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INSIDE THIS ISSUE:



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WARPO
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NEWSLETTER

# National Workshop on Industrial Water Use Policy (Draft) Held

A national workshop on 'Industrial Water Use Policy (Draft)' jointly organized by Water Resources Planning Organization (WARPO) and 2030 Water Resources Group, World Bank was held on 15 May, 2024 at Multipurpose Conference Hall of Pani Bhaban, Dhaka. Mr. Zaheed Farooque, MP, Hon'ble Minister of State, Ministry of Water Resources was present as the chief guest. The workshop was presided over by Mr. Nazmul Ahsan, Secretary; Ministry of Water Resources and Mr. Md. Rezaul Maksud Jahedi, Director General, WARPO presented the keynote statement. Mr. Michael John Webster, Program Manager, WRG-2030, World Bank was present as the guest of honor in the workshop. Mr. Mohammad Alamgir, Principal Scientific Officer, WARPO provided the detail presentation on the Draft Industrial Water Use Policy in the workshop. About 125 participants from ministries, departments, academia, NGO, industrial associations, civil society participated in the workshop and raised their valuable comments. Mr. Zaheed Farooque, MP, Hon'ble Minister of State, Ministry of Water Resources and chief guest of the workshop, appraised WARPO for taking outstanding initiatives to prepare the Industrial Water Use Policy in the right time. He stated that the purpose of the policy is to ensure water-secured industrialization, poverty mitigation, water, food and public health security, protection of the natural environment and continued advancement in achieving the national economic development vision. He also uttered that by combined efforts from the Ministry of Water Resources, other ministries, departments, public and private institutions, development partners and academia, significant outcomes can be achieved to improve the draft policy, which will lead to unprecedented success in the implementation of Smart Bangladesh as declared by the Hon'ble Prime Minister.


*Hon'ble Minister of State, MoWR Mr. Zaheed Farooque MP graced the National Workshop on Industrial Water Use Policy as the Chief Guest held at Pani Bhaban, Dhaka on 15th May, 2024.*

The chairperson of the workshop, Mr. Nazmul Ahsan, Secretary; Ministry of Water Resources mentioned that conservation of water resources; conjunctive uses of water; protection of aquifers; Managed Aquifer Recharge; adoption of Polluter Pay Principles etc needs due attention for timely implementation. About Seven professionals including ministry, department and academia participated as expert panelist and expressed their valuable comments and suggestions. After inclusion of the comments and suggestions from different stakeholders, the draft policy will be finalized and sent to cabinet division for approval. It is hoped that by implementing the policy, water secured sustainable industrial growth could be achieved and Bangladesh will be a prosperous developed country by 2041.

# The 18th Board of Governors (BoG) Meetings of the Water Resources Planning Organization (WARPO) Held

The 18th WARPO Board of Governors (BoG) meeting was held on 17 September 2023 at the WARPO conference room. The meeting was chaired by Mr. Zaheed Farooque, MP, Hon'ble Minister of State, Ministry of Water Resources. Mr. AKM Enamul Hoque Shameem, MP, Deputy Minister, Ministry of Water Resources; Mr. AKM Fazlul Haque, Member (Secretary) and Vice-Chairman of the BoG; Mr. Nazmul Ahsan, Secretary, Ministry of Water Resources and all members of the BoG attended in the meeting.

At the beginning of the meeting, Mr. Zaheed Farooque, MP, Hon'ble Minister of State, MoWR, and Chairperson of the WARPO BoG, started his speech by remembering the memories of the Father of the Nation Bangabandhu Sheikh Mujibur Rahman and his family members and all the brave, die-hard freedom fighters who were martyred on the black-night of August 15 and attempted to brutal genocide during the war of liberation with deep respect.

*Hon'ble Minister of State, MoWR Mr. Zaheed Farooque MP graced the 18th BoG Meeting of WARPO as the Chair Person held at WARPO Conference Room on 17th September, 2023.*

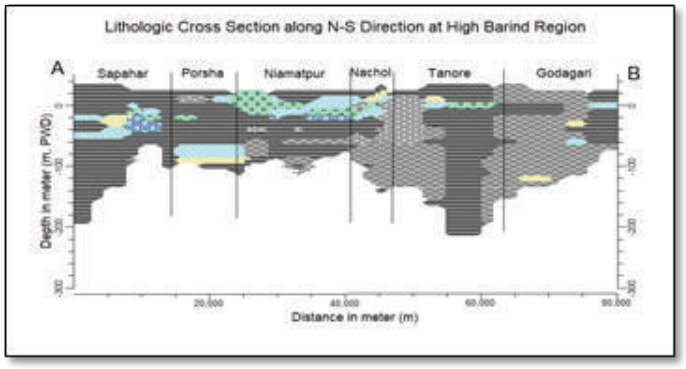
After a brief introduction by the members and a welcome speech by the Chairperson, Director General, WARPO, Mr. Md. Rezaul Maksud Jahedi made a detailed presentation as per the scheduled agenda. In the presentation, DG, WARPO, clearly addressed all the time-bound agenda of the 18th BoG meeting including the achievement of the last 17th BoG meeting decisions. He also affirmed the BoG about the commitment and dedication of WARPO to continue as a Center of Excellence in the water sector. After the presentation, all the BoG members appreciated the in-valued activities performed by WARPO and joined in enthusiastic constructive discussion. The meeting ended with the following major decisions:

(a) The Board of Governors agreed to recommend the proposed draft "Department of Water Resources Act, 2023" to transform the Water Resources Planning Organization (WARPO) into "Department of Water Resources" and directed to take necessary initiatives in this regard.
(b) Dissemination workshops on Bangladesh Water Act, 2013 and Bangladesh Water Rules, 2018 should be continued & expedited in remaining Divisions/ Districts as well as Upazila and Union level simultaneously.
(c) Before undertaking any development projects under water sector, all concerned agencies/institutions must take necessary Clearance/NOC from WARPO.
(d) The results and recommendations of the WARPO completed project titled "Implementation of Integrated Water Resources Management in Compliance with Bangladesh Water Rules 2018" should be disseminated to all concerned stakeholders.
(e) Draft "Industrial and Commercial Water Pricing Policy" need to be finalized based on the opinions of the beneficiaries/stakeholders.
(f) Initiatives need to be taken to include the Bangladesh Water Act, 2013 in the Mobile Courts Act, 2009.

The Hon'ble Minister and all the board members highly appreciated the innovative intellectual services performed by WARPO as a center of excellence for the well-being of the nation and expected to create a tuned roadmap of progress and growth for the future.

# Assessment of Water Stress Area under the Project of "Operationalizing Integrated Water Resources Management (IWRM) in Compliance with the Bangladesh Water Rules, 2018"

Recently WARPO has conducted a study project titled "Operationalizing Integrated Water Resources Management (IWRM) in Compliance with the Bangladesh Water Rules, 2018" to perform baseline study for identifying the state of surface and groundwater resources up to Union level of Rajshahi, Naogaon and Chapainawabganj Districts. It aims to put the Bangladesh Water Rules, 2018 into practice in the water stressed parts of the Barind region, and to promote IWRM process in compliance with the Rules nationally and create improved environment by supporting equitable and adequate access to water in that region. Hydrogeological investigations as well as mathematical modelling by using state of art technology have been conducted. The hydrogeological investigations included exploratory drilling, construction of production tubewells, long term aquifer tests, installation and monitoring of groundwater level, geophysical survey, seepage and percolation measurements and water quality sampling and analysis. A hydro - stratigraphic section of High Barind Region is given below:




From the diagram it reveals that aquitards are mostly composed of clay and silty clay sediment materials and aquifers are mostly composed of medium to coarse sand with occasionally fine sand sediment.

One of the major tasks was to identify Water Stress Area (WSA) for the study area. While analyzing the water stress of the study area, a mapping technique using Eight Parameters related to water resources has been used. The technique has been approved by the Panel of Expert (PoE). The following parameters have been considered:

[D]-Depth to Water Table, [R]-Recharge, [A]-Aquifer Thickness, [U]-Media of Unsaturated Zone, [H]-Hydraulic Conductivity of the Aquifer, [Q]-Groundwater Quality, [E]-Environmental Issues, [L]-Trend of Groundwater Level,
assigned based on expert judgment.

Water Stress Area Index at any cell or polygon on the map has been determined as:

**Water Stress Index (WSI) = DrDw + RrRw + ArAw + UrUw+ HrHw + QrQw + ErEw + LrLw**

The method has been named DRAHQEL according to the used parameters. For the study area, identified district wise number of water stressed unions are shown in the map. The case study shows that, among the 215 unions under three districts, about 40 unions are in High water stress and about 47 unions are under Very High water stress zone. The study reveals that about 41% unions of these three districts are under High to Very High water stress.

The important recommendations for water management that have been made from the study are:

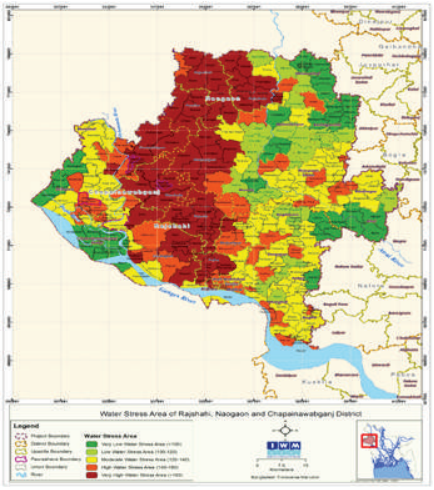
a) Installation of new tube wells and extraction of underground water should be limited in water-stressed areas.

b) Out of the public or private ponds leased in water-stressed areas, some ponds should be reserved for drinking water and domestic purposes without leasing them. A signboard will be placed in front of each protected pond with detailed instructions on which pond can be used for which purpose.

c) The necessary number of canals for drinking and domestic water should be excavated in water-scarce areas and there will be detailed instructions on which canals can be used for which purpose by installing signboards in front of the canals.

d) The shortage of water should be met by supplying water from low water-stressed areas to high water-stressed areas.

e) The local people should be informed about the overall status of water resources (availability, demand, use, critical status etc.) in the project area to sensitize the users at various levels and thus ensure optimal uses of water.




*Water Stress Area of Study Districts*


*Mr. Zaheed Farooque MP, Hon'ble State Minister, Ministry of Water Resources graced the National Workshop on "Operationalizing Integrated Water Resources Management in Compliance with the Bangladesh Water Rules 2018" as the Chief Guest; Mr. Nazmul Ahsan, Secretary, MoWR attended as the Special Guest. Mr. Rezaul Maksud Jahedi, DG, WARPO Chaired the workshop held at Pan Pacific Sonargaon on 25 June, 2023.*

A pilot study of three districts namely Rajshahi, Chapainawabganj and Naogaon districts water resources assessment up to union level has already been assessed under this project. During the final dissemination workshop of the study, Hon'ble Minister of State, Ministry of Water Resources Mr. Zaheed Farooque, MP requested to conduct and complete the baseline study of the water resources up to the Country level within 2030.

Following the recommendation of Honb'le Minister of State and experience from pilot study, WARPO already started the study "Assessment of water resources availability and lowest safe yield of aquifer in 10 districts of the North-Central Hydrological Regions of Bangladesh for effective implementation of Bangladesh Water Act, 2013". A study on remaining hydrological regions is expected to be completed within 2030.

## Technical Committee Meetings of WARPO Held

The 5th meeting of the Technical Committee (TC) of WARPO held on 27 July 2023. During this session, some crucial matters were deliberated and resolutions were reached to support the Board of Directors (BoD) of the organization for the effective management of WARPO. The committee not only addressed the implementation status of decisions from its 4th meeting, but it also made significant new decisions. The key outcomes of the meeting are outlined:

(a) A clearance certificate from WARPO must be a prerequisite before approving the water resources related projects by the Agriculture, Water Resources and Rural Institutions Division of the Planning Commission. Other Divisions of the Planning Commission, including Agriculture, Water Resources and Rural Institutions Division, will take necessary measures to ensure a clearance from WARPO before approving the water resources related projects by them.

(b) Agriculture, Water Resources and Rural Institutions Division of the Planning Commission will take necessary initiatives for inclusion of WARPO representatives in the Project Steering Committee (PSC), Project Implementation Committee (PIC) and Project Evaluation Committee (PEC) of the water resources related projects proposed by different organizations.

(c) WARPO should formulate a draft policy for collection of water prices from large industrial and commercial sectors for using groundwater by them and discuss it in the next Board of Directors meeting of WARPO.

Later on, the 6th meeting of the Technical Committee held on 15 February 2024. The 7th meeting which was held on 24 April 2024 at WARPO conference room was presided over by Mr. Abdul Baki, Member (Secretary), Agriculture, Water Resources and Rural Institutions Division, Planning Commission.

During the discussion, the chair appreciated the progress of the decisions of the previous meeting done by WARPO and gave an assurance to extend the assistance from Agriculture, Water Resources and Rural Institutions Division, Planning Commission. Some important decisions were taken in the meeting for the strengthening of WARPO. The key outcomes of the meeting are outlined:

(a) WARPO will take the necessary steps discussing with to arrange the PSC meeting for the approval of the projects proposed by WARPO.

(b) Agriculture, Water Resources and Rural Institutions Division, Planning Commission will take necessary steps for the approval of the projects proposed by WARPO awaiting the PSC meeting.

(c) WARPO may take necessary attempts to establish Water Governance Center and Water Quality Testing Lab at WARPO.

The decisions taken in the meeting considered as pivotal steps in the ongoing management and strategic direction of WARPO which will expedite the present activities of the organization.

*Mr. AKM Fazlul Haque, Member (Secretary), Agriculture, Water Resources and Rural Institutions Division, Planning Commission, presiding over the Meeting*

*Mr. Abdul Baki, Member (Secretary), Agriculture, Water Resources and Rural Institutions Division, Planning Commission, presiding over the Meeting*

## Collaborative Research on Assessment of Drinking Water Security in the Selected Areas of South-West Coastal Region of Bangladesh

Increasing population and human activities along with global climate change have enormously increased the vulnerability of the water system. The WARPO-KUET research project identified the drinking water security challenges in the south-western coastal zone of Bangladesh. To evaluate the overall water security, the study determined the availability of drinking water, analyzed its accessibility, and assessed its quality separately by indexing methods at the union, upazila, and district levels. Spatial analyses were also completed to create drinking water availability, accessibility, quality, and overall water security map. At the final stage of the project work a water app (WATAPP) for Android mobile devices is produced depending on the water security index of Khulna, Satkhira, and Bagerhat districts of the south-western coastal zone of Bangladesh. In the aspect of availability, the result shows that the majority of the households collect water from private sources followed by Government and non-government sources. Overall water availability condition seems to be better in Khulna than in Bagerhat and Satkhira Districts. In terms of accessibility, the findings indicate that the majority of families gather water from sources more than 300 meters away, which is twice the national standard for Bangladesh. Overall water accessibility condition seems households of Satkhira district have higher access to the source than Khulna and Bagerhat districts. According to the findings of drinking water quality, only 1% of water sources were of good quality and the other 99% were not good with a significant portion of water sources poor or very poor for drinking purposes during the dry season due to the occurrence of extremely higher values of E.Coli in the source. Overall water quality shows that the Bagerhat district was relatively better than Khulna and Satkhira during the dry season. The Overall water security condition in 18 disaster hotspots in the south-west coastal region is poor to very poor. However, in comparison, Satkhira has better water security with an average score of 2.82 whereas Khulna and Bagerhat have scores of 2.55 and 2.48 respectively. The application (WATAPP) is designed as a decision-making tool that will provide an instant overview of the water security situation of the Khulna, Satkhira, and Bagerhat districts of south-western Bangladesh.

# National Mourning Day 2023 Observed by WARPO

Water Resources Planning Organization (WARPO) observed National Mourning Day 2023 and 48th martyrdom anniversary of Bangabandhu Sheikh Mujibur Rahman with due respect and solemnity on 15th August, 2023. Mr. Md. Rezaul Maksud Jahedhi, Director General, WARPO along with a number of professionals and staff participated on the rally from WARPO Bhaban to Bangabandhu Memorial Museum at Dhanmondi. The professionals stood in solemn silence for a minute as a mark of profound respect to the memory of father of the nation after placing the wreath. On 17th August 2023, the discussion meeting and dua mahfil were held in Pani Bhaban and WARPO professionals participated. It is mentioned that WARPO celebrated the birth of martyred Captain Sheikh Kamal, son of father of the nation Bangabandhu Sheikh Mujibur Rahman and Bangamata Begum Fazilatunnesa on 5th August 2023. WARPO professionals participated in a rally from WARPO Bhaban to Sheikh Kamal Park at Dhamondi and placed the wreath with due respect.


# Issues for the Next National Water Management Plan (NWMP)

**Dr. Rezaur Rahman, Professor, IWFM, BUET**

## Introduction

The National Water Management Plan (NWMP) was formulated in the early 2000s for the period of 2001-2025. It is reasonable to assume that the next NWMP will be formulated by 2026, and WARPO will soon initiate activities in this regard. Some issues have emerged since the 1st NWMP and need to be addressed in the next NWMP.

## River and Floodplain Restoration

Restoration of rivers has become a priority of the government. This now needs to be extended to the restoration of floodplains. In this regard, connectivity between rivers and their floodplains should be reestablished. Restoration of ecosystems, such as floodplains, provides immense benefits, as proven in many scientific studies both globally and locally. To facilitate the restoration, all flood management projects need to be repurposed (Rahman, 2022) under an NWMP programme in synergy with Bangladesh Delta Plan 2100. All the gates and sluices should be remodeled. In most of the places, they have proven to be redundant and only hinder natural flow.

## Pollution Control

Industrial pollution is causing havoc to the riverine ecosystem in many places. The pollution has worsened manifold in the last 25 years. NWMP proposed river clean-up programs, which need to be reviewed in the context of deteriorating water quality, and chart a course for the next 25 years for complete cleanup of our rivers. Many countries have successfully cleaned up their rivers. Lessons can be drawn from those cases.

## Groundwater Decline

During the formulation of the NWMP, our assessment was that although groundwater was being extensively used by then, the decline would remain seasonal except in cities like Dhaka. But it has been seen in more recent years that decline is becoming long term, especially in the North-West region. Barind Multipurpose Development Authority (BMDA) has put much effort into the sustainable use of groundwater resources in the Barind region, which can be studied to provide future guidelines for the sustainable use of groundwater resources. Potential of innovative nature-based solution (NbS) for groundwater recharge has been demonstrated in a very recent article in Science (Shamsudduha et al., 2022)

## Environmental Flow for the Sundarbans

The environmental flow was not considered requirement for the Sundarbans in the NWMP. It was not considered under the Ganges Water Treaty 1996 either. Because of the lack of sufficient freshwater flow through the Gorai River under the treaty, the quality of the Sundarbans has deteriorated much. During the expected re-negotiation of the Ganges Treaty in 2026, the next NWMP should provide environmental flow requirements for the Sundarbans to the negotiators.

## Rejuvenation of Teesta River

Teesta River has become a dry river during the dry season after the unilateral withdrawal of water by India through a number of dams and barrages. The recent dam break in Sikkim, on the other hand, shows us how vulnerable downstream has become to devastating floods from such incidents. In 2011, there was an almost a diplomatic breakthrough regarding the sharing of Teesta River water between India and Bangladesh. NWMP should give directions on how to solve the problem either internationally or bilaterally. The current proposal of the Bangladesh Water Development Board (BWDB) of narrowing the river to basically a man-made canal is not a sustainable solution. The role of wide braided plains of the river in shock absorption of sudden floods is documented (Shampa et al., 2023). The future of Teesta Barrage should be considered, given the reliance of farmers of Lower Teesta Basin on groundwater irrigation. If found practical, this barrage should be removed, releasing the residual flow for the sustenance of the river instead.

## Water Allocation

The focus of NWMP will be water allocation among different sectors. Sectoral characteristics have changed immensely since 2000. Demand for water in the agriculture sector needs to be reappropriated, given the fact that rice consumption has decreased over the years and, on the other hand, fish and meat consumption has increased. In this regard, our assessment during the 1st NWMP has proven to be substantial underestimation. The push for higher income for the country necessitates more allocation of water for the industrial sector. Higher income, on the other hand, will give rise to more demand for water in the domestic sector.

## Climate change

Around the year 2000, climate change was still not very evident. As a result, climate change was addressed only marginally in NWMP. Since then, climate change has become a major threat, and its impact on water resources has become too evident. The next 25 years will be crucial for Bangladesh to successfully adapt to climate change. NWMP should give directions on how the water sector can adapt well to various climate change related threats, especially to sea level rise. In this regard, there needs to be synergy with the National Adaptation Plan (2023-2050) and Bangladesh Delta Plan 2100.

### Nature-based Solution

The world is moving towards nature-based solutions (NbS), especially as a favorable option for achieving climate resilience (World Bank Group, 2022). Many solutions mentioned above, such as river & floodplain restoration, etc., are nature-based solutions to prevailing problems. Next NWMP should prioritize the adoption of NbS in the water sector for ensuring resilience to climate change.

### Research Output

We did not have many research reports or articles on water resources management of the country while we were working on NWMP. But since then, there has been flurry of research publications, especially on climate change, river pollution, groundwater, etc, which are easily available in books and journals. Such research outputs will be immensely useful for the formulation of the next NWMP.

## Towards "Water Sector Digital Library, Information & Documentation Center" at WARPO

Water Resources Planning Organization (WARPO) maintains a well-organized, rare, and rich Library stuffed with national and international information, books, journals and documents on water resources management and development. It has various categories of study reports which are very rare from very early onwards on water resources and relevant to other allied sectors like agriculture, land, fisheries, environment, climate change, flood, river-bank erosion, coastal zone, public health, water supply and sanitation etc. Being web-enabled and serving as an easy-searching computerized cataloging system, the library is regularly updated. WARPO authority & its staff are always relentless in enriching the library as a valuable water sector information resource center in Bangladesh to serve students, multi-sector planners, professionals, academicians, and practitioners.

Any user can search the library catalog from anywhere in the world through the WARPO website. According to this continuation, the WARPO library is going to turn (only the) as the biggest/largest "water sector digital library, information, and documentation center" in Bangladesh. So that various updated national and international information can be available in the WARPO center through collecting the updated national and international books, journals, reports, etc. As well as all backdated impotent books and reports are transferred to digital format through scanning. Within this process 1005 rare and important study reports and books are already scanned and included in the WARPO Digital library, information, and documentation center to enrich its collection. It is always an ongoing updating and development process as the budget and manpower allow.

## Importance of Ground-water Assessment and Monitoring in Bangladesh and Role of Bangladesh Water Development Board (BWDB)

**Dr. Anwar Zahid, Director, BWDB**

Bangladesh is one of the largest deltas in the world having a very flat topography. To assess the current trend of hydrologic conditions for overall water resources development and management, including groundwater and to predict future changes due to human activities and climate change impacts, generation of adequate data and information by appropriate monitoring network is utmost important.

Importance of groundwater irrigation increased with the introduction of High Yield Variety (HYV) seeds, which require a timely and assured water supply. Currently, about 80% of dry season irrigation and 98% of drinking water supply has been provided from groundwater (BDP 2100, 2018). Deep Tubewells (DTWs) and Shallow Tubewells (STWs) irrigation was extended rapidly during the late 1970's and the 1980's.

This groundwater resource is increasingly facing quality problems in many areas where the exposure to pollution from agriculture, urbanized areas and industrial sites as well as arsenic contamination in shallow groundwater and high salinity in coastal aquifers makes the water unfit for human consumption. With climate change, groundwater balances in many areas would change and bring in another level of uncertainty. Over exploitation is usually the result of irrigation abstraction in rural areas and huge domestic and industrial usage in cities. Annually, an estimated 32 cubic kilometers of groundwater is withdrawn in the country for irrigation (90%), as well as domestic and industrial (10%) purposes (World Bank Group 2019). The Dhaka Water Supply and Sewerage Authority (DWASA) sources 78% of its water supplies from groundwater through a network of about 890 production wells and in several parts of the city groundwater level has now dropped 60-75 m below ground surface due to excessive withdrawal than recharge. Relentless abstraction of groundwater leads rural and urban Bangladesh facing water crisis, including the non-functioning of wells during irrigation period and declination of groundwater table. Ground Water Hydrology Divisions of BWDB so far completed over 1500 nos. borehole drilling to explore the aquifer system of Bangladesh by collecting both core and washed sediment samples. In many holes, the borehole lithologic logs have been verified by conducting borehole geophysical logging using Gamma and conductivity probes. Based on these investigations, down to the depths of about 350m, it depicts that the unconsolidated Miocene to Recent fluvial and estuarine sediments underlying most of Bangladesh form multi-layered aquifers. Aquifer pumping tests generally serve two main objectives. Firstly, a pumping test is performed in order to determine the hydraulic characteristics i.e. transmissivity, storage co-efficient, hydraulic conductivity etc., of aquifers. Secondly, a pumping test provides information about the yield and drawdown of the well. These data can be used for determining the specific capacity or the discharge drawdown ratio of the well, etc. BWDB has conducted about 350 constant-discharge aquifer pumping tests throughout the country, started in the upper aquifers down to the depth of about 70-80 m. Under BCCT project, for conducting 18 deep aquifer pump tests, 18 deep production wells down to the maximum depth of 350 m has been installed by BWDB. 124 numbers of slug tests have been conducted to estimate hydraulic conductivities of aquifer sediment. Different methods were used to analyze aquifer test data considering aquifers as confined or leaky confined in nature.

Analysis of the groundwater table data, selected from 1272 nos. BWDB groundwater observation wells throughout the country, shows that in many areas groundwater withdrawal from the shallow aquifer for various purposes during dry periods is balanced with the vertical percolation of rainwater and inflow from surrounding aquifers during monsoon when pumping is ceased. A period of relatively constant levels during the monsoon indicates 'aquifer full' conditions. However, in many areas due to increased abstraction and where potential recharge is lower than actual recharge, the static or highest water level of the previous year declines during monsoon. Permanent decline of water table has been observed in urban areas, in the Barind tract, and to some extent in many other areas due to excessive demand and withdrawal for urban, irrigation and industrial uses.

*Groundwater monitoring with telemetry for real time data transmission*

Investigation of the aquifer systems, understanding of formation behavior, regular monitoring of groundwater storage and quality are important for the sustainable development and integrated management of water resources.

Sustainable use of available safe water including groundwater can be planned by analyzing data and information of the components of the hydrologic cycle. In Bangladesh where groundwater is the principal source of irrigation, industrial and potable water supply, regular assessment and monitoring of this resource is very important. Maintaining the water balance of withdrawals and recharge is vital for managing human impact on water and ecological resources. Because of increasing demand of water and to reduce dependency on limited fresh groundwater resources, utilization of available surface water and conjunctive use should be emphasized as per National Water Policy 1999 and other guidelines of the Government. Groundwater resources that can safely be abstracted from both upper and deeper aquifers need to be assessed properly. Integrated water resources management can be planned based on proper research and monitoring, assessment and uses of groundwater resources, preparation of water budget and water allocation plans as well as monitor changes in water storage and quality. Augmentation of both natural and artificial recharge of groundwater (MAR) can be done in groundwater depleted and water stressed areas by implementing appropriate programs and techniques. All of these tools can be implemented under the authority of the Water Act 2013 and Water Rules 2018.

## Formulation of WARPO District Offices and Its Function

As per the provisions of the act, the main office of the organization will be located in Dhaka, and it has the authority to establish branch offices at any necessary location. The Bangladesh Water Act, 2013 and Bangladesh Water Rules, 2018 guide the coordination and monitoring of water sector projects, as well as the coordination of district, upazila, and union IWRM committees to ensure the assured and coordinated use, distribution, and development of water resources. In line with the implementation of the Bangladesh Water Act, 2013 and Bangladesh Water Rules, 2018 decisions have already been made by the Ministry of Public Administration to establish district offices of WARPO in 63 districts. Apart from the Dhaka Division, seven offices have been established in seven divisional districts.

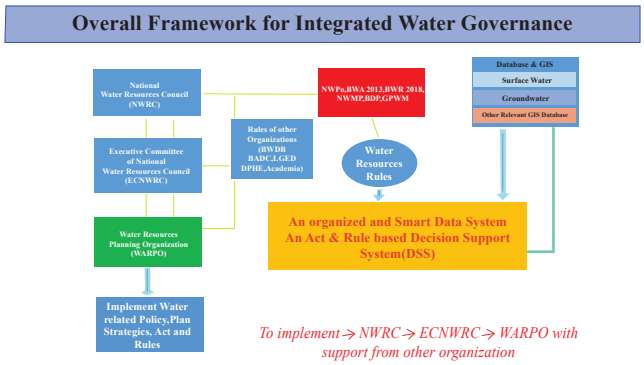
As per the directive of the Ministry of Water Resources, responsibilities and functions of the district offices of the WARPO have already been determined. The Honorable Director General, WARPO has been granted approval for the establishment with the goal of setting up 7 (seven) new District offices in 7 (seven) divisional cities on 12 November 2023. WARPO has received government approval to create a total of 56 (fifty-six) positions in 7 (seven) divisional cities for its 7 district offices. Currently, 7 Executive Engineers have been appointed, along with 14 Assistant Engineer, 14 Sub Assistant Engineer, 7 Accountant, 7 Office Assistant cum Computer Operator, and 7 Office Assistant directly recruited. These positions have been filled in the respective district offices.

*Administrative duties and program management at the District Offices of WARPO*

Until the construction of dedicated Office Buildings for district offices, the operational District Offices activities are currently being conducted in 2/3 rooms allocated within the campus of the Bangladesh Water Development Board (BWDB). As per the decision of the 18th meeting of the Governing Board of WARPO held on 17 September 2023, it has been decided that, initially, for the construction of each building in every district, sufficient land will be allocated under the jurisdiction of the BWDB for the convenience of WARPO, subject to approval.

## A Proposed Framework for Water Governance in Bangladesh

As water is a critical element in development, balancing the water with demand and supply, optimizing the use of water for irrigation, industrial use and other uses; water governance often demands a Decision Support System based Governance framework with holistic perspective of sustainable development. Integrated water governance challenges conventional, fractional water development and management systems and emphasizes an integrated approach with coordinated decision making across sectors and scales where Policy, Act and Rules will be embedded in the center. To face the growing challenges regarding water rights, protection of resources, water use, and water services management, Bangladesh has enacted comprehensive legal frameworks such as National Water Policy (1999), the Bangladesh Water Act (BWA) 2013 and Bangladesh Water Rules (BWR) 2018; that outlines a coordinated and comprehensive regime for the development, management, extraction, allocation, use and conservation of water resources.




*Proposed Integrated Framework for Water Governance*

The formation of the high-powered National Water Resources Council (henceforth termed as the Council) with the honorable Prime Minister as the head implies the importance the government is paying to the management of this precious resource. An Executive Committee under the Ministry of Water Resources will implement the decisions taken by the Council. The intention to take initiatives for a basin-scale, integrated water resources management of trans-boundary rivers, and exchange of data on flooding, drought, and pollution with co-riparian countries are good steps in the right direction. Water Resources Planning Organization (WARPO) under Ministry of Water Resources will take the lead coordination role in the framework of water governance as the Secretariat to the Executive committee of the NWRC.

Stakeholder's participation in framework will play a pivotal role to implement Integrated Water Resources Management. Academia, IT organizations, Water User Group will act as a dynamic actor in this framework. For Issuing Project Clearance Certificate in case of Surface Water Projects and No objection Certificate (NOC) for abstraction of Groundwater by different stakeholders, this framework will provide a holistic view to perform proper management of groundwater based on Decision Support System which is very dynamic and technology based approach. The overall framework will be implemented by NWRC, ECNWRC, and WARPO with continuous support from all relevant institutions.

The vision of WARPO is to become an apex organization in macro level planning for the management and integrated development of water resources in the country. As a central coordinating body, it has to achieve sustainable water resource development by pursuing IWRM. To achieve these vision and mission, WARPO is proposing some strategic planning for implementing water governance in Bangladesh. They are as follows:


*Proposed Strategy for Implementing Water Governance*

Identifying Water Stress Area, Availability of Water Resources, Water Quality Assessment and Determining Emerging Elements with establishment of Water Governance Center/Managed Aquifer Recharge Center in WARPO for proper utilizing and budgeting of volumetric allocation of water is vital for ensuring water governance.

## Establish Water Quality Index (WQI) for Dhaka-based Rivers: A Collaborative Research between WARPO and BUET

The collaborative research project titled 'Establishment of Water Quality Index (WQI) through Principal Component Analysis for the Dhaka-based Rivers' between Water Resources Planning Organization (WARPO), and Department of Chemical Engineering (DChE), Bangladesh University of Engineering and Technology (BUET) with assistance of Research and Innovation Centre for Science and Engineering (RISE) was signed on 06 June, 2023.

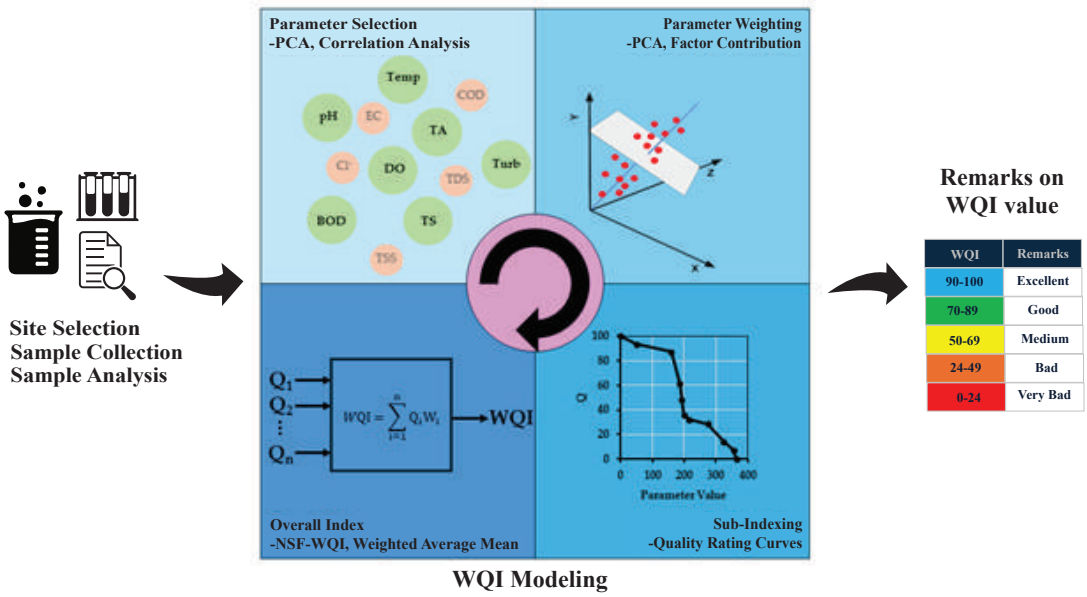
The initial work plans were to select 6 potential monitoring sites through field survey and inspection for each river for sampling. It was preliminary suggested that sampling would be done for three seasons (pre-monsoon, monsoon and dry) for each monitoring site and analysis would be completed to evaluate 16 different water quality parameters. After collecting primary data, performing Principal Component Analysis (PCA) and identifying dominant water quality parameters the ultimate goal of the project is to develop a WQI model with appropriate method. The project is said to be a 2 year long collaborative project with a research team composed of 9 persons.

For primary data collection, 4 measuring equipment – Microbium MPN Analyser, Hach DR-1900 Spectrophotometer, SCAN Spectrolyser, Portable Multiparameter Water Quality Meter were purchased by which several water quality parameters can be measured on site and as well as on laboratory. Sampling for primary data collection was conducted between October to November, 2023 for post-monsoon period and between January to February, 2024 for dry season. The collected data were later analyzed in the lab to measure the parameters. The tentative time of sampling for pre-monsoon season is to be April – May, 2024. The interim report of this project has been submitted on April 2024 where the future activity plan and directions have been discussed.


Several field survey and inspections were conducted from July to September 2023 and monitoring sites were selected for future sampling. Settlement of lab equipment for analysis of samples, a case study on secondary data and sampling for dry season was completed to date. An inception report was submitted to WARPO on October, 2023 and a Technical Committee meeting on inception report was held on December, 2023 at WARPO conference room. As per the recommendation from TC,it was decided to increase the monitoring sites to 9 sites for each river (3 new monitoring sites for each river to be added) and to revise the sampling collection during four seasons (pre-monsoon, monsoon, post-monsoon and dry). The outcome of the secondary data analysis was submitted on the 'City and Environmental Interaction' journal of Elsevier on February, 2024 and the journal paper was published on April, 2024.


City and Environment Interactions

Principal component analysis incorporated water quality index modeling for Dhaka-based rivers




WQI Modeling

# Role of RRI in Sustainable Water Resources Development in Bangladesh

**Dr. Engr. Md. Alauddin Hossain, PSO, RRI**

Bangladesh is a flat deltaic region having a unique and uncommon system of rivers, tributaries and distributaries which play an important role in its agriculture, communication, economic development, social and natural environment. But these river systems are getting silted up gradually each year along with the shifting of the shore line since 1990 decade, which is causing navigational, communication and transportation problem. In addition, Floods and river bank erosion are a perennial occurrence in Bangladesh and it takes away a huge toll of lives and valuable properties every year. Drought is also a problem for the country which affects our food production severely. Devastating effects of floods, drought, river bank erosion and sedimentation must be controlled for rapid development of the country. Water resources should be utilized properly to increase food production and generation of hydro-electricity. For overcoming this prevailing situation, the rivers need to be trained and dredged to increase their hydraulic efficacy and to protect river bank from erosion. Irrigation, drainage and communication system should be developed by constructing hydraulic structures to increase food production & healthy economy and rivers need to be restarted to develop biodiversity of natural environment. It is true that river problems are very complicated and require extensive scientific investigation, research and study in order to arrive at correct engineering solution before actually taking up/launching a project or scheme in the field, which is generally very costly.

River Research Institute (RRI) has been providing design support of hydraulic structures to the planners and designers through the researches, investigations and studies by means of both Physical and Mathematical Model study to make the project sustainable and cost effective. The researches, investigations and studies on river and other hydraulic problems result in economizing and sustainability of the different projects of water resources development and guard against waste of huge expenditure. Since it's established, RRI has successfully conducted about more than 200 physical model studies under different water resources development projects related to flood mitigation, river bank erosion, irrigation and drainage system development, and communication system development and river restoration. In addition, concrete materials, soil & water and sediment samples have been tested in RRI for maintaining the quality of hydraulic structures and for determining its foundation details. The modelling and test results have played an important role for sustainable design and planning of the allied water projects.

# Welcome to the Team: WARPO's New Wave of Engineers and Scientists

Water Resources Planning Organization (WARPO) recently welcomed 15 (fifteen) highly qualified professionals, including 11 (eleven) Assistant Engineers and 4 (four) Scientific Officers, following a rigorous examination process. The incoming talent pool boasts diverse engineering backgrounds, with 14 (fourteen) individuals holding B. Sc. degrees, specializing in Civil Engineering (11) and Water Resources Engineering (3). Additionally, 1 (one) professional has earned an M.Sc. in Irrigation and Water Management Engineering. Their alma maters reflect a range of prestigious institutions, with 5 (five) graduates from BUET, 3 (three) from RUET, and the remaining from esteemed universities such as CUET, MIST, IUT, SUST, DUET, PUST, and BSMRAU. All of these professionals share a common passion for water resources, with a collective commitment to advancing their field. Excited about contributing to WARPO, they are determined to explore and enhance the future prospects of the water sector through their professional endeavors.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