at 75 locations
- Short term (1 day) aquifer tests at 50 locations
- Water quality sampling at 1500 locations

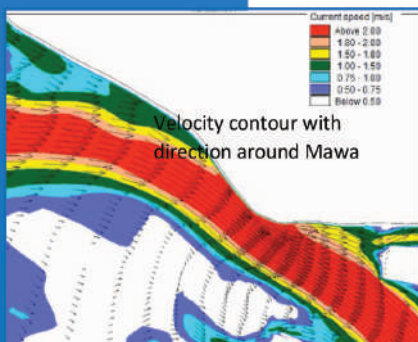
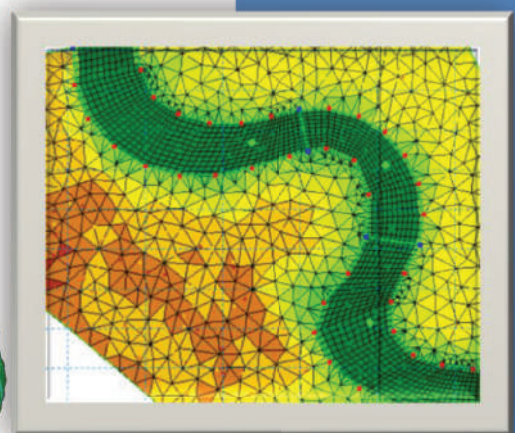
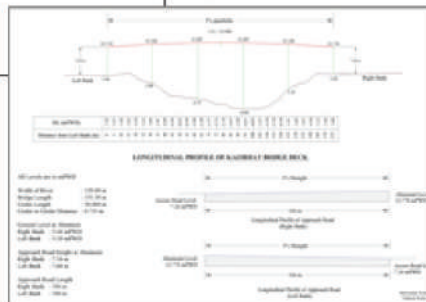
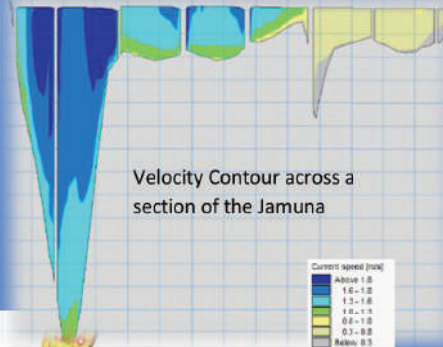
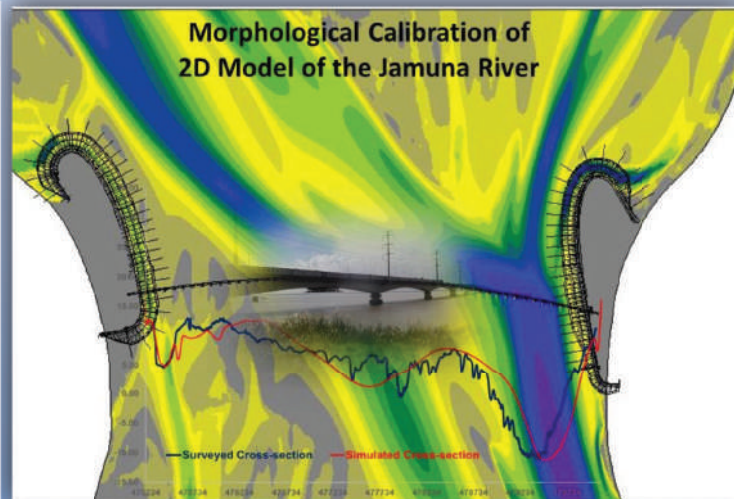
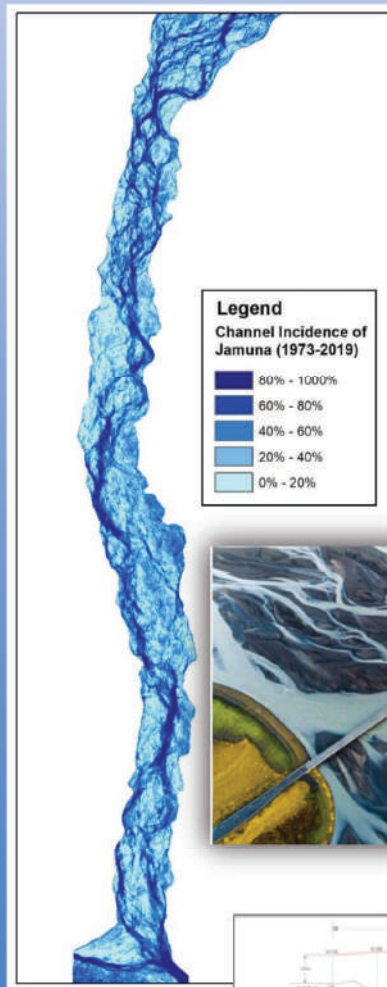
In the study Aquifer mapping includes preparation of aquifer GIS Data sets and development of maps considering quantity, quality and movement characteristics of ground water in aquifers. The modelling works include development, calibration and validation of surface water and groundwater interaction model for the study area to assess the surface water and groundwater resources. Interactive Information System (IIS) to be developed will be capable for visualization through GIS, graphs, charts and reports, data entry, modifications and data export, data storage and management tool.

The contract agreement between BADC and IWM has been signed on November 19, 2018. Immediately after signing the contract, IWM mobilized the study team to have a thorough understanding of the assignment, identify data availability and gaps, assess data requirement and devise study methodology and other activities for smooth completion of the study.



Contract Signing Between BADC and IWM at Sech Bhaban, BADC

River Engineering



Hydrological and Morphological Mathematical Modelling Study for Construction of Four Bridges of Eastern & Southern Region of Bangladesh

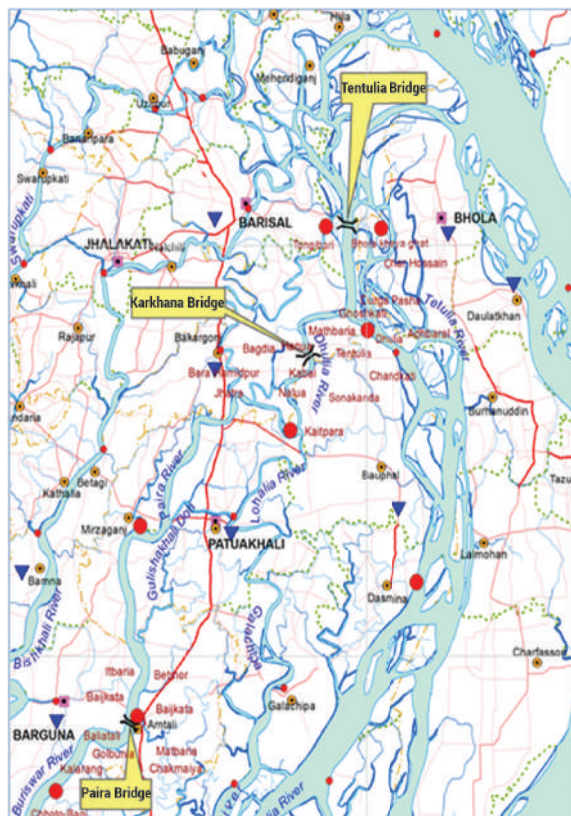
Bangladesh Bridge Authority (BBA) has taken steps to establish better connectivity of the south-western part of Bangladesh that is detached from northern and eastern part including the capital city until a massive bridge is built across the Padma River. In this line, BBA has taken an initiative to build four bridges in the eastern and south-western parts of Bangladesh.

The locations of the proposed bridges are at ferry crossings at (i) Patuakhali-Amtali-Barguna-Kakchira Road (R-880) over Paira River, (ii) Bakergonj - Bauphal Upazila Road (Z8806 & 8044) over Karkhana River, (iii) Bhulta -Araihazar-Bancharampur Road (R-203) over Meghna River, and (iv) to develop direct connectivity from main land to Bhola Island a Bridge will be constructed on Barishal-Bhola Road over Kalabador/Tentulia and Isha Rivers.



Location of Project Area .

The rivers, on which the bridges will be constructed, are large tidal streams, which hamper road communication considerably - particularly during flood season. Decision about construction of a bridge on a river is complex, and needs comprehensive review of the related aspects in a scientific manner.



Major Water Structure in Study Area .

Under the backdrop, BBA signed an agreement with a joint venture (JV) association, comprising Bangladeshi, Indian and UK firms, to conduct a feasibility study (FS) focusing on several aspects of the bridges. The JV association, comprising STUP Consultant Private Limited of India, Development Design Consultant Ltd., Dev Consultant Limited of Bangladesh and COWI UK Limited, is carrying out the feasibility study.

Institute of Water Modelling (IWM) was sub-contracted by the JV association to conduct numerical modelling of the rivers on which the four bridges would be constructed. The assignment basically included: investigation of the existing and probable hydro-morphological conditions of the rivers concerned so that safe hydraulic design of the bridges can be made. Analyzing recent and past data and mathematical models' outputs, design hydraulic

variables of these bridges and RTWs were provided to the FS Consultants. The design variables include: suitable alignment of the bridges from hydro-morphological viewpoint, probable maximum flows (which may pass through the rivers), high and low water levels, maximum possible scours, maximum velocity, maximum and minimum water depths, etc.

Detail Topographic Survey, Hydrological and Morphological Study using Mathematical Model for Proposed Rail Line Construction from Bhanga to Payra Port

The Government of Bangladesh is constructing a multipurpose bridge over the river Padma with a view to connecting Dhaka with south-west and southern part of the country. The Padma Multipurpose Bridge having provision of railway track will open a new horizon to expand railway network in the South and South-West region of the country. As a part of such expansion of communication networks, Bangladesh Railway (BR) has planned to construct Padma Bridge Railway Link (Dhaka-Mawa-Bhanga-Narail-Jashore). However, Barishal Division is not yet connected with railway network. Once the Padma Bridge Rail link is implemented, an opportunity will come forward to connect Barishal Division through the Padma railway link. Moreover, the Government has decided to construct first deep sea port of Bangladesh in Payra, at Kalapara Upazilla of Patuakhali district. Railway connectivity of the Payra Port is essential to make the port viable for transporting freight through this port.

Under the backdrop, Bangladesh Railway is going to extend its railway network by constructing the first rail track in the Barishal Division. In connection with the aforementioned developments, this rail track will be constructed starting from Bhanga (of Faridpur district) up to Kalapara (of Patuakhali district) near Payra Bandar. The tentative length of this rail line has been estimated as 190 km that would run through some low lying areas as well as crossing a number of small and large rivers of the South-West Region of Bangladesh. To assess the impact of this huge rail line construction work over the complex river system of the region, a hydro-morphological study comprising data collection and mathematical modelling is needed that would assist the feasibility study of the proposed project for finalizing the rail line alignment and other components of construction works. A Contract was signed between BR (Bangladesh Railway) and Institute of Water Modelling (IWM) on 11 March, 2018 to conduct the study.

The study area is situated in the South West region of Bangladesh. Selection of appropriate alignment of rail track as well as suitable bridge locations requires detailed investigation of the floodplain features (for rail track) and hydro-morphological characteristics of the rivers over which bridges have to be constructed. The hydrology of the study area is complicated as four types of climate factors influence its hydrology that are: cyclonic surge, tidal flow, monsoon flow and sea level rise due to global warming. Thus, investigation of the combined effect of these four factors are very important to determine the formation level of the proposed rail track and vertical clearances of the bridges.

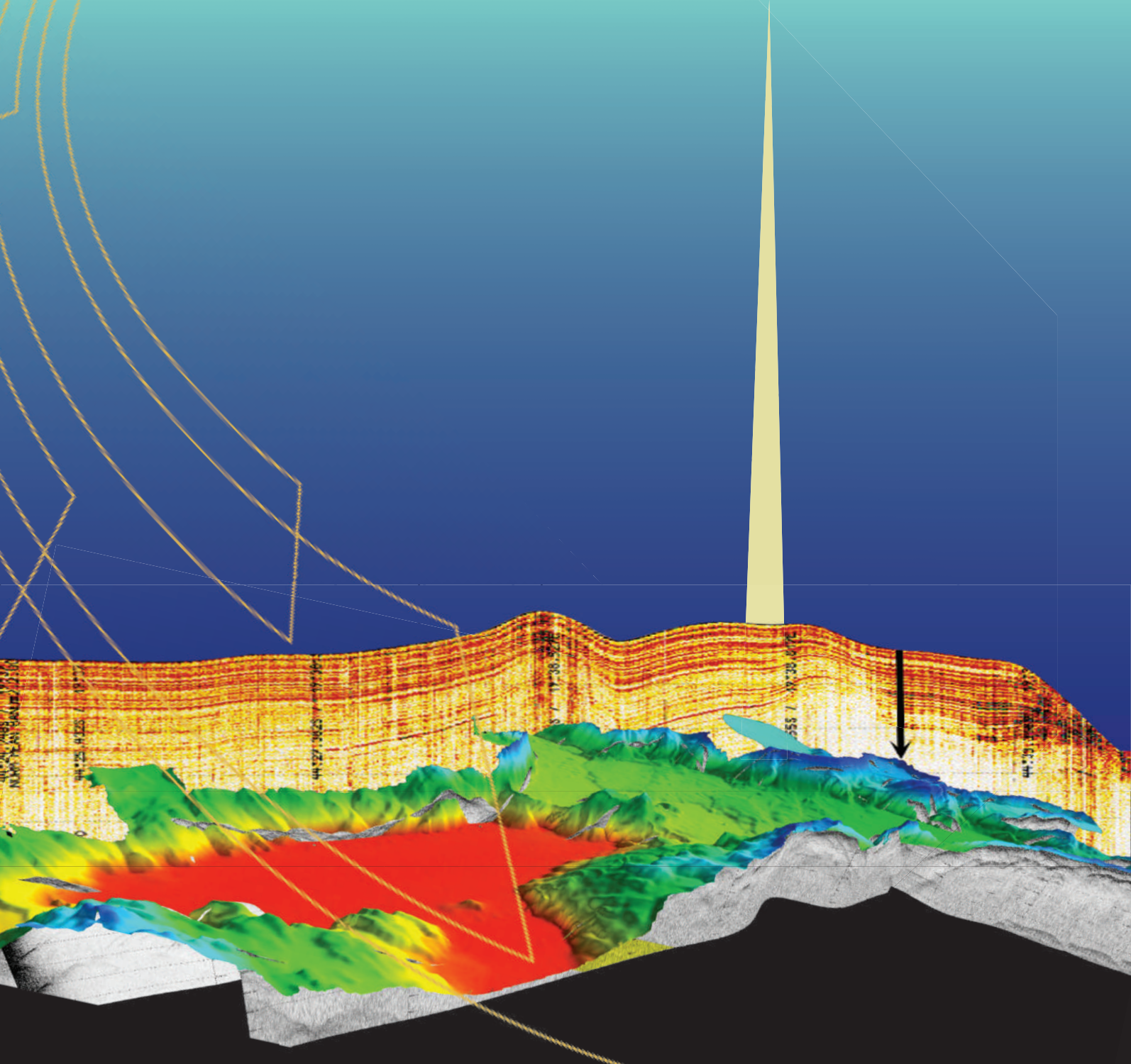
Implementation of the proposed rail track and bridges may cause adverse impacts on the floodplain flooding and drainage, and sedimentation and erosion in the rivers concerned. Mathematical morphological modelling is a proven technology to determine these hydraulic design parameters and the potential impacts of the rail track and bridges integrating all the hydrological and morphological conditions. The objectives of the study are to:

- Collect primary and secondary data required for the hydro-morphological study.
- Identify alternative alignments for the proposed rail line (in concurrence with the feasibility study consultant).
- Determine the design parameters of the proposed rail line, cross-drainage structures and bridges, using mathematical model, after finalization of the rail line alignment.



Proposed Railline Network

Survey & Data Management



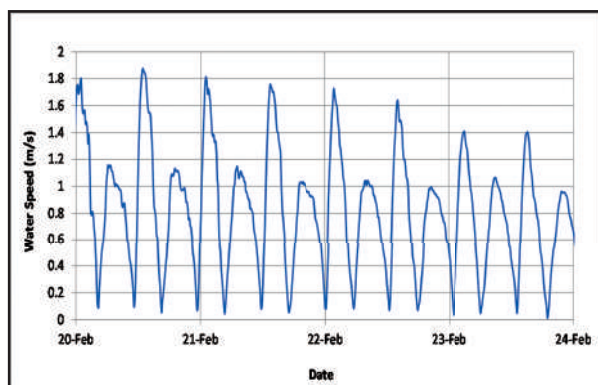
Met Ocean Data Collection for Feasibility Study for New Port on the Sandwip Channel at Sitakunda, Chattogram

Government of Bangladesh has planned to construct an Economic Zone in the Feni-Mirasarai area, some 60-80 km north of Chattogram. In order to improve the supply chain efficiency for production, distribution and trade it is considered important that a Port/Terminal is established with adequate port facilities near the Economic Zone. The proposed location of this new Sitakunda Port is in the Sandwip Channel, in and around Sitakunda Upazila near Mirasarai, and opposite of the Sandwip Island.

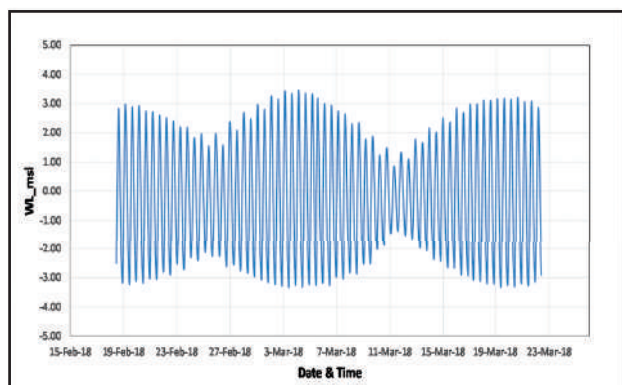
Institute of Water Modelling (IWM) was engaged to collect data to support the Main Consultant for conducting Techno-Economic Feasibility Study of the proposed Port. The study area is morphologically very dynamic with high tidal range that exceeds 6m during spring tide, strong current and very high sediment concentration. A comprehensive data collection program was carried out to collect bathymetry, topography, sediment concentration, water level, current and wave data of the Sandwip Channel. The data collection campaign was performed in Feb-Apr 2018. Major Instruments deployed for the work are RD Instruments Workhorse Sentinel, Sentinel V50 & Sentinel V20ADCP, Teledyne Odom CV100, CV200 and Hydrotrac Echo Sounder, Trimble SPS855 RTK-GPS and Valeport CTD Monitor. The survey team successfully completed a large amount of data collection which has been used by the Consultant to establish the baseline hydrodynamic and morphological condition, identify erosion vulnerable area and for design work. These data has also been used to develop and update the existing Bay of Bengal, Storm surge model, wave model and for model calibration.



Map showing location of different types of data collection



Observed Water Speed in the Sandwip Channel near proposed port area



Observed Water Level in the Sandwip Channel near proposed port area

BLCS
INSTITUTE & HOSPITAL

Water Resources Planning

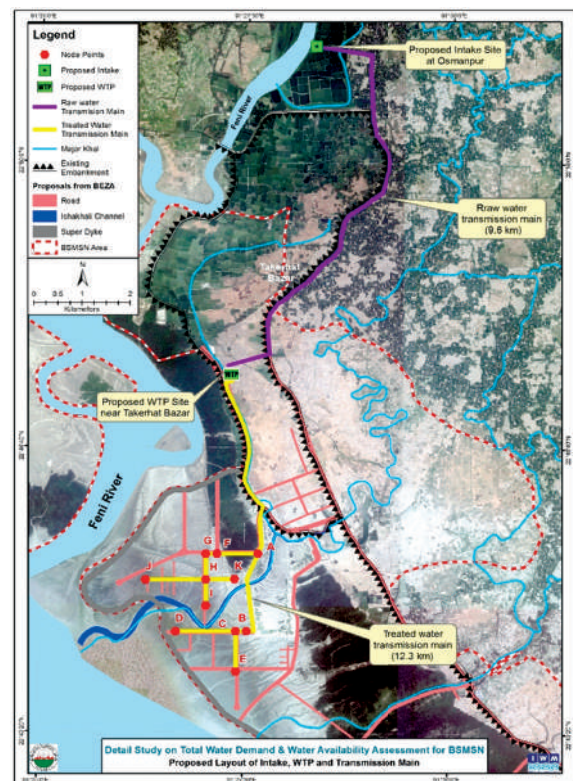


Detail Study on Total Water Demand & Water Availability Assessment for Bangabandhu Sheikh Mujib Shilpa Nagar (BSMSN)

Bangladesh Economic Zones Authority (BEZA) aims to establish economic zones in all potential areas in Bangladesh including backward and under developed regions with a view to encourage rapid economic development through increase and diversification of industry, employment, production and export. Proposed Bangabandhu Sheikh Mujib Shilpa Nagar (BSMSN) will be the first multi sectoral economic zone comprising an area of around 30,000 acres, located in Mirsarai Upazilla of Chattogram district and Sonagazi Upazilla of Feni district. The zone area is very potential due to its strategic location as it is very close to the Dhaka-Chattogram highway and nearby railway station.

BEZA engage IWM to prepare a Water Supply Master Plan to fulfill water demand for BSMSN requirement in the context with water availability and demand. The study will provide the following outputs:

- Resources assessment of surface water (fresh and marine water) and groundwater;
- Water demand estimation of the economic zone;
- Identified of suitable water source for multipurpose usage;
- Water zoning and phasing plans ;
- Water Management Plan (WMP);
- Outline design of treatment plant including transmission and distribution main;
- Preparation of BOQ and cost estimation;
- Tender documents Preparation.



Map of Project Area

Water is a very important component to run the industries and meet other domestic and non-domestic requirement. About 17,000 acre area is planned to be allocated for light and heavy industries. Other areas will be developed as residential, institutional, logistics and service, transportation and communication purposes. For the entire economic zone about 1,000 MLD water is necessary after fully development in 2040.

Feni closure and regulator constructed on Feni River create significant storage provision upstream of closure in dry season for irrigation practice. The gates are kept opened during other months. This storage water is potential for water supply in the economic zone after proper treatment. It is planned to supply 100 MLD water in two phases (50MLD+50MLD) in the economic zone. Another prospective surface water source is Halda River in Chittogram. It is planned to construct a SWTP with capacity of 90MLD and supply to the southern part of the zone area. Little Feni river is another potential water source which need to be analyzed for quantification.

The BSMSN area is very close to the Bay of Bengal. The shallow aquifer of the zone area is saline and so not potable. For hydrogeological investigation of the deep aquifer construction of test tube well, geophysical logging, long term aquifer test and vertical electrical sounding (VES) has been instigated. The hydrogeological investigation quantifies that about 170 MLD can be safely withdraw from the intact economic zone area. Water quality analysis indicate the water quality is good enough and no treatment is necessary before supply.

After fully development more water will be required. Large scale desalination plant will be necessary to provide water for industrial and other purposes though the production cost is very high.

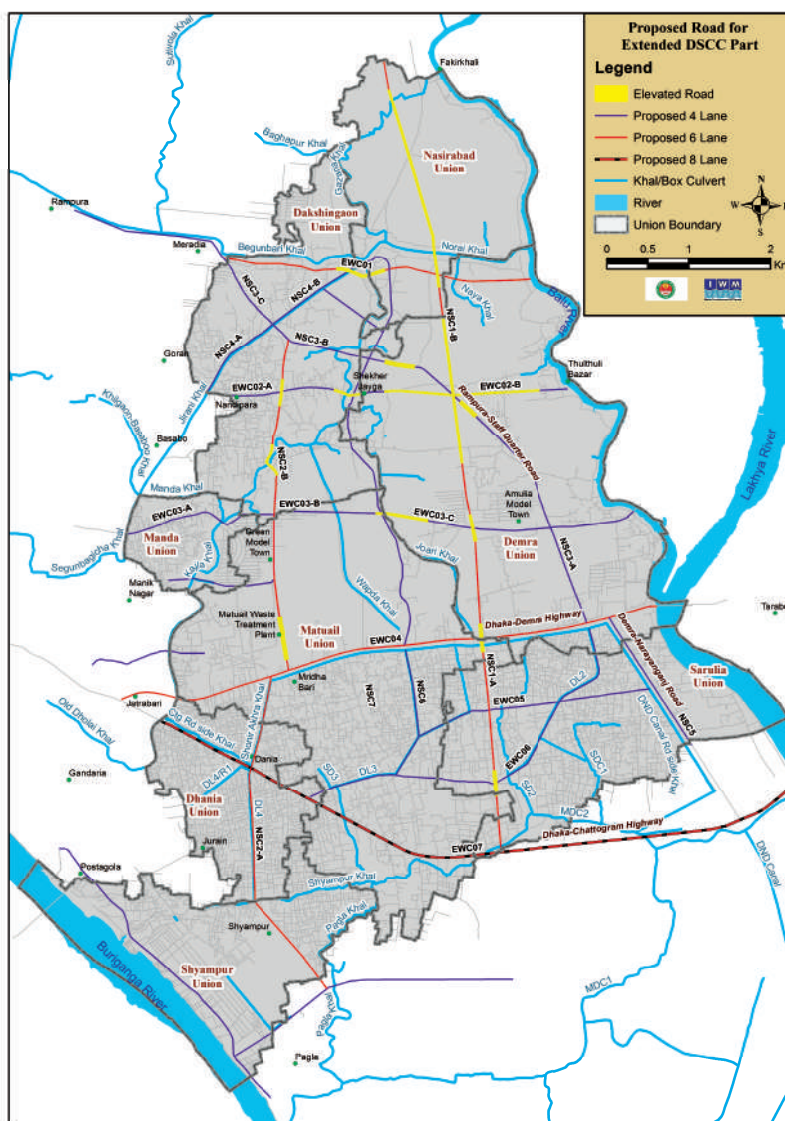
IWM has been entrusted to carry out the above analysis, provide design of water treatment plant and related other structures, and water management plant. The study has been commence in January 2018 and expected to end by September 2019.

Preparation of Master Plans and Feasibility Studies for Dhaka South City Corporation (DSSC)

The Dhaka North and Dhaka South Corporation came into being after the Dhaka City corporation area was dissolved by the Local Government (City Corporation) Amendment Bill 2011 on 29 November 2011. In May 2016, 16 unions in the eastern border were included with the older boundary. As a result, unions namely Dania, Shyampur, Sarulia, Dakshingaon, Manda and part of Demra Union became part of Dhaka South City Corporation (DSSC), which increased the South City area from 45 sq.km to 109.17 sq. km. The area of newly included area of eight union is about 64.17 sq. km. Institute of Water Modelling (IWM) has been awarded a contract, signed on 31 May 2018 for the preparation of Master Plan including the followings:

- i) Development of road and drainage improvement Plan;
- ii) Local Area development plan
- iii) Solid waste management plan;
- iv) Water bodies improvement plan;
- v) Disaster management plan
- vi) Land acquisition plan.

For the purpose of planning the study area has been divided into 19 blocks. Two new proposed North-South and three East-West corridor road and a numerous collector road forms the basic arterial road network integrating the Strategic Transport plan (RSTP, 2016), Dhaka Structure Plan, 2016. Conceptually the south of Dhaka Demra road remains a flood control cum pump drainage area and the area North of Dhaka – Demra road will be developed conceptually as 'Building with nature' protecting and developing the remaining water bodies, integrating khal and river as a part of overall multi-model transportation network consistent with the principle of recently revised Detailed Area Plan (RDAP). A good number of intersections and water body crossing infrastructures have been proposed to keep flood flow, navigation and traffic mobility uninterrupted. Area plan would allow keeping the ecologically functional wetlands undisturbed. The study proposes a new road cum drain integrating the utility duct with the road to ease operation and maintenance of urban utilities. A project with priority roads and drains is under preparation.



Map Showing Proposed and Existing Road Network for Extended Part of DSSC

Journey of Climate Change Cell in IWM

IWM has been working with climate projections and scenarios for different projects in collaboration with BUET, DOE, BWDB, World Bank and other government and international organizations. Government of Bangladesh envisages climate change scenarios in all its planning and implementation of investment projects in “Bangladesh Delta Plan 2100”. Considering the above issues and as per decision of the 84th meeting of IWM board of Trustees, IWM has recently established a Climate Change Cell with a view to conduct (i) Basic research in the field of Climate Change (ii) Climate Change impact assessment, (iii) Training and capacity building, (iv) Awareness building, (v) Developing local level Climate Change model and provide support to develop Climate Change services in line with Bangladesh situation (vi) multi-level collaboration with partners, research institutes, stakeholders and donor organizations. (vii) Formulation of adaptation & mitigation Techniques. The vision of the Climate Change Cell is to enable better risk management of climate variability & formulating adaptation and mitigation options of climate change, through development and incorporation of science-based climate information and prediction into planning, policy and practices on the global, regional and national scale.

The cell has started its journey with a team of young researchers under the head Mr. Md. Tarikul Islam who has a professional experience of about 21 years in the field of water and environmental engineering, focusing model development and application of different scenarios. The team of the cell will work having the mission of finding new and innovative challenges in Climate Change sector.



Professionals of CCC, IWM and other workshop attendees from different organizations at ICIMOD, Kathmandu, Nepal

Recently Climate Change Cell have attended the “Regional Workshop on Future Climate Projections and their Applications in South Asia” in ICIMOD, Kathmandu, Nepal, organized by Asia Regional Resilience to a Changing Climate (ARRCC) Programme of The Met Office Partnership (MOP), UK. The workshop emphasized on the need of regional collaboration in new and innovative knowledge development in climate change and related issues.

Training & Capacity Development



JAN	FEB	MAR	APR	MAY	JUN
<p>Training on CompTia A+</p> <p>Training on "GeoDASH: Overview, Configuration & Administration"</p> <p>Training on Remote Sensing</p>	<p>Training course on 'Oceanography: Principles and Applications'</p> <p>Workshop on State-of-the-Art Hydrometric Data Acquisition and Transmission Networks: Measurement and Modelling</p> <p>Training on Seven fifth year plan and Sustainable development goal (SDG) implementation</p>	<p>Training on "Hand-on-training on Delft 3D Flow flexible Mesh"</p> <p>Workshop on SMS & 2D Hydraulic (SRH-2D) Modelling</p> <p>CSIRO/ ACIAR workshop/ Australia Awards South and West Asia Program</p> <p>Internship of the Students of WRE, BUET</p> <p>Cyber Security Awareness Workshop</p> <p>Training on Basic ArcGIS (Partially Earning based)</p> <p>Training on 2-D Morphology</p>	<p>Training on Gomoti River for BWDB professionals</p> <p>Training program on "River and Delta Morphology: Evolution, Dynamics and Prediction"</p> <p>Monitoring of Hydraulic & Morphological conditions of Jamuna River for the safety of River Training Works of the Bangabandhu Bridge during the year 2013-2017</p> <p>Training workshop on 'Use of satellite data for Ground Water monitoring'</p> <p>Training workshop on 'Use of satellite data for Ground Water monitoring'</p>	<p>Internal Divisional Training</p>	<p>Internal Divisional Training</p>

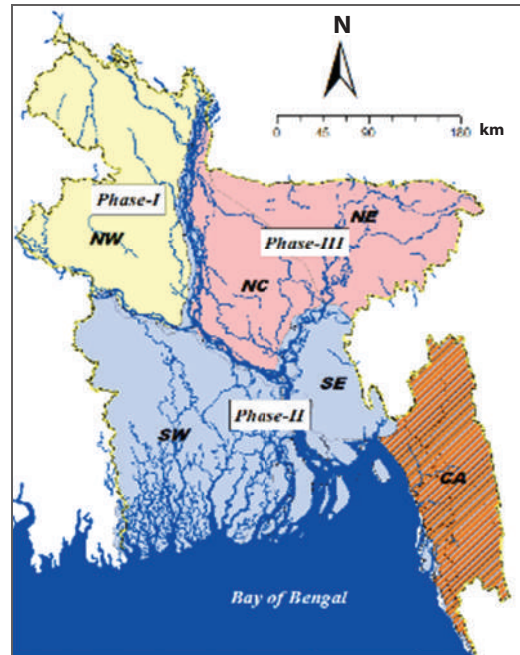


JUL	AUG	SEP	OCT	NOV	DEC
<p>Management User Training on Automation of IWM Management and Financial System</p> <p>Training on "Urban Rainwater Harvesting System"</p>	<p>Professional Training Program on Environmental Impact Assessment (EIA): a Primer</p>	<p>Training on 2-D Modelling/ Storm Surge Modelling</p>	<p>Training on Drainage Modelling</p> <p>Internship of the Students of WRE, BUET</p> <p>Teledyne Marine Technology Workshop</p>	<p>Training course on "IWRM, Water Security and Climate Change for Developing Economies"</p> <p>Training on CTCN TA for Saline Water Purification Technology at Household level and Low-cost Durable Housing Technology for Coastal Areas of Bangladesh</p>	<p>Training on Basic ArcGIS for BEPZA (Earning based)</p> <p>Training on Preparation of Monitoring and Evaluation Plan for Ongoing and Completed Project in Bangladesh</p>

IWM Research & Development

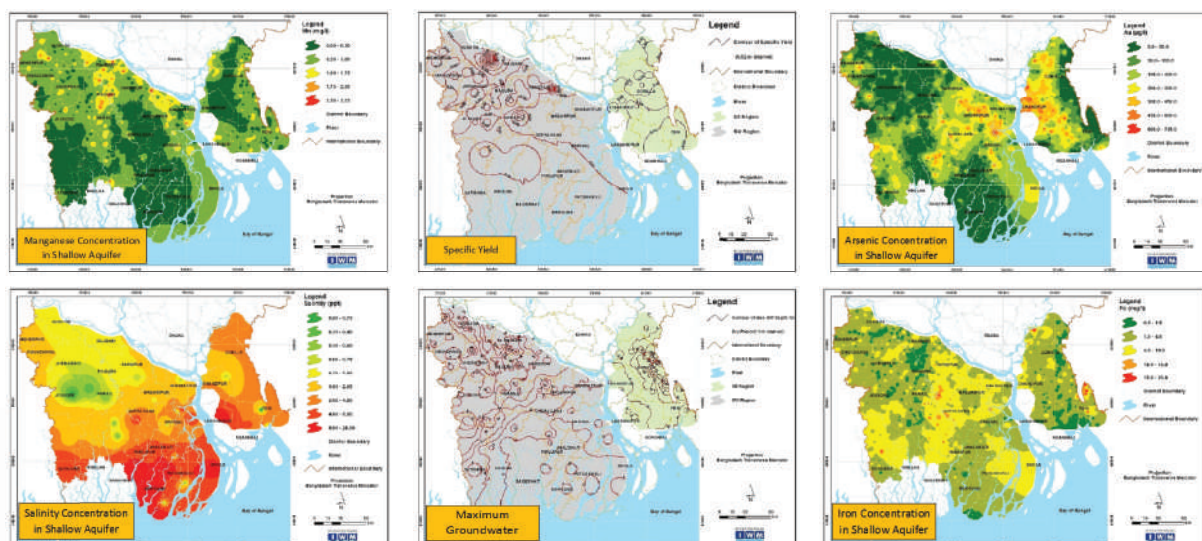
Determination of Hydro-geological Parameters for Different Regions of Bangladesh: Phase-II: South East & South West Region

Groundwater is the most essential input for drinking purpose, increasing crop production as well as for the sustainable agricultural development in the SE and SW regions of groundwater irrigation has probably been the most dramatic development in Bangladesh agriculture during the past 25 years. Groundwater will be the most important water resource to help attain the Millennium Development Goals of basic water access for the poor people as well as securing water for expanding agricultural and industrial production. Recognizing the important role that groundwater will play in the future to support rural economies within Bangladesh, its availability in terms of quantity and quality must be ensured. The seasonal variation of availability of water, along with the competing demands of water for the water supply and sanitation, agriculture, industry, fisheries and wildlife, navigation, hydropower and recreation as well as the environment and the preservation of water bodies has made the water management and planning a very challenging task.



The main objective of the R&D project is to assess hydro-geological parameters and groundwater quality for The South-East (SE) & South-West (SW) regions of Bangladesh for efficient planning and management of groundwater resources. The study will provide support to the planners and decision makers for groundwater development of the country. The main component of this study is to assess lateral and vertical extent of main aquifer and its hydro-geological parameters for efficient planning and management of groundwater resources. The agencies are mainly responsible for collection of hydro-geological data in Bangladesh are BWDB, BADC, DPHE, WASA and BMDA. Looking at the national importance of this project, this study has been carried out in collaboration with BWDB, WARPO and DPHE who have plenty of hydro-geological data, information and knowledge. They have contributed with data and resource personnel for establishing the hydro-geological parameters.

In addition to estimation of the hydro-geological parameters, analysis of groundwater level and water quality data have also been performed for assessment of suitability of groundwater resources. The other major component of this study is to develop a database interface and analytical tools for improved data management, precise analysis and effective dissemination of data.



IWM International Participations



Prof. Dr. M. Monowar Hossain, Executive Director, IWM attended a dialogue at Shanghai Institutes for International Studies (SIIS) China with Dr. Anamika Barua, IIT, Guwahati, India Prof. Dr. Yan Feng and Dr. Wenling Wang, Yunan University in September 2018.



Prof. Dr. M. Monowar Hossain, Executive Director, IWM participated in the International Conference on Water and Wastewater Management & Modelling at Central University of Jharkhand, Ranchi, India in January 2018. Prof. Monowar chaired a Session in the Conference and Presented the Keynote Paper.



IWM is supporting Bihar Govt. (India) in establishing a Mathematical Modelling Center for the Water Resources Research Department with the assistance of WB. The inauguration of MMC was attended by Chief Minister of Bihar & IWM Professionals.

IWM Participates in Australia Awards Program

Strengthening Water Security and Cooperation in South Asia: Integrated Water Resources Management course is a component of the **Australia Awards South and West Asia Program**. This activity has been developed to enable participants to further develop their skills and knowledge in the areas of **Transboundary Water Resources Management**.



Participants from IWM, Bangladesh and six other Countries in Australia Awards South and West Asia Program

In 2018, Mr. M. Samiun Nabi of IWM got selected in the program from Bangladesh along with four other participants of MOWR, BWDB, JRC and Planning Commission. A total of 26 water professionals from seven countries, namely Bangladesh, Bhutan, India, Kazakhstan, Nepal, Pakistan & Tajikistan participated in the program.

The purpose of the course was to make the participants aware of the key principles & best practices in integrated water resources management, as applied to transboundary water cooperation in: food and water security; ecological and environmental sustainability, key elements of international and regional treaties / agreements, governing water cooperation and the High-Level Panel on Water and its water action agenda for contributing to Sustainable Development Goal (SDG)6.

The course was conducted by a range of water governance and Integrated Water Management Experts across Australia to provide a positive learning experience for participants and to provide a network they can work with in their future endeavors. There were four case studies of varying complexity and contestation: Murray-Darling Basin, Mekong River Basin, Jordan River Basin & Danube River Basin.

Systems Thinking tools and models were used to help participants make sense of complex multi-level governance structures, and explore the cross-cutting issues of gender, social inclusion, and climate change. Hosted by the **Queensland University of Technology (QUT) in Brisbane**, participants also visited Canberra & Adelaide to meet & learn from representatives of the **Murray-Darling Basin Authority, CSIRO** etc. to discuss national governance and integrated water management to achieve multiple objectives. Few field trips were made to the **Murrumbidgee River** to examine irrigation and the water management, the **Coorong Wetlands** and RAMSAR sites at the mouth of the **Murray River** to discuss the governance and management issues associated with being at the end of the river, with representatives from the Department of Environment, Water and Natural Resources of Australia, etc. This course helped the participants to understand the policy instruments, institutional arrangements and models of cooperation that enable cross-border water-related cooperation in a South Asian context.



Presentation of course work at QUT

IWM Major Events

Honourable Chairperson, IWM BOT & Secretary, MOWR visits IWM



Prof. Dr. M. Monowar Hossain Welcomed Honourable Chairperson of Board of Trustees, IWM

IWM Participates in Bangladesh Unnayan Mela 2018



Honorable Secretary (MOWR) Visits Stalls of Unnayan Mela 2018

IWM Organized UDW Workshop Jointly with NWO



Urban Deltas of the World (UDW) Workshop Arranged Jointly by IWM & NWO

Netherlands Organisation for Scientific Research and Institute of Water Modeling jointly organized a workshop on **Linking Urbanising Deltas of the World research, innovation and implementation in delta management**. H.E. Leoni Margaretha Cuelenaere, Ambassador, Embassy of the Kingdom of the Netherlands to Bangladesh as present in the workshop as Special Guest. Prof. Isa Baud, Chair of the UDW Steering Committee gave an introduction on Urbanizing Deltas of the World and Prof. Dr. Shamsul Alam, Member (GED), Planning Commission and Senior Secretary delivered a concept note on Bangladesh Delta Plan (BDP) 2100. Prof. Jaap De Heer delivered a presentation. The program was Chaired by Dr. M. Monowar Hossain, Executive Director, IWM.

The UDW research and innovation programme and the BDP 2100 will be drawn on as an entry points, to enhance the possibilities of UDW to meaningfully contribute to policy and practice. Eminent experts on delta management like Prof. Dr. Ainun Nishat, Dr. A. Atiq Rahman, Dr. Saleemul Huq participated in this workshop. Mr. Peter de Vries, Ms. Swarna Kazi and other dignitaries also attended the program.

IWM organized National Stakeholder Consultation Workshop for Cox's Bazaar Airport Extension Project of CAAB



IWM Representative Presented Paper in Teledyne Marine Technology Workshop in France



Mr. Mahbub Alam, Associate Specialist, SDT of IWM Presented a paper at Teledyne Marine Technology Workshop in France, 2018

IWM Major Seminars & Contract Signing



Contract Signing Ceremony of Feasibility Study for Water Distribution System Development in DNCC & DSCC under interim Water Supply Project of DWASA



Contract Signing Ceremony of Water Management Knowledge and Innovation Programme (WMKIP) with DELTARES supported by the Embassy of the Kingdom of the Netherlands (EKN)



Contract Signing Ceremony of Rail Line Construction from Bhanga to Payra Port for Bangladesh Railway



Contract Signing Ceremony With BTRC



Contract Signing Ceremony With BEZA



Memorandum of Understanding signing between ISABELA FOUNDATION & IWM



Contract Signing between Payra Port Authority (PPA) and Institute of Water Modelling (IWM)



Contract Signing Ceremony of WB funded Long term Monitoring, Research & Analysis of Bangladesh Coastal Zone of BWDB



Executive Director, IWM visited Flood affected Project Area of Haor Region with Director General and other senior officials of DBHWD



Executive Director Observing Bathymetric Survey using Multibeam Echosounder at Kutubdia Channel, November, 2018



Prof. Dr. M. Monowar Hossain, Executive Director, IWM, Signs agreement of Joint Cooperation Programme (JCP). JCP is a four years Programme which will be implemented by IWM, CEGIS, Wageningen University & Research (WUR) and Deltares. Mr. Harry Verweij, Ambassador of the Kingdom of the Netherlands, Mr. Peter de Vries, Thematic Water Management Expert, Embassy the Kingdom of the Netherlands, Mr. Rokun ud-Doula, Additional Secretary, Ministry of Water Resources and Engr. Md. Wajidullah, Executive Director, CEGIS also were present in the signing ceremony.



MoU Signing Ceremony with Korea Institute of Civil Engineering & Building Technology (KICT) & IWM in November, 2018



Mr. Xue Songgui, Deputy Director, Yellow River Conservancy Commission China & Prof. Yin Dewen, Director General, Yellow River Engineering Consulting Co. Ltd., China, Visited IWM to discuss future collaboration, 2018

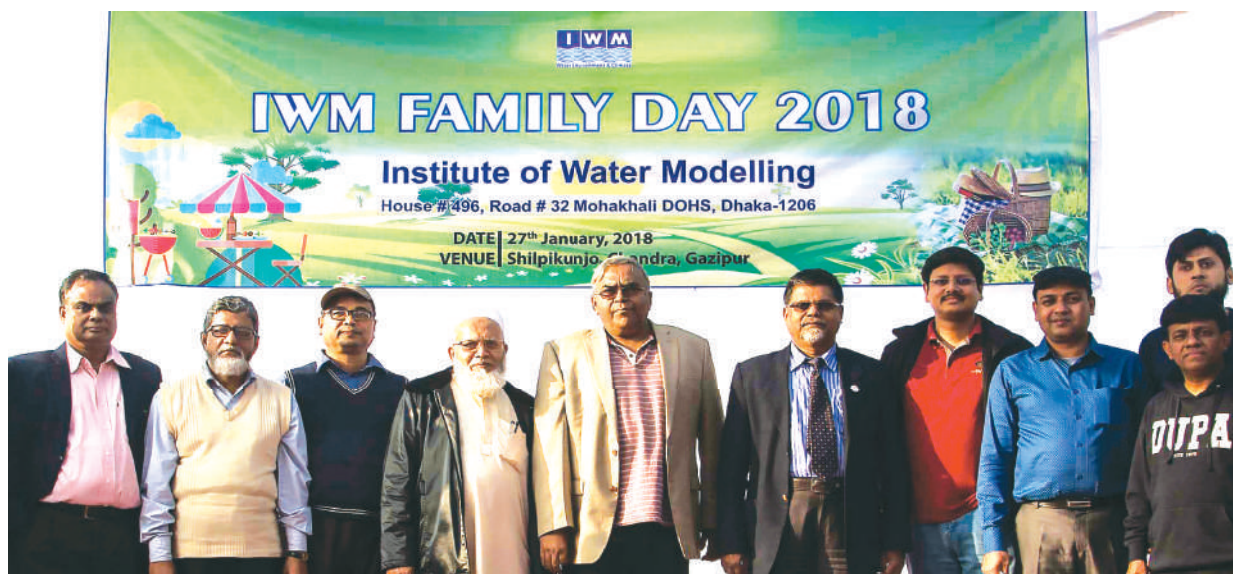


DeltaCap- External Advisory Board (EAB) Members Meeting At CIRDAP International Conference Center, December, 2018



IWM Observes National Mourning Day 15 August 2018

IWM Cultural Event & Sports



Training and Capacity Building

IWM Provides Training on following Technologies



OUR STRATEGIC PARTNERS



ANNUAL REPORT 2018



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