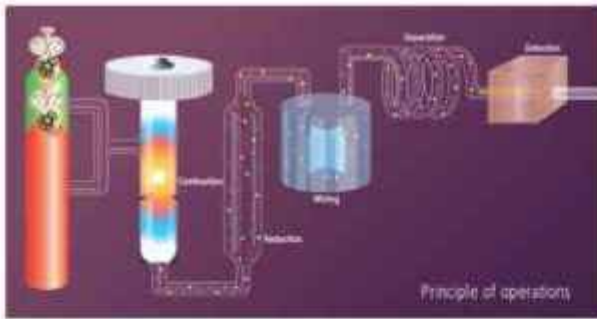


# ANNUAL 2024 REPORT 2025

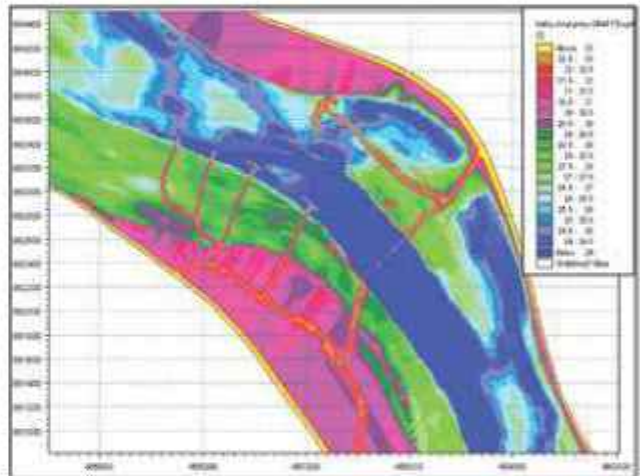


**RIVER RESEARCH INSTITUTE, FARIDPUR**  
**MINISTRY OF WATER RESOURCES**  
Government of the People's Republic of Bangladesh





Rajshahi WASA Model Study



Mathematical Model Study

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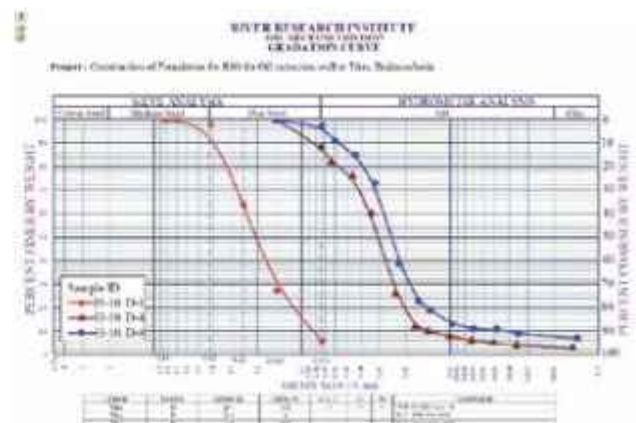
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Gradation curve used for particle size analysis

# ANNUAL REPORT

JULY 2024- JUNE 2025

PUBLISHED IN SEPTEMBER 2025



## RIVER RESEARCH INSTITUTE

Ministry of Water Resources

Government of the People's Republic of Bangladesh

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## EDITORIAL NOTE



River Research Institute is the only one national research organization where both Physical and Mathematical modelling facility available in the country and based in Faridpur, Bangladesh. Since 1948 the Institute has provided or conducted more than two hundreds Physical model studies from over the country, the vast majority from Bangladesh Water Development Board (BWDB). Also, numerous research, pilot and institutional strengthening projects carried out to strengthen capacity in the water sector nationwide.

An annual report is the reflection of activities that is performed in one year of an organization or any other company. River Research Institute publishes an annual report every year focusing on its activities and financial performance based on fiscal year. In order to accomplish this task, an Editorial Committee is formed at the end of every fiscal year. Accordingly, the annual report of the fiscal year 2024-2025 has been prepared by the Editorial Committee with the guidance of the Chief Executive of the organization. This annual report includes general description of the institute, its activities performed by its different directorates as well as divisions and financial management. It also highlights the backgrounds, objectives and findings of different physical and mathematical model studies and also the testing of various engineering properties of soil, concrete, water and sediment. Moreover, this report contains the human resource development, research and development activities, future development prospects etc. which will assist to provide useful information to the organizations and individuals working in the water sector.

The Editorial Committee likes to express sincere thanks and gratitude to Chief Executive of RRI Mr. S M Abu Horayra, Director General for his valuable direction, suggestion, assistance and back-up in publishing this annual report provided informative and comprehensive. The committee is also grateful to the relevant personnel who extended their efforts and co-operation in preparing and publishing this report in time. Any valuable comments and suggestions regarding improvement of this report from among readers will be highly appreciated.



Dr. Engr. Md. Alauddin Hossain  
Convener  
Editorial Committee  
and  
Director, Geotechnical Research, RRI



**Syeda Rizwana Hasan**  
Advisor  
Ministry of Water Resources  
Government of the People's Republic of Bangladesh

## Message

It is with appreciation that I acknowledge the dedicated efforts of the River Research Institute (RRI), Faridpur, in carrying forward its crucial mandate of advancing research, innovation, and sustainable management of our nation's river systems. Rivers are the lifelines of Bangladesh-shaping our environment, economy, and culture. At the same time, they pose increasing challenges in the form of erosion, siltation, flooding, and the adverse impacts of climate change.

During the fiscal year 2024-2025, the Institute has contributed significantly through applied research, model studies, and technical support to national projects, helping policymakers and engineers design effective river training, flood management, and navigation solutions. I commend the continuous development of hydraulic and morphological studies, the use of modern technologies, and the professional commitment demonstrated by the scientists, engineers, and staff of RRI.

As adviser to the Ministry of Water Resources, I emphasize the need for strengthening collaborative research, enhancing capacity-building, and ensuring that the outcomes of RRI's studies are translated into practical solutions for sustainable river management. Our collective goal is to safeguard our rivers and environment, protect vulnerable communities, and secure water resources for future generations.

I hope that with its growing expertise and dedication, the River Research Institute will continue to play a pivotal role in supporting national development and resilience. I am also confident that, with the continued dedication of the institute and the support of all stakeholders, we will make significant strides in securing a resilient future for Bangladesh's rivers and the communities that depend on them. The Ministry of Water Resources remains committed to extending its guidance and support to further strengthen the Institute's research capacity and impact.

  
(Syeda Rizwana Hasan)



**Senior Secretary**  
Ministry of Water Resources  
Government of the People's Republic of Bangladesh  
Dhaka



## Message

This is an immense pleasure for me to express the best wishes to River Research Institute (RRI) on the publication of its Annual Report for the fiscal year 2024-2025. In today's world, development in digital technology is phenomenon and also crucial for all developing nations. The role of RRI in emergence of an economically capable and sustainable growth is quite significant in the present scenario of technology-driven development. I am sure that RRI shall work hand-in-hand towards achieving these objectives.

As a research organization in water sector under the Ministry of Water Resources (MoWR), RRI has been playing a vital part in providing technical assistance to different water resources development and management projects undertaken by the Government of Bangladesh (GoB) by using physical modelling technology. Moreover, RRI is also using state of the art mathematical modelling technology to meet the increasing demand for quality services along with dealing the water related problems in a sustainable manner. So far, RRI has proven its capability of providing important technical assistance in implementing a number of government projects by using both physical and mathematical modelling technologies. I expect that RRI would take up more and more problem oriented and site-specific researches to develop insight into the problems and come up with sustainable solutions for the benefit of the country.

I would like to express my sincere thanks and appreciation to the editorial committee of RRI for their endless efforts for the annual report preparation.



Md. Mokabbir Hossain  
Senior Secretary, Ministry of Water Resources  
Government of the People's Republic of Bangladesh

## MESSAGE

### From Director General



I take immense pleasure in expressing best wishes to River Research Institute (RRI) on the publication of its Annual Report for the fiscal year 2024-2025. This report encapsulates the collective efforts and achievements that have been made by River Research Institute.

Bangladesh being mostly a flat deltaic country with its unique geographic location is prone to different water related disasters. In this regard River Research Institute have been playing very crucial role from its inception by providing better understanding of the complex dynamics of Bangladesh's rivers, which are vital to the nation's ecology, economy and infrastructure. The institute has already proven its capability of providing sound technical solutions to different water related problems by means of physical and mathematical modeling. River Research Institute has laboratory facilities to test different physical and engineering properties of soil, quality of construction materials (cement, brick, MS rod, sand, concrete block and cylinder), sediment characteristics and water quality of the rivers etc in Faridpur. To extend the activities of the organization, at present, 72 Green Road, Panthapath, RRI Dhaka office is well equipped with modern and sophisticated device for above testing facilities. The testing results have been used for planning and design of hydraulic structures like bridge, groyne, barrages, sluice gate, drainage channels, irrigation canals, sluices, closures etc.

As we look ahead, we are aware of the increasing complexities posed by climate change, urbanization and other environmental pressures. These factors underscore the need for innovative solutions and adaptive management strategies. River Research Institute is committed to stay at the forefront of these developments, providing scientific guidance.

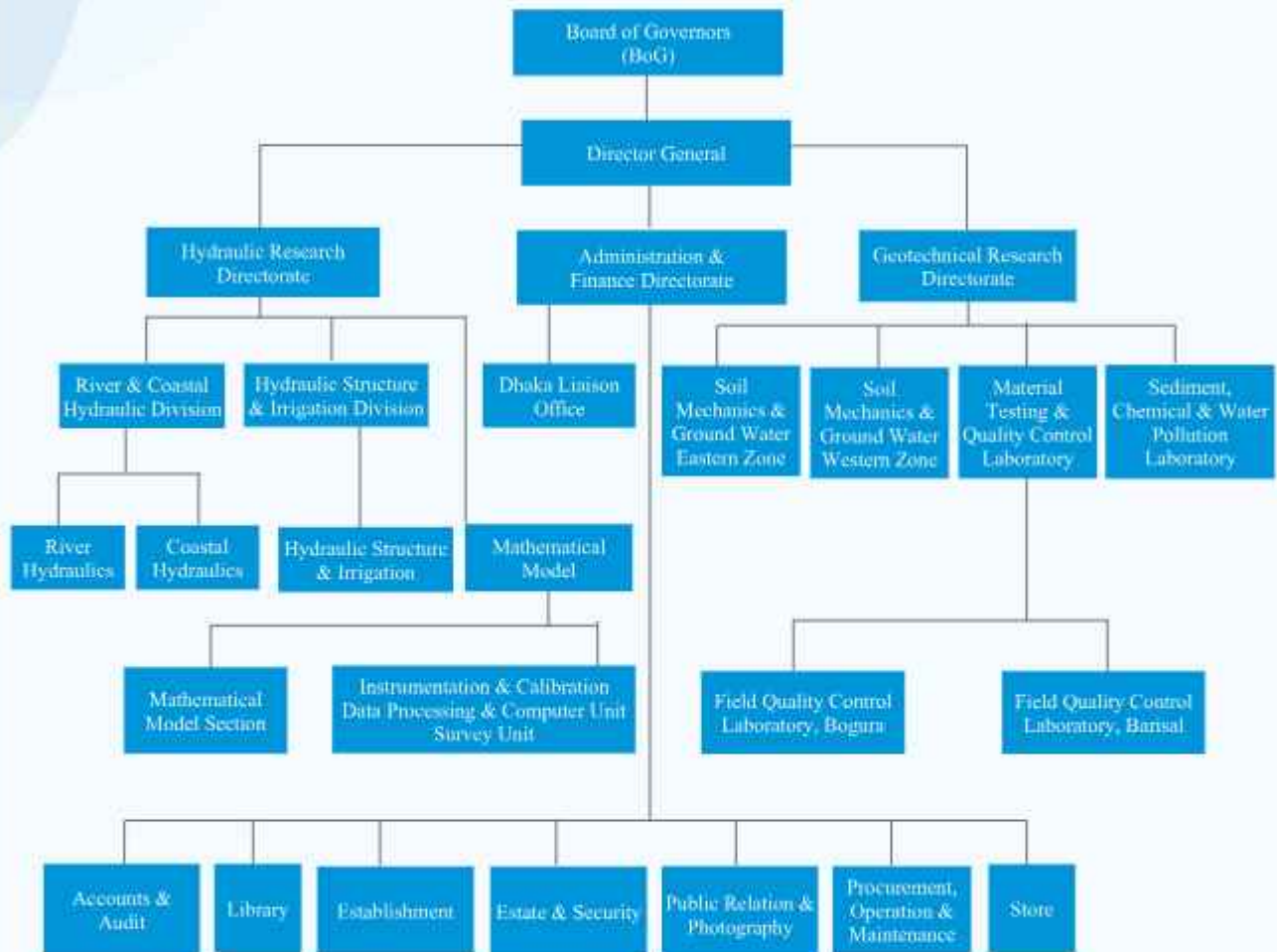
I extend my deepest gratitude to all officers and staffs of River Research Institute, whose hard work and dedication are the cornerstone of success of this institute. I also wish thank all partners and stakeholders for their unwavering support. Together, we are making meaningful progress in safeguarding Bangladesh's rivers for future generations.

I would like to express my warmest and most sincere thanks to the editorial committee for their conscientious efforts in preparation of the RRI annual report. I am hopeful that this report will provide the readers with good insight about the functions and activities of the institute.



S M Abu Horayra  
Director General  
River Research Institute

# ORGANIZATIONAL STRUCTURE



## ACTIVITIES OF RRI

The activities of RRI as per the River Research Institute Act, 1990 (Act 53 of 1990) are directed towards the achievements of the following objectives:

- ❖ To carry out studies for design supports in river training, riverbank protection, flood control, irrigation and drainage works and to conduct research in river engineering, sediment control, estuary and tidal effects by means of physical model.
- ❖ To conduct mathematical model studies on river flow and regional flow network, hydrology, surface and ground water utilization and environmental issues with special attention to salinity intrusion and water quality with a view to develop the water resources.
- ❖ To perform tests on construction materials required for river training, riverbank protection, flood control, irrigation and drainage structures and to inspect and evaluate the quality of the construction works thereof.
- ❖ To conduct training program on the above-mentioned subjects and to publish reports and periodicals related to technical aspects.
- ❖ To advise the Government, Local Authority or any organizations regarding the problems and best approach towards the solution on the above-mentioned subjects.
- ❖ To co-operate and conduct joint ventured research work with other similar local or foreign organizations.
- ❖ To take any necessary steps for performing the above-mentioned works.

## WHAT KIND OF SERVICE CITIZENS CAN EXPECT FROM RRI

- ❖ Providing consultancy services for viable technical solutions to the problems related to riverbank erosion, flooding, drainage and irrigation.
- ❖ Assisting in development of water resources by devising appropriate technological solutions for maintaining river flow, use of surface and ground water, environmental protection and reducing salinity.
- ❖ Testing and assessment of quality of soil, sediment, water as well as materials used for construction of water infrastructures for water resources development and river management.
- ❖ Conducting applied research on river management, sediment control of river, coast and estuary management etc. using physical and mathematical modelling technology and publishing the research results in report form as well as in periodicals and journals.
- ❖ Field level implementation of research outcomes in limited form to assess its effectiveness.
- ❖ Conducting basic research to develop understanding of river and coastal processes for the sake of applied research works.
- ❖ Taking up problem-oriented research and studies as to decrease in dry season flow of the rivers, sedimentation in river bed, loss of navigability of rivers, increase in flooding, long-term water logging etc. to furnish the outcomes to the planners and decision makers.
- ❖ Taking up projects for capacity building of the institute as well as human resource development and conducting joint venture multi-disciplinary studies.
- ❖ Determining the physical, chemical and engineering properties of sediment along with various chemical properties of surface and ground water such as arsenic, iron, calcium, magnesium, sulphate, carbonate, potassium, salinity, etc.

River Research Institute (RRI) is a national research organization in Bangladesh. It is working as a statutory public authority under the Ministry of Water Resources (MoWR), Government of the People's Republic of Bangladesh. RRI has a Board of Governors (BoG) comprising ten members chaired by the Hon'ble Minister, MoWR, Government of the People's Republic of Bangladesh which reviews and evaluates the activities of RRI and approves important proposals so that it can run with all its activities properly. Director General is the Chief Executive of the institute and responsible for implementation of the decisions approved by the BoG. The activities of RRI are conducted by three directorates namely, Hydraulic Research Directorate, Geotechnical Research Directorate, and Administration and Finance Directorate. The first two directorates operate the research activities while the last is responsible for the overall administration and financial activities of RRI and works for its development.

RRI is set up with a view to devising plans and actions to develop water resources in a sustainable manner to meet the development needs of Bangladesh. Since its establishment, RRI has been conducting multi-disciplinary and problem-oriented tests and researches in the field of River Hydraulics, Hydraulics of Structure and Irrigation, Coastal Hydraulics, Soil Mechanics, Material Testing and Quality Control, Sediment Technology, Hydro-chemistry, Geo-chemistry and Instrumentation. The results of such tests and research are playing a vital role in providing information and recommendations regarding different water resources development plans and interventions.

RRI has been conducting physical modelling in the field of water resources since its establishment. RRI has also been involved in Mathematical modelling since 2009. Physical and mathematical modelling tools are complementary to each other. Both physical and Mathematical model have been proved very essential for sound engineering judgments to find out solutions for different water resources development projects. In view of this, RRI has adopted hybrid-modelling approach by using physical as well as Mathematical modelling to improve the understanding of different water systems, which may lead to safe and less expensive solutions for engineering problems. RRI has the mandate for conducting hydrodynamic and morphological study of the river mainly to derive and verify the design parameters of any hydraulic structures, bank protection and river training works.

RRI has conducted in-house training and seminars in 2024-2025 fiscal year for skill development of its scientists as well as other staffs and officials. In addition to these, there were other training courses with different title. Moreover, a number of officials and staffs are trained out-side training. Detailed description of in-house training, out-side training and seminar are also summarised under the section "Human Resource Development".

As per requirements of different clients, some proposals have been submitted for model studies and correspondence with the relevant organization is going on. A good number of soil, water, sediment and construction material samples are received from different projects of Bangladesh Water Development Board (BWDB) and other organizations. These samples are tested with the sophisticated laboratory equipment of RRI as routine works of Geo-technical Research Directorate. The results and findings are sent to the project authorities concerned. Recently, many pieces of equipment have been procured under IDCB project (Phase-II) for Geo-technical Research Directorate as well as Hydraulic Research Directorate. In addition, the operation and maintenance activities of office and residential buildings, roads, rest house, vehicles, water supply system, sewerage system, power distribution system including power generator etc. are routinely done as presented under the section Administration and Finance Directorate.

Qualified and trained personnel are very much essential to meet the objectives of RRI and maintain its standard to the international level. For this purpose, a number of officials have already been completed their higher studies and obtained training in the related fields at home and abroad. Many others are expected to be trained in the near future. At present RRI has shortage of junior officers to undertake more responsibilities. For this reason, recruitment of junior officials is under consideration. The existing manpower is, however, well experienced and well trained in the field of hydraulic, geotechnical and environmental engineering. Detailed list of existing scientists, supporting and managerial staffs is shown in Annexures. List of abbreviations is shown in the Annexures. RRI has been publishing journal yearly named "Technical Journal" since 1991. RRI's technical journal got recognition in 2000 by ISSN - International Centre, 20, rue Bachaumont, 75002 Paris - France and its serial has been registered as ISSN 1606-9277 with key- title: Technical journal-River Research Institute. Multidisciplinary research activities and case studies of different water resources projects are published in the journal. RRI has also been publishing Newsletter quarterly.

RRI undertakes sports and cultural activities and observes all national days. RRI officials and staffs along with their families take part spontaneously in the sports and cultural activities. In addition, RRI takes part in different world and international days such as "World Water Day" and different national program taken by the government



## HYDRAULIC RESEARCH DIRECTORATE

The Hydraulic Research Directorate has three divisions such as (i) River and Coastal Hydraulics (ii) Hydraulic Structure and Irrigation and (iii) Mathematical Model. These three divisions carry out studies and research work in the field of flood control and drainage, river training and bank protection, coastal engineering, hydraulic structure and irrigation etc. by means of physical and mathematical modelling along with other laboratory testing and studies. This directorate is well equipped with physical and mathematical modelling facilities.

### (i) River and Coastal Hydraulics Division

This division conducts studies and researches related to river training, river erosion, bank protection, flood control, river engineering, river sediment control, river estuary, tidal phenomena etc. by means of physical modelling. Local scour, 3-dimensional flow phenomena like eddy and vortex, morphological processes and developments etc. are only possible to reproduce well in the physical model. Moreover, the real phenomena that are happening in the field can only be visualized by physical modelling. This

division also involves mathematical modelling of river and coastal-related problems.

### (ii) Hydraulic Structure and Irrigation Division

This division conducts studies and researches to determine the proper alignment of different hydraulic structures related to civil engineering such as bridge, barrage, sluice, culvert, groyne, revetment etc as well as verify the design parameters through physical modelling. The physical processes/phenomena, which are not possible to describe well by empirical formula or mathematical expression, can easily be reproduced precisely in physical model. This division also involves mathematical modelling related to hydraulic structure & irrigation.

### (iii) Mathematical Modelling Division

RRI conducts hydrological and morphological studies in the fields of flood control and drainage, river training and bank protection, coastal engineering, hydraulic structure and irrigation etc. through mathematical modelling.

Mathematical modelling is complementary to physical modelling for the correlation of results and also for any sound engineering judgment. It is a very useful tool for research and studies and also for the sustainable development of water resources projects.

### Physical Modelling

Physical modelling is an authentic tool, which can be used confidently to verify the effectiveness of any structural intervention in the river and coastline protection works by reproducing the natural phenomena of river and coastal hydro-morphology at a reduced scale. The causes of any river and coastal engineering problems are identified and its mitigation measures are investigated through physical modelling. Local scour, 3-dimensional flow phenomena like eddy and vortex, morphological processes and developments etc. are possible to reproduce well in physical model. The important design parameters such as

local scour around the structure, flow field, maximum velocity, appropriate location, dimension and orientation of hydraulic structures, spacing between groyne/spur like structures etc. can also be obtained by physical modelling. The physical process/phenomena, which are not possible to describe well by empirical formula and mathematical expression, can be easily reproduced precisely in physical modelling. Moreover, the real phenomena that are happening in the field can only be visualized by physical modelling. RRI has sufficient physical modeling facilities including indoor and outdoor model areas. Other available facilities include various measuring instruments, tide generator, wave generator, sediment feeder, power generator, workshop etc. So far, more than two hundred Physical model studies of different projects have been conducted by the Hydraulic Research Directorate since 1948. Some of the important Physical model studies carried out at RRI are given below.

Name of the project	Year of completion	Objectives of the physical modelling
Physical modeling component of the "Feasibility Study for Rehabilitation of Muhuri-Kahua Flood Control, Drainage and Irrigation Project in Feni District	2025	To investigate the appropriate alignment and determine the optimum design parameters and dimensions of the flood bypass.
Consultancy Services for Assessing the Future Course of surrounding Rivers beside the Proposed Solar Power Plant Project on 386.44 acre land at Sonagazi, Feni for EGCB Ltd.	2025	To assess erosion, accretion, and river channel shifting at and around the project area, and to predict future trends in river course shifting.
Physical Modelling Work for Rajshahi WASA Surface Water Treatment Plant Project	2024	To investigate suitability and sustainability of the proposed intake structure location as well as the sustainability of the river channel in terms of availability of flow round the year.
Physical Modelling in connection with "Detailed Study for Restoration and Development of Water Resources Management System of Polder 31 under Dacope Upazila in Khulna District"	2024	To investigate sediment transport and design sustainable solutions using physical modelling.
Physical Modelling to Support Feasibility Study for Augmentation, Conservation and Wise Use of Surface Water Resources through Dredging of the Upstream of Teesta Barrage and Bank Protection Work of the Teesta River in Kurigram District	2023	To investigate the feasibility of augmentation and conservation of surface water resources through the dredging of the upstream of Teesta barrage
The consulting services for Physical Modeling Study for Feasibility Study for the Management of Karatoa River System and Rehabilitation of FCD Projects on Both Bank of Nagar River in Bogura District	2023	To investigate the efficacy of dredging options, strategies and spoil disposal plan
Physical Modeling Study for feasibility Study for the Management of the Brahmaputra and Jinjiram River Basin Through Flood Control, Drainage Facility and Bank Protection in Kurigram District	2023	To investigate the efficacy of dredging options, strategies and spoil disposal plan

Sustainability of the Buriganga River Restoration Project (Revised)	2021	To augment 141 cumec dry season flow in the Buriganga river by diverting 245 cumec water from the Jamuna river through the New Dhaleswari-Pungli-Bangshi-Turag-Buriganga river system.
Padma River Dredging Management Project	2019	To investigate the efficacy of dredging options, strategies and spoil disposal plan
Sustainability of the Buriganga River Restoration Project	2019	To finalize the layout of the off-take structure such as guide bund, intake canal and sedimentation basin in order to get required discharge in Dhaleswari River.
Bangabandhu Railway Bridge Project	2018	To determine the local scour around the proposed Bangabandhu Railway Bridge pier and to check the efficacy of the existing RTW with proposed railway bridge pier.
Laboratory Based Study Using Concrete Block Mats to control River Bank	2018	To determine the cost effectiveness and sustainability of Concrete Block Mats compared to traditional method of river bank protection.
Paira Bridge Project	2016	To finalize the type, location, dimension and hydraulic design parameters of the proposed river training works
Ganges barrage project	2013	To finalize the location, effectiveness and design parameters of the proposed barrage.
Padma multipurpose Bridge project	2013	To check the efficacy of river training structure.
3 <sup>rd</sup> Karnaphully bridge project	2006	To decide the effectiveness and design parameters of bridge piers.
Gorai river restoration project	2001	To find out the suitable options for sustainable measures
Bangabandhu multipurpose bridge project	2000	To find out the efficacy of river training structure and to solve instantly arising any difficulties during the period of erection.
Paksey roadway bridge project	1996	To verify the efficacy of river training structure.
Silt trap model for Teesta barrage project	1994	To finalize the effectiveness and design parameters of the barrage component.

### Physical model studies conducted at RRI during the financial year 2024-2025

#### Physical modeling component of the "Feasibility Study for Rehabilitation of Muhuri-Kahua Flood Control, Drainage and Irrigation Project in Feni District

The Muhuri-Kahua Flood Control, Drainage and Irrigation (MKFCDI) Project extends over Parashuram, Fulgazi, Feni Sadar and Chaganaiya upazilas of Feni District, covering the basin areas of the Muhuri, Kahua and Selonia rivers. These rivers, along with their tributaries, chharas and internal khals, form the region's drainage network. Intense monsoon rainfall from upstream, outside Bangladesh, often leads to sudden and destructive flash floods, causing major losses to

agriculture and local infrastructure. To find effective solutions, Bangladesh Water Development Board (BWDB) commissioned River Research Institute (RRI) to conduct a physical modelling study as part of the project's rehabilitation feasibility assessment. Based on preliminary analysis, two undistorted models, a flood bypass model (scale 1:50) and a loop-cut model (scale 1:75) have been selected considering the river dimensions within the project area.



### Objective of the Study

The primary objective of the study is to identify the existing challenges of the Muhuri Kahua FCDI Project and develop sustainable solutions and a rehabilitation plan for the project. The specific objectives of the study are as follows:

- To investigate the appropriate alignment of the flood bypass;
- To determine the optimum design parameters and dimensions of the flood bypass;
- To identify the suitable location of loop cuts;
- To assess the long-term sustainability of flood bypass and loop cuts; and

- To identify the protective work for the proposed interventions.

In this model, calibration tests and base runs were conducted for both the Muhuri and Selonia rivers to evaluate model performance under bankfull/dominant discharge as well as the associated water levels conditions. Subsequently, a series of test runs were performed to assess the hydraulic and morphological effectiveness of flood bypass and loop cut interventions under 50-year and 100-year return period discharges, along with their corresponding water levels. A nine-gated regulator was installed at the flood bypass to facilitate controlled diversion of flow from the Muhuri River to the Selonia River.

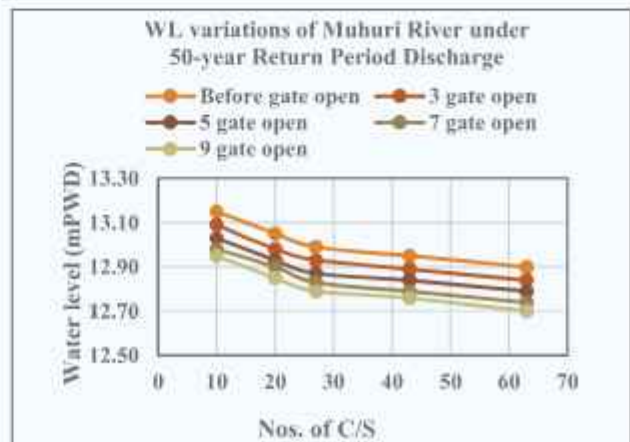
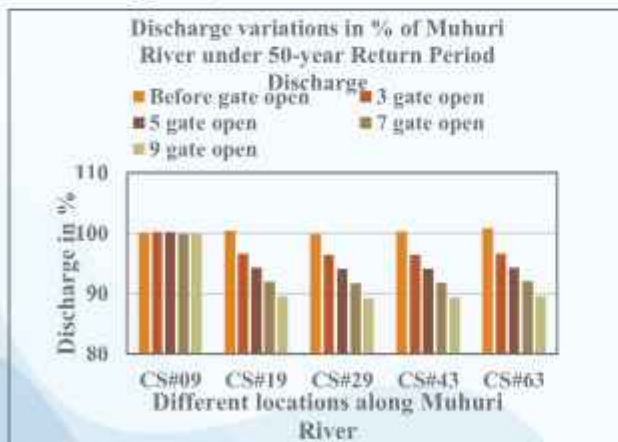


Figure: Discharge and water level variations in Muhuri River under 50-year return period discharge

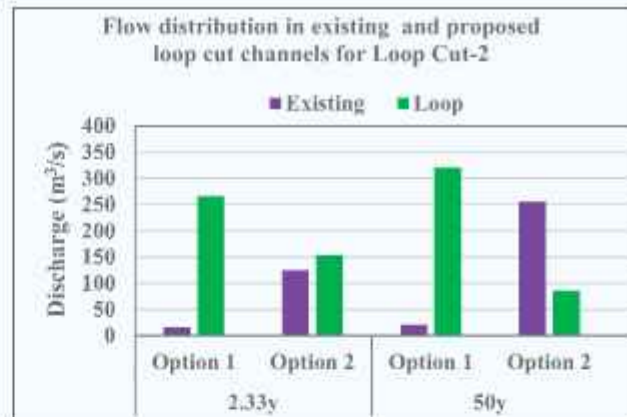
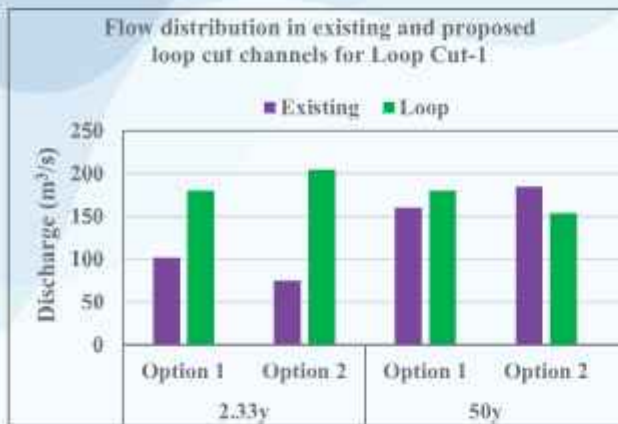


Figure: Flow distribution for different options of Loop Cut-1 and Loop Cut-2

### Conclusions

The following conclusions have been drawn based on the gained understanding and outcomes of the physical model study.

- In extreme events (50 & 100 year discharge), main channel velocity changes little as excess flow is distributed across adjacent floodplains.
- With the flood-bypass at 50-yr discharge, downstream velocity decreases 16–25% in the Muhuri River but slightly increases in the Selonia River compared to the base condition.
- With nine gates open at 50-yr discharge, the flood bypass reduces Muhuri River flow by about 12% and water level by about 20 cm, while Selonia River flow and water level increase by about 50% and 50 cm, respectively, compared to the base condition.
- With nine gates open at 100-yr discharge, Muhuri River flow and flood level in the immediate downstream of the flood bypass decrease by about 11.5% (45 m³/s) and 27 cm, respectively, while Selonia River flow and flood level increase by about 39% and 60 cm compared to the base condition.
- The left bank of the Selonia River, downstream of the proposed works, may experience approximately 50 m of erosion, and the embankment may need to be raised to prevent overtopping from increased flood levels.
- In Loop Cut 1, Option 1 involves a 320 m channel with 60,000 m³ of soil removal, while Option 2 involves a 150 m channel with 26,000 m³ of soil removal.
- In Loop Cut 2, Option 1 involves a 260 m channel with 36,000 m³ of soil removal, while Option 2 involves a 260 m channel with 19,000 m³ of soil removal.

- In Loop Cut 1, the cut-off channel velocity increases over time, with potential downstream erosion; 64% of the 2.33-yr flow passes through Option 1 and 45% of the 50-yr flow through Option 2.
- In Loop Cut 2, Option 1 directs about 90% of 2.33 yr flow through the cut-off channel, risking bed and bank erosion and potential abandonment of the old channel, while Option 2 directs about 25% of 50 yr flow, making the cut-off less effective and prone to siltation.

### Recommendations

The following recommendations have been made concerning the implementation of the proposed flood bypass and loop-cuts:

- The flood bypass, as designed, may be implemented.
- For loop-cut at the proposed two locations, Option-1 of loop-cut channel may be considered for implementation.
- There is sedimentation potential in front of the flow regulator of flood bypass channel. Therefore, to ensure smooth flow diversion during flood period, monitoring of such sediment deposition is necessary for deciding about the removal of sediment through dredging;
- Routine inspections and maintenance of the control gates, embankments, bed and bank protection measures of the flood bypass channel should be conducted to prevent failures.

- Provision of bank stabilization beyond the proposed bank protection works of the Selonia River should be considered.
- The height of the existing embankment of the Selonia river in the downstream of the flood bypass may have to be adjusted to avoid potential overtopping caused by increased flood level.
- The morphological developments within the loop-cut channel in terms of bed and bank erosion should be monitored closely.
- Bank erosion situation in the immediate upstream and downstream of the cut-off channel should be monitored, and bank protection measures should be taken to arrest such bank erosion if necessary.
- Hydrodynamic assessment of gradual shift in the flow distribution between the cut-off channel and the old channel with time may be considered; and
- Technical assistance of RRI may be sought during the implementation of the proposed measures.

**Consultancy Services for Assessing the Future Course of surrounding Rivers beside the Proposed Solar Power Plant Project on 386.44 acre land at Sonagazi, Feni for EGCB Ltd.**

**Background**

The River Research Institute (RRI) conducted a comprehensive hydro-morphological study for the Electricity Generation Company of Bangladesh Ltd. (EGCB). The study assessed the stability of 386.44 acres of land proposed for the extension of existing solar power plant adjacent to the Little Feni River. to evaluate long-term river course dynamics. The title of the study was "Consultancy Services for Assessing the Future Course of surrounding Rivers beside the Proposed Solar Power Plant Project on 386.44 acre land at Sonagazi, Feni for EGCB Ltd".

The site lies in an active deltaic coastal zone, bounded by the Little Feni River, Feni River, and the Sandwip Channel, all tidally influenced and morphologically dynamic. Previous infrastructure such as the Musapur Closure Dam (2016) and its 23-vent regulator (collapsed in Aug 2024) has altered local river flow and sedimentation patterns. The area is also exposed to tidal flooding, storm surges, and salinity intrusion.

**Objectives**

The Objectives of the Study were as follows

- Assessment of erosion, accretion, and river channel shifting at and around the project area;
- Prediction of future trends in river course shifting;
- Assessment of the stability of the land to be acquired for the proposed solar power plant against erosion; and
- Suggesting sustainable erosion management measures if necessary to safeguard the proposed solar power plant's infrastructures against fluvial hazards, ensuring the project's resilience and environmental compatibility.

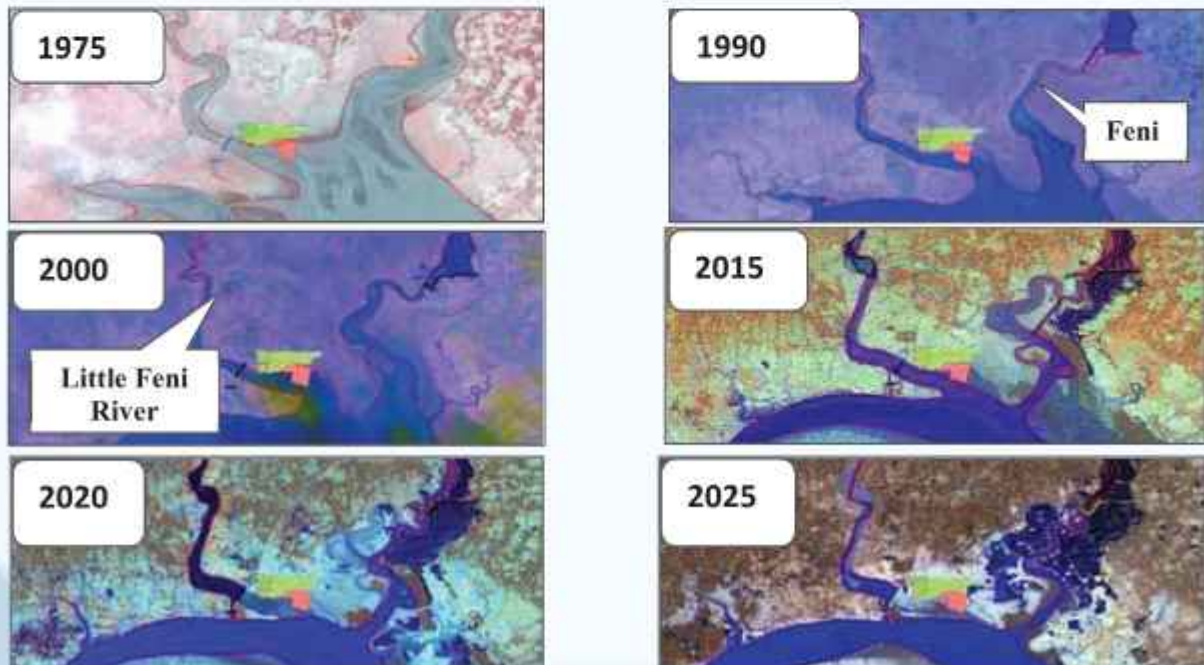


Figure 1: Historical river channel positions at and around the project area



Figure: Bankline's of the Lower Feni river in the year 1985, 2007 and 2016

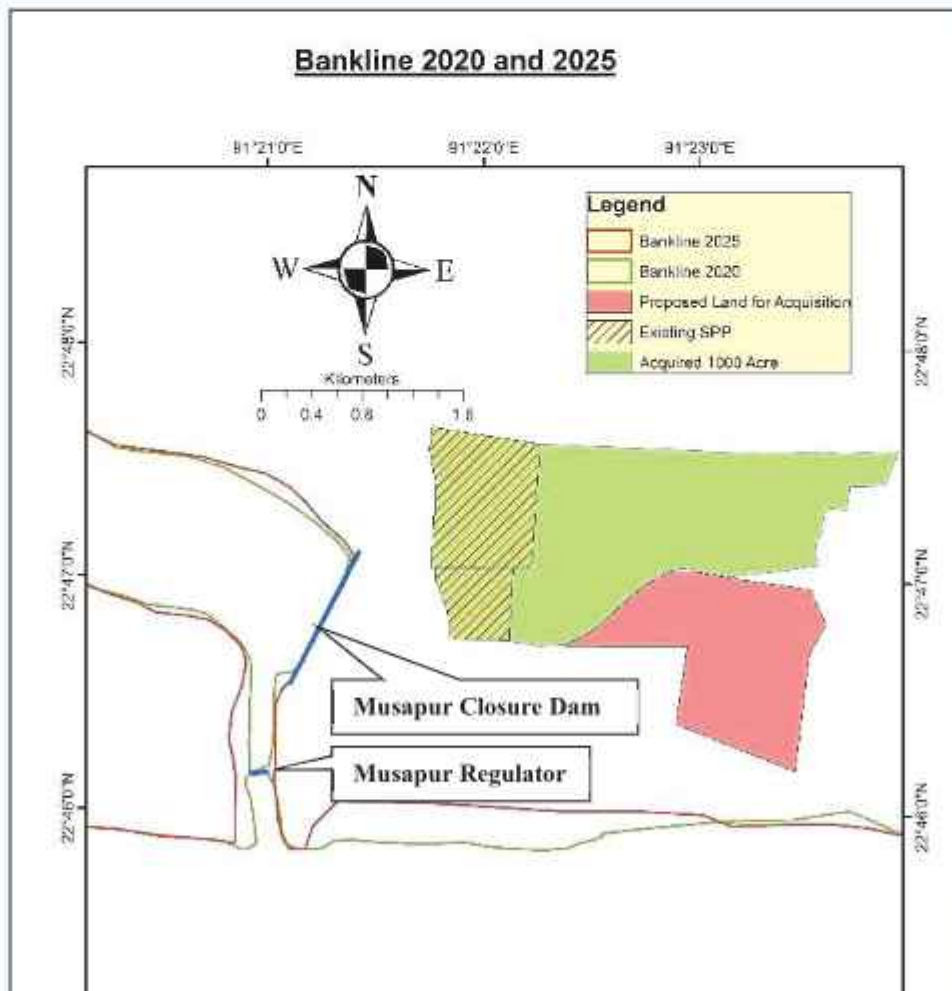


Figure: Immediate effect of the collapse of Musapur regulator on bank erosion at nearby locations

## Conclusions

The project site is at a safe distance from both the Feni and Little Feni rivers; no imminent threat of channel migration exists under current conditions.

Collapse of the Musapur regulator increased localized erosion but is unlikely to revert the Little Feni River to its former downstream course.

The Sandwip Channel shows historical shifts, but recent trends near the project area are stable and in some locations accretionary.

The Feni River has shifted away from the site and experienced outfall shrinkage, creating favorable land accretion.

The area is vulnerable to tidal, riverine, and storm surge flooding, requiring climate-resilient protective measures.

## Important Mathematical model studies conducted at RRI in the past

Detail Engineering Design of Kurigram Irrigation Project (South Unit).

Wazed Miah Bridge project in Rangpur District under Rangpur Road Division of RHD.

Road Bridge over the Banar River on Mymensingh-Goffargaon-Toke Road in Mymensingh District under Mymensingh Road Division of RHD.

Road Bridge over the river Lohalia at Boga in Patuakhali District under Patuakhali Road Division of RHD.

Hydro-morphological Study for Pagla-J agannathpur-Raniganj- Aushkandi Road Project in Sunamganj District under Sunamganj Road Division of RHD.

Road Bridge over the Kalni River in Habiganj District under Habiganj Road Division of RHD.

Road Bridge at Nalua-Baherchar over the river Pandab-Paira in Patuakhali District under Patuakhali Road Division of RHD.

Road Bridge over the Monu River in Moulvibazar District under Moulvibazar Road Division of RHD.

Hydro-Morphological Study for the Proposed Laxmipasha bridge at 23rd km of Barishal (Dinarer Pool)- Laxmipasha-Dumki Highway (Z-8044) on the Porar Dhon River under Roads and Highways Department (RHD).

Hydro Morphological Study for the Proposed Banaripara bridge at 2nd km of Banaripara-Najirpur Highway (Z-7710) on the Sandha river under Roads and Highways Department (RHD)

Hydro Morphological Study for the Proposed Atul Nagar Ghat Bridge at 28th km of Pirojpur- Najirpur- Matibhanga-Patgati-Gonapara Highway (Z-7704) on the Kaliganga River under RHD

## Recommendations

Construct continuous earthen embankments (min. crest level 7.5 mPWD) with CC block protection on tidal/storm-facing slopes.

- Develop internal drainage with sluice/flap gates and pumping facilities; include retention ponds.
- Apply bioengineering and hard measures where necessary; current river training not required.
- Prefer naturally higher ground/elevated platforms; account for sea level rise and storm surge.
- Maintain ongoing surveillance of river morphology for adaptive management.

Hydro Morphological Study for the Proposed Bishkhali Bridge at 6th km of Binapani- Kachua- Betagi- Mirjaganj- Patuakhali Highway (Z-8052) on the Bishkhali river under RHD



Picture: Beauty of Nature in RRI



## GEO-TECHNICAL RESEARCH DIRECTORATE

Geo-technical Research Directorate comprises of three divisions. These are Soil Mechanics and Groundwater Division, Material Testing & Quality Control division and

Sediment, Chemical & Water pollution division. The scope of works and facilities available in each division are narrated in the following sections.

### SOIL MECHANICS AND GROUND WATER DIVISION

Soil Mechanics and Groundwater Eastern and Western Zone of Geo-technical Research Directorate is an utmost important wing of RRI. It has been conducting tests and research work for the determination of different physical parameters of soils which are required for planning and design of the infrastructures of flood control, irrigation, drainage, water development and other development projects. Ground Water Circle (GWC) of BWDB and other organizations explore site and complete their boring and collect soil samples from different project sites in connection with construction of hydraulic structures like bridges, dams, barrages, regulators, sluices, weirs, flood control and river training works and other relevant works. Site investigation and boring logs are prepared by them are sent to RRI with collected samples. RRI has developed sufficient laboratory facilities for testing of soil samples received from the clients. The soil samples of these zones are tested with great care by the scientists and trained / skilled soil technicians. Finally, the reports on the tested soil samples are prepared based on field investigation and laboratory analysis of data. The reports focus on the

engineering characteristics of the soil samples according to the foundation needs. Then the approved report is sent to the respective clients along with bill. The works executed in connection with soil testing, analysis and publication of reports during 2024-2025 have been discussed briefly in this section.

#### Receiving procedure of soil samples

The disturbed soil samples were collected by driving split spoon sampler and undisturbed soil samples in Shelby tubes by the clients and sent to the Soil Mechanics and Groundwater laboratory of Geo-technical Research Directorate of RRI. A total 9 nos. of samples from GWC of BWDB and other organizations in fiscal year 2024-2025 were received in the laboratory. All the samples were tested and reports were sent to the respective clients.

#### Testing of soil samples

At first all the soil samples are visually examined in the laboratory and representative samples are selected for necessary testing. Generally, tests are conducted for

determining Natural Moisture Content (NMC), Grain Size Distribution, Atterberg Limits, Density ( $\gamma_d$ ), Void Ratio ( $e$ ), Compression Index ( $C_c$ ), Unconfined Compressive Strength ( $q_u$ ), Shear Strength (cohesion  $c$  and angle of internal friction  $\Phi$ ), by Direct Shear, Tri-axial Shear with or without pore pressure, California Bearing Ratio (CBR) value and

Permeability value etc. As per planned schedule, different tests are performed simultaneously in order to work out all necessary parameters quickly within the shortest possible time. Other necessary soil parameters are also tested according to client's requirements.



Photo: Soil sample preparation for particle size analysis and permeability testing at Soil Mechanics Laboratory of RRI

**List of samples received (project-wise in chart), billed amount and volume of work executed during 2024-2025 fiscal year in Soil Mechanics & Ground Water Division**

Sl No.	Report No.	Name of Division / Client	Name of Project/ Work	No. of Sample Received & Tested	Billed amount (Taka)
01	01 (2024-2025)	Managing Director The National Soil Engineers, Old Taltala, Dhaka-1207.	Triaxial Shear test for undisturbed soil samples from Dhaka water supply and Sewerage Authority, Dhaka.	02	57000.00
02	02 (2024-2025)	-Do-	DWASA SSCP 101 Project for water supply & sewerage Authority (DWASA).	02	57000.00
03	03 (2024-2025)	Sub-Divisional Engineer Water Development Sub- Division-01 BWDB, Kushtia.	"Gorai River dredging & Bank Protection" Project under Kushtia O & M Division, BWDB, Kushtia during the Fiscal Year- 2022-23. Tender ID No. 829515 & Package No. GRDP-W 13. Protective work along the Right Bank of Gorai River from Km. 14.700 to Km. 15.050 = 0.350 Km at Chapra, Upazila: Kumarkhali, District: Kushtia in c/w	01	5250.00
04	04 (2024-2025)	Director, River Delta and Sub- Divisional Engineer, Kushtia WD Sub-Division- 1, BWDB, Kushtia.	"Gorai River dredging & Bank Protection" Project under Kushtia O & M Division, BWDB, Kushtia during the year- 2022-23. (Tender ID No. 829514 & package No. GRDP-W12).	04	55350.00
				<b>Total =</b>	<b>1,74,600.00</b>



Photo: Young university students explore laboratories of Geotechnical Research Directorate of RRI, gaining first-hand experience and inspiration from scientific facilities.

## MATERIAL TESTING AND QUALITY CONTROL DIVISION

The Material Testing and Quality Control discipline of Geo-technical Research Directorate deals with the determination of physical and engineering properties of concrete and concrete materials normally used for different types of river training works, hydraulic structures and other infrastructures. It also involves 'Laboratory Trial Mix' and computation of concrete mix design to

attend particular design strength with materials to be used in the construction works. At present this discipline has two types of working facilities viz. laboratory-oriented testing & research facilities and the other is monitoring & evaluation of construction works by conducting field tests and investigations for quality control of concrete to the ongoing projects.

### Laboratory activities in 2024-2025 fiscal year

#### Category-wise list of samples received from different BWDB Divisions and other organizations during the fiscal year 2024-2025

Sl. No.	Name of division/ Other organization/ Field laboratory	Cement	Sand	Stone/ Khoa	Concrete cylinder	MS Rod	Total sample	Sample Tested
1	Boalmari WD Sub Division, BWDB, Faridpur	11	19	17	-	-	47	62
2	Bhanga WD Sub Division, BWDB, Faridpur	5	10	8	-	-	23	27
3	Shariatpur O&M Division, BWDB, Shariatpur	7	7	7	-	-	21	35
4	Faridpur WD Sub Division, BWDB, Faridpur	5	7	5	-	-	17	22
5	Magura O&M Division, BWDB, Magura	1	4	1	3	-	9	26
6	Gopalganj O&M Division, BWDB, Gopalganj	2	4	2	-	-	8	12
7	Baliakandi O&M Sub Division, BWDB, Rajbari	1	2	1	-	-	4	4
8	Naria WD Sub Division, BWDB, Shariatpur	1	1	1	-	-	3	5
9	Madaripur O&M Division, BWDB, Madaripur	-	-	-	-	2	2	6
	<b>Total</b>	<b>33</b>	<b>54</b>	<b>42</b>	<b>3</b>	<b>2</b>	<b>134</b>	<b>205</b>

Name of the Projects, total no. of samples received and billed amount & recovery amount of different BWDB Divisions and other organization during the fiscal year 2024-2025.

Sl. No.	Name of division/Other organization/ Field laboratory	Total sample	Total nos. of sample tested	Billed amount including VAT (In Taka)	Recovery including VAT (In Taka)
1	Boalmari WD Sub Division, BWDB, Faridpur	47	62	275500	275500
2	Bhanga WD Sub Division, BWDB, Faridpur	23	27	126450	126450
3	Shariatpur O&M Division, BWDB, Shariatpur	21	35	64125	64125
4	Faridpur WD Sub Division, BWDB, Faridpur	17	22	102475	102475
5	Magura O&M Division, BWDB, Magura	9	26	38700	38700
6	Gopalganj O&M Division, BWDB, Gopalganj	8	12	48450	48450
7	Baliakandi O&M Sub Division, BWDB, Rajbari	4	4	24225	24225
8	Naria WD Sub Division, BWDB, Shariatpur	3	5	106875	106875
9	Madaripur O&M Division, BWDB, Madaripur	2	6	3750	3750
Total		134	205	790550.00	7,90,550.00



Photo: Supervision and guiding the technicians by the officer during the Compressive Strength test (left) and Cement test (right) at the Material Testing and Quality Control laboratory

#### Field services (Deputation of Technicians)

For quality control of works, a few numbers of trained technicians were deputed in the field in response to the request from the project authority. During the fiscal year

2024-2025, three number of technicians were deputed in the different work sites of BWDB.

## SEDIMENT, CHEMICAL AND WATER POLLUTION DIVISION

Sediment, Chemical and Water Pollution division is one of the important testing and research discipline of Geo-technical Research Directorate of RRI. There are two laboratories under this division, namely Sediment Technology laboratory and Chemical and Water Pollution laboratory. Test and analysis of various kinds of sediment samples of different rivers of Bangladesh are being carried out in the Sediment Technology laboratory. The test results

are used for planning and designing of hydraulic structures like barrages, drainage channels, irrigation canals, flushing sluices, closures etc. Sediment testing results are also used in physical and mathematical model studies. In the chemical and water pollution laboratory, samples of surface and ground water are being analysed for using water in different purposes.

### Test activities during 2024-2025 fiscal year

A total number of 1203 samples including general suspended sediment, bulk suspended sediment, river bed and bank soil samples and water samples were received and tested in the sediment technology laboratory as well as chemical laboratory during the fiscal year 2024-2025. The general suspended sediment and bulk suspended sediment

samples were collected by the field personnel of 4 (four) measurement divisions under the Surface Water Hydrology Circle-I of BWDB. The samples were collected as a routine work by the Surface Water Hydrology Circle-I of BWDB. A total of 45 reports were published from this division during 2024-2025 fiscal year.

### Testing Facilities in Chemical and Water Pollution Laboratory

The Chemical and Water Pollution laboratory is well equipped laboratory with modern instruments. Recently RRI has procured Particle size analyzer, Total Organic Carbon (TOC) analyzer, Carbon-Hydrogen- Nitrogen-Sulphur (CHNS) analyzer, Computerized Microscope Stemi 305 and Portable Air Monitoring System with rain gauge for Chemical Laboratory under Institutional Development and Capacity Building (IDCB) Project (Phase-II). These equipment are designed with cutting-edge technology and are ideal for a wide range of applications including environmental, materials, geological, food safety, clinical, petrochemicals and agricultural purposes.

and water samples. Hach portable colorimeter is used to detect substances in the field as Hach spectrometer does in the laboratory. Portable Multiparameter meter is used to determine pH, DO, EC, TDS, Salinity, etc. from the river. Aqua-culture kit is used to measure Ammonia, Cl<sup>-</sup>, CO<sub>2</sub>, Hardness, etc. Digital Turbidity meter can be used in this Laboratory to detect turbidity of water samples. TOC analyzer is used to determine the organic and inorganic carbon for water and wastewater samples in mg/l. Particle Size Analyzer is used to determine the particle size soil and sediment samples from 10 nm to 3500 nm. CHNS Analyzer is used to determine the percentage of soil, sediment and water samples. Besides these, the following facilities also exist in the Chemical and Water Pollution laboratory:

Portable Air Monitoring System with rain gauge (HAZ SCANNER, Model: HIM-600) is mainly used for EIA purpose. It is noticed that it is used specifically to determine Air particulate matters, humidity, temperature, wind speed with direction etc. Computerized Microscope Stemi 305 is used to determine shape & particle size of soil, bio-physical organism of water samples such as phytoplankton, Zoo plankton etc. Hach Spectrophotometer is used to detect substances such as Al, Ba, B, Cd, Cr, Mg, Fe, Cl, C, Ni, Fl, SO<sub>4</sub>, etc. in soil, sediment

- Determination of pH, arsenic, Salinity electrical conductivity, turbidity, free carbon di-oxide, bi-carbonate, sulphate, chloride, nitrate, sodium chloride, total solid content, hardness, calcium, magnesium, iron, silica, total dissolved solid, dissolved oxygen etc.

### Revenue Earned from Sediment, Chemical and Water pollution division

A total of Tk. 789625.00 has been billed during the fiscal year 2024-2025 for testing of sediment and water samples. In total Tk. 816925.00 has been received in this fiscal year 2024-2025 where TK. 789625.00 is from current and

remaining amount from previous fiscal years. A total of Tk. 4058.00 is remaining unpaid up to June 2025 from clients of BWDB



Photo: Quantifying the biochemical parameters of water samples in Kumar River at Bhanga Faridpur (left) and at the Chemical laboratory of RRI (right).

## GEOTECHNICAL LABORATORY, DHAKA OFFICE

A Laboratory was established in October 2021 at 72 Green Road, Dhaka-1205 named Dhaka Laboratory. The laboratory was initially established in a small scale with well-equipped facilities to test soil, sand, sediment, water, and cement samples. In September 2024, RRI has acquired a new four stored building in the 72 Green Road campus and established various laboratories on the ground floor of that building. The main laboratories focus on the geotechnical and environmental research, hence naming the laboratory as "Geotechnical and Environmental Research Laboratory". So far, there have been many

specialized laboratories established under this Geotechnical and Environmental Research Laboratory, such as, Physical and Nutrient Environmental Laboratory, Metal and Elemental Analysis Laboratory, Microbiological Environmental Laboratory, Sediment Laboratory, Water Treatment Materials Research Laboratory, Materials Synthesis and Sample Preparation Laboratory, Soil Mechanics Laboratory, Materials Testing and Quality Control Laboratory. A brief description of the laboratories has been given below:

### Physical and Nutrient Environmental Laboratory

The Physical and Nutrient Environmental Laboratory is dedicated to comprehensive water quality and nutrient assessment, equipped with advanced instruments such as the Shimadzu TOC Analyzer, HACH DR1900 Spectrophotometer, HACH HQ30D Multi-parameter Meter, Lutron Turbidity Meter, Shimadzu Precision Balance, Magnetic Stirrer, and Titration Unit. The laboratory routinely conducts a wide spectrum of physicochemical and nutrient analyses, including temperature, pH, electrical conductivity, salinity, Total Dissolved Solids (TDS), Dissolved Oxygen (DO), turbidity, odor, and color (true/apparent). In addition, it evaluates key ionic and nutrient parameters such as alkalinity, total hardness, Ca- and Mg-hardness, carbon dioxide/acidity, carbonate/bicarbonate balance, sulphate, orthophosphate, and total phosphorus, along with halide

and halogen contents like chloride, fluoride, chlorine (free/total), iodine, and bromine. Nitrogen species including ammonia-nitrogen, nitrate-nitrogen, and nitrite-nitrogen are also routinely analyzed, alongside trace elements such as iron (total, ferrous, ferric), silica, manganese, and arsenic (kit method). The integration of the TOC analyzer enables accurate determination of Total Organic Carbon (TOC) and Dissolved Organic Carbon (DOC), which are critical indicators of organic pollution and treatment efficiency. Collectively, these capabilities make the laboratory a vital resource for monitoring drinking water quality, wastewater characterization, surface and groundwater assessment, and nutrient load evaluation, thereby supporting both environmental research and applied water management practices.



Photo: Some equipment of Physical and Nutrient Environmental Laboratory (a) TOC Analyzer, (b) Spectrophotometer, COD Reactor and Balance.

### Metal and Elemental Analysis Laboratory

The Metal and Elemental Analysis Laboratory focuses on the precise characterization of elemental composition in environmental and material samples. It is currently equipped with a PerkinElmer CHNS/O Analyzer, which enables accurate determination of carbon, hydrogen, nitrogen, sulfur, and oxygen contents in soils, sediments, biochar, and synthesized adsorbents, thereby providing critical insights into organic matter quality, nutrient cycling, and material performance. In addition, the laboratory is in the process of procuring an Inductively Coupled Plasma-Optical Emission Spectrometer (ICP-OES), a high-sensitivity instrument designed for

multi-element and heavy metal analysis in water, soil, sediment, and industrial effluents. Once established, ICP-OES will facilitate simultaneous quantification of toxic metals such as arsenic, lead, cadmium, chromium, nickel, copper, and zinc, which are of significant concern in environmental pollution and public health. Together, these analytical capabilities position the laboratory as a core facility for elemental profiling, pollutant monitoring, material characterization, and compliance testing, supporting both advanced environmental research and regulatory applications.



Photo: Some equipment of Metal and Elemental Analysis Laboratory, (a) CHNS/O Analyzer, (b) Microwave Digester

### Microbiological Environmental Laboratory

The Microbiological Environmental Laboratory specializes in the assessment of microbial contamination and organic pollution in environmental samples, particularly water and wastewater. Core analyses include Total Coliform, Escherichia coli (E. coli), Fecal Coliform (F. Coli) as indicators of pathogenic contamination, along with Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) as key measures of organic load and pollution strength. The laboratory is equipped with a HACH BOD Trak II system with dedicated BOD

incubator for automated oxygen demand monitoring, a HACH DRB 200 COD Reactor for rapid COD digestion, and an Euromax Microscope for direct microbial observation. Supporting equipment such as an autoclave ensures sterilization of media and glassware, while a wide range of microbiological media and reagents enable reliable culture-based assays. Collectively, these capabilities make the laboratory essential for microbial water quality assessment, wastewater treatment monitoring, and environmental health studies.



Photo: Some equipment of Microbiological Environmental Laboratory, (a) BOD Incubator and Trak, (b) Microscopes

### Sediment Laboratory

The Sediment Laboratory is dedicated to the analysis of physical and compositional properties of sediments, which are critical indicators of erosion, deposition, and environmental pollution. Key analyses include sediment concentration, specific gravity, grain size distribution (via sieve and hydrometer methods), and organic matter content. The laboratory is equipped with a vacuum filtration unit for sample preparation and separation, a Constance Muffle Furnace for ignition loss and organic

matter determination, and a Constance Oven for drying and moisture analysis. For particle size characterization, the facility houses a Controls Sieve Shaker with a full sieve set and a soil hydrometer. These resources enable the laboratory to support studies on sediment transport, soil erosion, riverbed and coastal processes, as well as contamination assessment in aquatic environments, making it a vital unit for both environmental monitoring and geotechnical research.



Photo: Some equipment of Sediment Laboratory. (a) Vacuum Filtration Unit, (b) Oven, Hydrometer, etc.

### Water Treatment Materials Research Laboratory

The Water Treatment Materials Research Laboratory is dedicated to the development and performance evaluation of advanced materials for environmental remediation. The laboratory primarily focuses on magnetic nanoparticles (MNPs), metal-organic frameworks (MOFs), and related composites for the removal of heavy metals and the degradation of organic dyes and emerging contaminants through adsorption and photocatalysis. To support these research activities, the facility is equipped with a solar simulator for controlled light-driven photocatalytic experiments, an orbital shaker for batch adsorption and

kinetic studies, and an ultrasonic bath for nanoparticle dispersion and synthesis support. In addition, Fourier Transform Infrared Spectroscopy (FT-IR) and UV-Visible spectrophotometers are in the process of being procured, which will enable detailed structural characterization and optical analysis of synthesized materials, as well as monitoring of pollutant removal efficiencies. Through this integrated approach, the laboratory serves as a hub for innovative water treatment research, bridging material synthesis with real-world application in water purification and environmental protection.

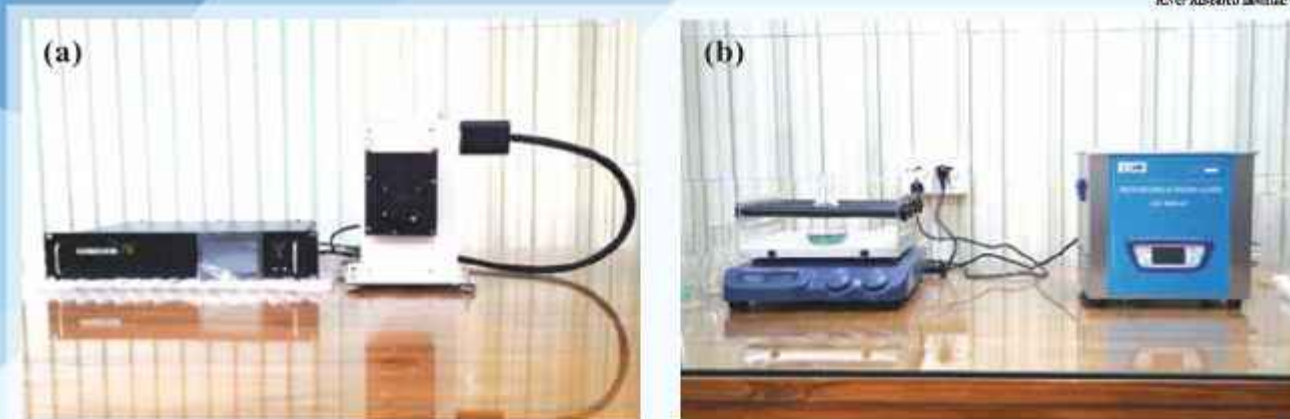


Photo: Some equipment of Water Treatment Materials Research Laboratory, (a) Solar Simulator (b) Orbital Shaker and Ultrasonic Bath.

### Materials Synthesis and Sample Preparation Laboratory

The Materials Synthesis and Sample Preparation Laboratory provides the core facilities for developing and processing advanced materials used in environmental applications, including adsorbents, catalysts, and nanostructured composites. The laboratory is equipped with a Labtron Microwave Digester for rapid and efficient digestion of solid and liquid samples, a Cryste Centrifuge for separation and purification of particulates, and a Faithful Tube Furnace for high-temperature synthesis and calcination of nanomaterials. Thermal processing and drying are supported by a JSR Vacuum Oven and Constance Convection Oven, while precise weighing is ensured with a Shimadzu Analytical Balance. Additional

preparation tools such as a DLab Vortex Mixer, MTops Hot Plate with Magnetic Stirrer, and a laboratory refrigerator enable versatile sample conditioning, reagent handling, and storage. Together with a wide range of reagents and consumables, the laboratory facilitates the controlled synthesis of magnetic nanoparticles, MOFs, hybrid composites, and bio-based materials, as well as their pre-treatment and modification for environmental remediation studies. These capabilities make the facility a vital support unit, bridging material synthesis with downstream testing in adsorption, photocatalysis, and water treatment research.



Photo: Some equipment of Materials Synthesis and Sample Preparation Laboratory, (a) Vacuum Oven, (b) Centrifuge, (c) Tube Furnace, (d) Analytical Balance, Vortex Machine, Hot Plate and Hydrothermal Autoclave.

### Soil Mechanics Laboratory

The Soil Mechanics Laboratory is designed to provide comprehensive testing of soil properties for both geotechnical engineering and environmental studies. The laboratory carries out a wide range of physical, mechanical, and chemical tests including Specific Gravity, Natural Moisture Content, Visual Inspection and Classification, Sieve Analysis, Hydrometer Analysis, Unit Weight, Loss-on-Ignition, Atterberg Limits (Liquid, Plastic, and Shrinkage Limits), Consolidation Test, Direct Shear Test, and Unconfined Compression Test (UCT). In addition, compaction characteristics are evaluated through Standard AASHO (4" and 6") and Modified AASHO (4"

and 6") methods, while Field Density, Permeability Test, Density Index (Id), and California Bearing Ratio (CBR) Test provide critical insights into soil strength and field behavior. The laboratory also maintains Laboratory Boring Logs for subsurface characterization and conducts chemical tests of soil (pH, chloride, and sulfate contents) to evaluate corrosivity and suitability for construction. Collectively, these capabilities make the Soil Mechanics Laboratory a vital unit for foundation design, earthwork assessment, slope stability analysis, and environmental soil quality evaluation.



Photo: Some equipment of Soil Mechanics Laboratory

### Materials Testing and Quality Control Laboratory

The Materials Testing and Quality Control Laboratory provides essential testing services for construction and civil engineering materials, ensuring compliance with national and international standards. For cement, the laboratory determines normal consistency, setting time, and compressive strength to evaluate quality and performance. For sand, tests include fineness modulus (F.M.), salinity, soundness, unit weight, specific gravity, and detection of organic impurities. Coarse aggregates are assessed for gradation, soundness, Los Angeles Abrasion resistance, unit weight, and specific gravity, which are

critical for durability and strength in concrete structures. For brick materials, the laboratory measures absorption, unit weight, and compressive strength, while for concrete, it evaluates crushing strength, trial mix design, and quality assessment through core cutting and core testing (supplied samples). These comprehensive tests allow the laboratory to play a central role in quality assurance, structural safety, and durability assessment of construction materials, supporting both academic research and industrial applications.



Photo: Some equipment of Materials Testing and Quality Control Laboratory. (a) Concrete Crushing Machine  
(b) Sand Sieve Shakers.

During the 2024-2025 fiscal year, Dhaka Laboratory tested 1405 samples and published 23 reports. The total billed amount of those reports is 1,381,050.00 BDT, of which 551,775.00 BDT (including VAT and TAX) has been received from the client, and 829,275.00 BDT is due.

The total collection of Dhaka Laboratory for 2024-2025 is 989,025.00 BDT (including VAT and TAX), consisting of the collections from previous dues. At the end of 2024-2025, the total dues of Dhaka Laboratory are 829,275.00 BDT.



Photo: "RRI Lake-A Living Model of Rainwater Harvesting". A partial view of Gitar type Lake and walkway surrounding the lake. This lake is the reservoir of Rainwater Harvesting and Storing Every Drop, Securing Tomorrow.



## ADMINISTRATION AND FINANCE DIRECTORATE

This Directorate consists of several sections namely, i) Establishment, ii) Accounts & Audit, iii) Public Relation & Photography, iv) Library, v) Estate & Security, vi)

Procurement, Operation & Maintenance and vii) Store. The other activities include procurement, operation & maintenance of physical facilities.

### Activities of Administration & Finance Directorate

The activities of Administration & Finance Directorate include overall administration of RRI, establishment, human resources development, financial management, photography, public relations, internal security, storing of materials, plantation, arrangement of different kinds of

training, publications of annual reports, journal, newsletters etc. The approved and existing manpower employing in this institute is 257 and 143 respectively. The details of manpower are given in the following table as shown below:

**Class-wise approved and existing manpower in RRI**

Sl. No.	Class	Approved manpower	Existing manpower
1	1 <sup>st</sup> Class	68	30
2	2 <sup>nd</sup> Class	03	01
3	3 <sup>rd</sup> Class	119	72
4	4 <sup>th</sup> Class	64	40
	Total	257	143

This directorate also collects a number of books both from home and abroad, journals, research reports, newsletter and many other publications every year for library. Many researchers, students and teachers from different institutions use this library for their necessary documents.

The total number of reading materials (including books, journal, newsletter reports and publications) is 16583 nos. and the total expenditure under this directorate during the fiscal year 2024-2025 is 1966.64 lakh.

**Total collection of items in the library**

Sl. No.	Description	Collection in 2024-2025	Total
1	Books	64	2690
2	Journal	6	2682
3	Reports	60	5899
4	Other publications	51	5312
	Total	181	16583

### Other activities

In addition to the above activities, this directorate also provides technical support services to the other directorates and divisions. This directorate is also responsible for procurement, operation & maintenance,

and mechanical & electrical works of physical facilities. The work completed by operation and maintenance, and mechanical and electrical section during the fiscal year 2024-2025 is outlined below.

### Works executed by Operation and Maintenance (Civil Engineering)

During the fiscal year 2024-2025, the River Research Institute carried out various repair, painting, and modernization works at its Dhaka and Faridpur offices, which included the repair and modernization of the conference room along with the toilet, front side of the office building, and stairways at the Dhaka office; repairing and painting works inside flats as well as tiling

works for bathrooms and toilets in officer and staff colony buildings at Faridpur; repairs and painting inside S.O. Building No. 1, including roofing compound painting; similar works inside P.S.O. Building No. 6 and S.O. Building No. 9 at Faridpur; and plastic painting of ceilings, walls, and corridors on the 4th floor of the Dhaka office building.

### Works executed by Mechanical Section

- ✓ Installation, repair & maintenance of pump, motors, tailgates, gate valves, foot valves, model bridges etc.
- ✓ Repair and maintenance of mechanical tools.
- ✓ Repair, fitting & fixing of grill, window etc at residential and office buildings.
- ✓ Repair and maintenance of all the vehicles of RRI.
- ✓ Purchase of raw materials for mechanical workshop of RRI.

- ✓ Repair and maintenance of RO water treatment plant.
- ✓ Purchase of anti scalant chemical, vessel kits, PP filter for RO water treatment plant.
- ✓ Purchase of centrifugal pump, foot valve, flow meter, drone, current meter for Physical model study.
- ✓ Purchase of lawn mower, hot and cool water filter.

### Works executed by Electrical Section

- ✓ Purchased of fuel & batteries for generator.
- ✓ Routine maintenance of computer, printers, UPS, IPS and other electronic equipment.
- ✓ Repair and maintenance of photocopy machines, air cooler and refrigerators.

- ✓ Purchased of computer accessories, electrical materials.
- ✓ Purchased of electric wires of different sizes.
- ✓ Electrification in the model area.

### BoG Meeting

The River Research Institute (RRI) is governed by its Board of Governors (BoG), which comprises representatives from the Ministry of Water Resources, related government agencies, academia, and technical experts. The Institute regularly organizes BoG meetings to

review activities, provide strategic guidance, and ensure effective management. Most recently, RRI held its 55th BoG meeting in January 27, 2025, reflecting its continued commitment to institutional development and the advancement of research in the water resources sector.



Photo: Honorable Adviser, Ministry of Water Resources briefing in the 55th BoG meeting

### Bidding Farewell

During the fiscal year 2024–2025, River Research Institute bids a warm and heartfelt farewell to four of its distinguished officers whose contributions have left a lasting impact on the organization. Ms. Uma Saha, Director (AC), Geotechnical Research, and Mr. Md. Azzizul Haque Podder, Director (AC), Geotechnical Research, have both played vital roles in strengthening the geotechnical research wing of the Institute. Through their expertise, dedication, and guidance, they have enhanced the technical capacity of RRI and nurtured a culture of professionalism and integrity among colleagues and young researchers. Mr. Pintu Kanungoe, Director, Hydraulic Research, has been a driving force in hydraulic investigations and research, providing leadership and direction in projects that have contributed to a deeper

understanding of river behavior and water management challenges. His commitment to scientific rigor and practical solutions has set a high standard for future research endeavors. Mr. Md. Azmol Hossain Fakir, Librarian and Deputy Director (AC), has rendered invaluable service in enriching the Institute's knowledge resources and facilitating access to information, thereby supporting researchers and professionals in their pursuit of excellence. Together, their dedication, sincerity, and professional achievements have greatly contributed to the growth and reputation of RRI. As they step into a new chapter of their lives, the Institute gratefully acknowledges their outstanding service and extends its best wishes for their continued health, happiness, and success.



Photo: RRI organized bids a warm and heartfelt farewell (clock wise) to Ms. Uma Saha, Director (AC), Geotechnical Research, Mr. Md. Azzizul Haque Podder, Director (AC), Geotechnical Research, Mr. Pintu Kanungoe Director, Hydraulic Research, and Mr. Md. Azmol Hossain Fakir, Librarian/Deputy Director (AC)

## RESEARCH AND DEVELOPMENT

Research plays a significant role to improve the quality of lives of the people and also the socio-economic development of the country. Quick and effective decision making by proper use of information contributes for upliftment of the society. Researches in the field of hydraulics, geo-technical and environmental engineering carry great importance for the development of water resources of the country. In view of the above-mentioned facts, RRI takes up research projects every year. The two directorates of RRI, namely Hydraulic Research and Geo-technical Research conduct research and

development activities in their respective fields. These activities are briefly described in this chapter.

Three research works have been conducted in 2024-2025 fiscal year, of which one is completed and other two will be carried out at present fiscal year. Completed research work entitled "Title of the Research: Assessment of Water Quality of the Kumar River in Faridpur District using the Water Quality Index" under Geo-technical Research Directorate.

## Title of the Research: Assessment of Water Quality of the Kumar River in Faridpur District using the Water Quality Index

Ongoing River Research Institute Research Project on “Assessment of Water Quality of the Kumar River in Faridpur District using the Water Quality Index” was started on 27th April, 2025 and will be ended on 26th July, 2025 (three months duration) which was approved by Research management committee, MoWR. Total cost estimate was 7.80 lac. 12 (Twelve) locations were selected for samples collection. The physicochemical parameters such as pH, dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrate, phosphate, and heavy metal concentrations, among others were measured using standard analytical methods. For trace metal analysis, advanced techniques like Atomic Absorption Spectrophotometry (AAS) was utilized to determine concentrations of metals such as arsenic, lead, cadmium, chromium, and nickel, Arsenic (As). Lead (Pb),

Cadmium (Cd), Chromium (Cr), Nickel (Ni), Manganese (Mn), Iron (Fe), and Zinc (Zn). At each location, samples were collected following standard protocols to avoid contamination. These samples were transported to the laboratory under controlled conditions for analysis. The water samples were tested in RRI laboratory and Atomic Energy Centre, Dhaka. The total numbers of 240 parameters were tested from different locations. The study focuses on the Kumar River in Faridpur, Bangladesh, a vital waterbody serving as a key resource for agriculture, fisheries, and domestic use. Despite its importance, the river faces significant challenges due to pollution and human activities, necessitating a comprehensive evaluation of its water quality. Table-1 has shown the location of sampling points at Kumar River.

Table 1: location of sampling points at Kumar River

No	Sites	Easting	Northing
1	S1 (Baliaghat)	792337	2615534
2	S2 (Sluice ghat)	791141	2615131
3	S3 (Chunagat Bridge)	789991	2614553
4	S4 (Gabindapur Kum)	786899	2614398
5	S5 (Ambikapur Shashanghat)	787198	2614325
6	S6 (Alipur Bridge)	788731	2613119
7	S7 (Rothkhola Bridge)	788889	2612660
8	S8 (Char Kamlapur Ghat)	790062	2611709
9	S9 (Bakhunda Bridge)	791519	2606936
10	S10 (Saltha)	787885	2596275
11	S11 (Nagarkanda Bazar)	795525	2592996
12	S12 (Bhanga)	804134	2589479

### Research Question

The research questions include the following:

1. What is the current state of the water quality in the Kumar River based on physicochemical and heavy metal parameters?
2. How does the Water Quality Index (WQI) classify the Kumar River's water quality across different locations?
3. What are the primary sources of pollution affecting the Kumar River, and how do they vary geographically and seasonally?
4. How do anthropogenic activities, such as agricultural runoff and industrial discharges, impact the ecological health of the Kumar River?

### Objectives

1. To assess the pollution level of potential toxic metals using different pollution assessment indices (HPI,

HEI, Cd, NPI, WQI, ERI etc.).

2. To identify potential sources of trace metal pollution in surface water using different statistical indices (i.e. Pearson correlation, PCA, Spatial distribution).

### Results

#### 1. Water Quality Assessment

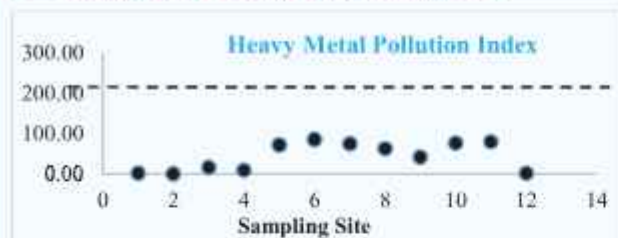
The majority of sites (S3, S4, S5, S8, S9, S10, and S12) have excellent water quality (WQI < 50), according to the Water Quality Index (WQI), which measures water usability. Water quality at sites S1, S2, S6, and S11 is classified as good (WQI 50–100). Poor water quality (WQI between 100 and 150) is only present in S7. No site is categorized as being very inadequate or inappropriate.

#### 2. Heavy Metal pollution assessment

The assessment of the environmental and water quality conditions at each of the 12 sampling locations can be drawn from the evaluation of several pollution and water quality indices. All of the sites have Heavy Metal

Pollution Index (HPI) values under 200, which suggests that there is little chance of heavy metal pollution in the region.

### 5. Heavy Metal Pollution Assessment (HPI):



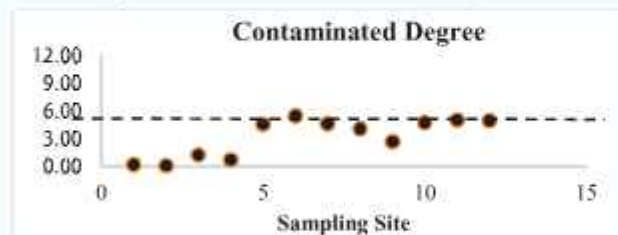
All sites fall into the low-risk category for overall heavy metal contamination since the Heavy Metal Evaluation Index (HEI) values are all less than 10.

### 4. Heavy Metal Pollution Assessment (HEI):



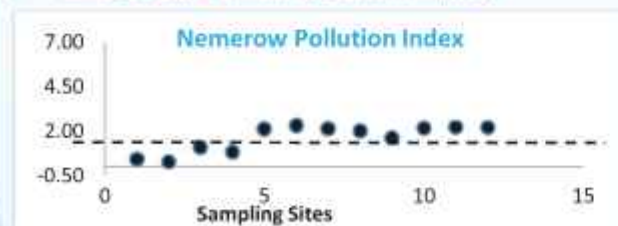
Additionally, the Contamination Degree (CD) is continuously below the 6 threshold at every site, indicating low levels of contamination.

### 5. Heavy Metal Pollution Assessment (Cd):



According to the Nemerow Pollution Index (NPI), sites S1 through S4 are pollution-free (NPI < 1.5), whereas sites S5 through S12 are classified as low pollution (NPI between 1.5 and 2.5). Based on the NPI scale, none of the locations show moderate or high levels of pollution.

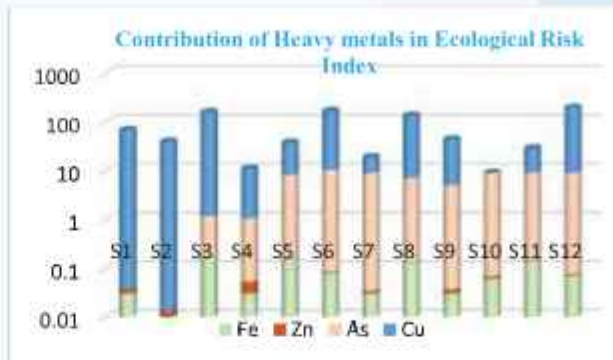
### 6. Heavy Metal Pollution Assessment (NPI):



### 7. Ecological Risk Assessment

There is greater variation in ecological risk as determined by the Ecological Risk Index (ERI). At S4, S5, S7, S10, and S11, there is little ecological risk. At S1, S2, and S9, there is a moderate ecological risk.

While S6 and S12 exhibit high ecological risk, probably as a result of the presence of more toxic elements like Cd or Pb, despite having low HPI values, sites S3 and S8 are classified as moderate to high risk.



### 8. Source identification

#### Correlation

The basic geochemical processes and pollution behavior in the study area can be better understood by using correlation analysis between heavy metals and water quality parameters. The total dissolved solids (TDS), electrical conductivity (EC), and salinity all showed a strong and perfect positive correlation ( $r = 1.00$ ), suggesting that these variables are related to one another and represent the water's overall mineral content or ionic strength. TDS, EC, and salinity all exhibited moderate to strong positive correlations with iron (Fe) ( $r \approx 0.52$ ), indicating that its mobility is increased in more salinized or mineral-rich environments. Arsenic (As) also showed a strong positive correlation with these same parameters ( $r \approx 0.85-0.86$ ), suggesting that it may be soluble and transportable in higher ionic conditions. Curiously, arsenic also exhibited a strong negative correlation with both pH ( $r = -0.73$ ) and sulfate ( $r = -0.68$ ). This suggests that reductive dissolution processes may be the cause of the rise in arsenic concentrations in more acidic and sulfate-deficient waters. Additionally, the study found a negative correlation ( $r = -0.65$ ) between nitrate and dissolved oxygen (DO), suggesting that nitrate may be reduced in low-oxygen environments, which is consistent with denitrification. Zinc (Zn) showed a negative correlation with TDS, EC, and salinity ( $r \approx -0.54$ ), but a positive correlation with DO ( $r = 0.41$ ) and temperature ( $r = 0.42$ ). This suggests that processes like sorption or precipitation may cause zinc concentrations to drop in more saline waters. Iron may contribute to suspended particles in the water, as evidenced by the moderate correlation between turbidity and Fe ( $r = 0.57$ ).

However, there was a negative correlation ( $r = -0.50$ ) between turbidity and phosphate (P), which might mean that phosphate is more diluted in clearer water or is susceptible to dilution effects. Chloride (Cl) and copper (Cu) also showed a strong positive correlation ( $r = 0.82$ ), pointing to a potential common

anthropogenic source like wastewater discharge from homes or businesses. Overall, the correlation patterns show that a mix of redox conditions, possible anthropogenic inputs, and salinity-driven geochemical processes regulate the distribution of heavy metals and water quality in the study area. These results emphasize the necessity of integrated water quality management that addresses the natural and man-made factors that contribute to aquatic pollution.

### Principal Component Analysis

Only four of the 13 extracted components had eigenvalues greater than 1, according to Principal Component Analysis (PCA), suggesting that they were important in describing the dataset's underlying structure. These four principal components (PC1 through PC4) provide a strong summary of the data, accounting for 86.35% of the total variance. The total heavy metal pollution load, including indices like HPI, HEI, CD, and NPI, is probably represented by PC1, which alone accounts for 37.72% of the variance. PC2, which accounts for 17.78%, seems to be linked to ecological risk factors, possibly impacted by harmful metals like Pb or Cd, and associated with ERI. PC3, which accounts for 16.19 percent of the variance, might be a reflection of the general features of the water quality, especially those that affect the Water Quality Index (WQI). PC4, which accounts for 14.67%, most likely reflects localized or particular contamination patterns, which may be caused by anthropogenic or geogenic activities unique to a given location. When taken as a

whole, these four elements offer a thorough understanding of the main dynamics of pollution and the variations in water quality among the sampling locations.

### Discussion

The Kumar River exhibits spatially variable pollution:

1. Industrial/Agricultural Inputs: Elevated metals (Cd, Pb) at S6/S12 linked to discharges and runoff.
2. Hydrodynamic Factors: Low dry-season flows concentrate pollutants.
3. Geochemical Processes: Reductive dissolution releases As in acidic, sulfate-deficient waters.
4. While most sites show low-heavy-metal pollution, ecological risks persist due to localized toxic elements. The WQI confirms "excellent" to "good" status in 11/12 sites, but S7 requires urgent intervention.

### Recommendations

1. Targeted Monitoring: To focus on S6, S7, S12 for Cd/Pb and nutrient loads.
2. Pollution Control: To enforce regulations on industrial effluents and promote organic farming.
3. Community Engagement: To educate on waste management and river conservation.
4. Infrastructure: To upgrade sewage treatment in urban Faridpur.

Title of the Research: Performance evaluation of some magnetically responsive nanoparticles (NPs) and metal-organic frameworks (MOFs) for heavy metals removal and organic dye degradation in polluted water

Water pollution is one of the acute problems in developing countries. Rapidly growing industrialization and untreated effluent water, urbanization, over-abstraction, diversity loss, and climate change cause the global freshwater crisis to be severe. With the economic growth, Bangladesh is also facing a similar problem. The major sources of water pollution include untreated wastewater from the textile and leather industries and agricultural pesticides through surface runoff. Industrial pollutants include heavy metals and organic dyes. The effluent needs to be treated before being released to the environment. One of the main reasons for releasing untreated effluent into the environment is the operational cost of conventional treatment methods. Therefore, a cost-effective and easy wastewater treatment method is of higher priority. To address this situation, RRI has taken the initiative to find cost-effective materials which can remove heavy metal and degrade organic dyes from polluted water. Advanced materials with high surface area having semiconductor-like behavior can effectively adsorb heavy metals and photodegrade organic dyes from polluted water. Incorporating them with magnetic elements can

enhance the probability of recovering them after treatment. This research aims to synthesize some magnetically susceptible nanoparticles and metal-organic framework materials, study their structural, mechanical, and magnetic characteristics, and evaluate their adsorptive performance to remove heavy metal and photocatalytic performance to degrade organic dye from wastewater, and finally find out suitable materials to treat different pollutants in water. The research proposal was approved on 14th of December 2024 by the Research Management Committee (RMC) where the RMC was approved by the MoWR. The duration of this research is 2 years 6 months spanning from December 2024 to May 2027 and the total budget is 434 lac BDT.

A field investigation was conducted on May 16 and 17 to evaluate the water quality of inland surface water bodies in and around Dhaka city, with a primary focus on assessing the performance of water treatment processes. As part of this initiative, water samples were systematically collected from multiple locations across

both the eastern and western reach of the river system traversing Dhaka. Each sampling site was analyzed for a set of key physicochemical parameters, including pH, chloride concentration, electrical conductivity (EC),

resistivity, salinity, total hardness (TH), total alkalinity (TA), total dissolved solids (TDS), and dissolved oxygen (DO). Heavy metals concentration determination is in processing at the SRDI laboratory.

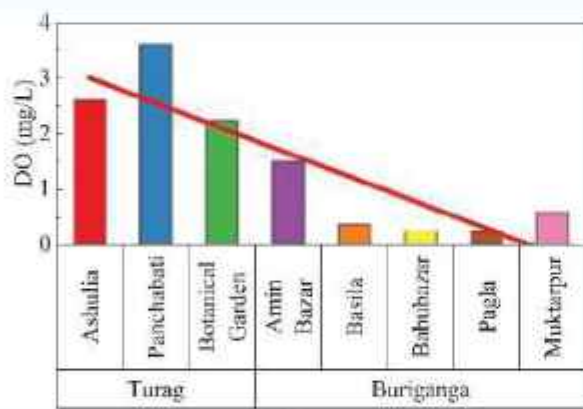


Photo: Some glimpse of sampling at the rivers around Dhaka.

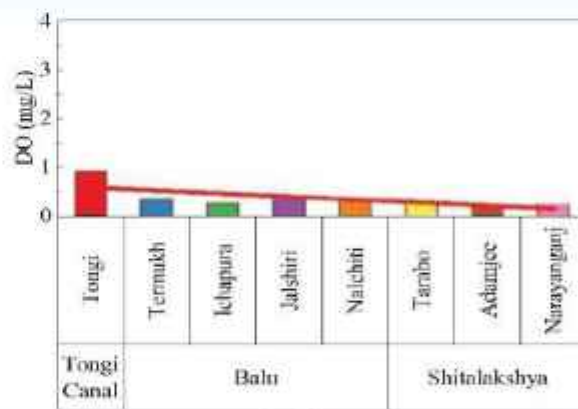
Among these, dissolved oxygen (DO) emerged as a critical parameter of concern due to its significant deviation from the acceptable standard set by the Department of Environment (DoE), which prescribes a minimum DO concentration of 6 mg/L to ensure the ecological health of aquatic systems. The DO values recorded at all surveyed sites fell short of this critical value, as visually illustrated in the accompanying bar graph.

A comparative analysis between the eastern and western sampling locations reveals a marked spatial disparity in DO concentrations. Sites on the western side-including

Ashulia, Panchabati, Botanical Garden, Amin Bazar, Basila, Babu Bazar, and Pagla-exhibited relatively elevated DO levels. Notably, Ashulia and Panchabati recorded the highest values at approximately 3.6 mg/L and 2.6 mg/L respectively. Despite these comparatively better readings, none of the western sites achieved compliance with the DOE standard, and several sites-particularly Amin Bazar, Basila, Babu Bazar, and Pagla-registered critically low DO levels (below 1 mg/L), indicating potential point-source pollution or limited water aeration in these regions.



(a) West



(b) East

Figure: DO Variation among locations, (a) West, (b) East reach of Dhaka.

In contrast, the eastern locations-comprising Muktarpur, Tongi, Termukh, Ichapura, Jalshiri, Nalchiti, Tarabo, Adamjee EPZ, and Narayanganj-demonstrated a consistently alarming trend, with DO concentrations uniformly below 1 mg/L. This pervasive oxygen deficiency suggests a more acute level of environmental degradation on the eastern flank, likely exacerbated by high organic pollutant loads, industrial effluents, and reduced hydrological flushing capacity.

In summary, the results underscore a widespread deficit in dissolved oxygen across both regions of the river system, with the western zone displaying significantly more severe impairment. The observed patterns necessitate immediate attention from environmental regulatory bodies and stakeholders, urging the implementation of targeted pollution control strategies, enhanced wastewater treatment measures, and regular monitoring programs to restore and preserve the ecological balance of the affected water bodies.



Photo: Equipment acquired through this research. (a) Solar Simulator, (b) Centrifuge, (c) Vacuum Oven, (d) Tube Furnace, (e) Orbital Shaker and Ultrasonic Bath, and (f) Analytical Balance, Hydrothermal Autoclave, Hot Plate with Magnetic Stirrer, and Vortex Mixture.

To facilitate the research work smoothly, 2 research assistants and 1 laboratory assistant were recruited temporarily for the research duration. Two new laboratories have been established under the Geotechnical and Environmental Research Laboratory, Dhaka named “Water Treatment Materials Research Laboratory” and “Materials Synthesis and Sample Preparation

Laboratory”. Several sophisticated pieces of equipment have been acquired under this research to equip these newly established laboratories, such as Centrifuge, Tube Furnace, Vacuum Oven, Hydrothermal Autoclave, Ultrasonic Bath, Analytical Balance, Solar Simulator, Orbital Shaker, Hot Plate with Magnetic Stirrer, and Vortex Mixture.

**Research Title:** Assessment of Spatio-Temporal Variability of Soil and Water Salinity and Their Impact in Shatkhira District of Bangladesh

**Duration:** From January 2025 to February 2026

**Total Expenditure:** 17, 00,000 (Seventeen Lac only)

**Funding:** Ministry of Water Resources, Government of Bangladesh

### Study Area

The study area of the research is in the Satkhira district, a southwestern coastal district of Bangladesh which lies between 21°36' and 22°54' north latitudes and between 88°54' and 89°20' east longitudes. The world's largest mangrove forest, Sundarban, lies in between the southern part of this district and the Bay of Bengal. The Satkhira District lies adjacent to the Sundarbans and consists of multiple river basins (Kholpetua, Betna, Arpangasia, etc.). Its susceptibility to saline intrusion is exacerbated by

shrimp farming, deforestation, and groundwater overuse. The land is mainly flat and close to sea level, with pronounced wet and dry seasonal cycles influencing salinity. The quality of soil and water will be assessed in 26 points shown in Figure 1. Sampling will be carried out five times in a three-month interval. The land is mainly flat and close to sea level, with pronounced wet and dry seasonal cycles influencing salinity (Figure 1).

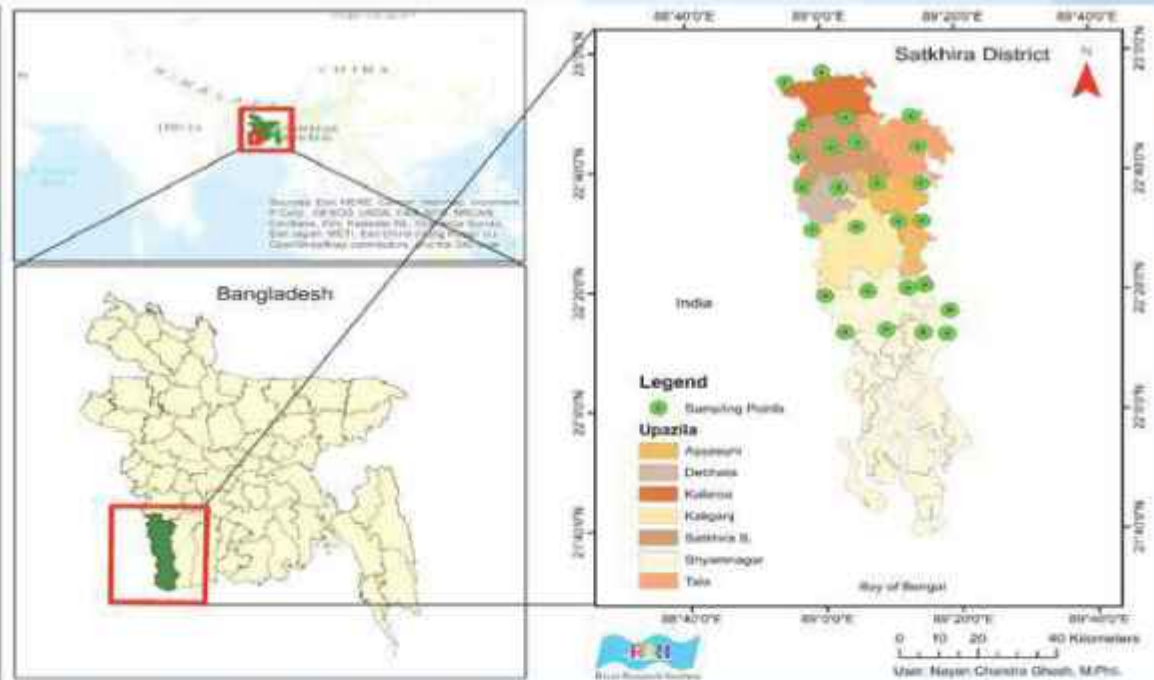


Figure 1. Study area and the sampling points

### Objectives

The general aim of this research is to assess the extent, causes, and impacts of salinity intrusion in surface water and soil in the Satkhira district of the southwest region of Bangladesh. The Specific objectives of the research work are as follows:

- To evaluate the extent and severity of salinity intrusion in surface water and soil in the study region

- To determine the primary sources and driving factors contributing to salinity intrusion in the study area
- To assess the seasonal and spatial variability of salinity levels in surface and groundwater
- To assess the impact of salinity intrusion on soil salinity and its implications for agriculture and crop productivity

### Description of Research and Preliminary Findings

The study has recently been approved by the Ministry, and the team is currently awaiting funding. The initiation of the field work of the study has been kicked off on 20th May 2025 in the form of a short field visit to the study area. Water quality parameters such as Temperature, pH, DO, EC, TDS, and Salinity have been determined in-situ in various rivers of the Satkhira district, all the way from

north, the border of Jashore district to south, the starting of the Sundarban, spread over Kalaroa, Satkhira Sadar, Debhata, Kaliganj, and Shayamnagar Upazila. The sampling includes surface water of the Betna, Kobadak, Kholpetua, Labangabati, Shalikka, Mather, etc. and the adjacent groundwater available. Some images of the field visit have been shown below.



a) Public consultation at the Kobadak river in Khordo



b) Betna River at Kalaroa



c) In-situ data collection at Shoalia of Shyamnagar.



d) Soil sampling at Shoalia of Shyamnagar.



e) Mather river at Vetkhali Bazar of Shyamnagar.



f) Kholpetua river at Nildumur of Shyamnagar.

Figure 2. Some images of the field visit.

Along with the in-situ water quality data collection, water samples of surface and groundwater and soil samples from the riverbank have been collected for further laboratory testing. The soil salinity of the collected soil samples has

been determined in the laboratory. The initial trend of the water quality and soil salinity has been shown in Figure 3 to Figure 9.

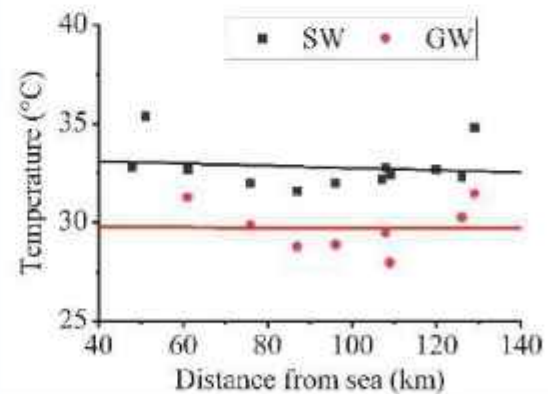
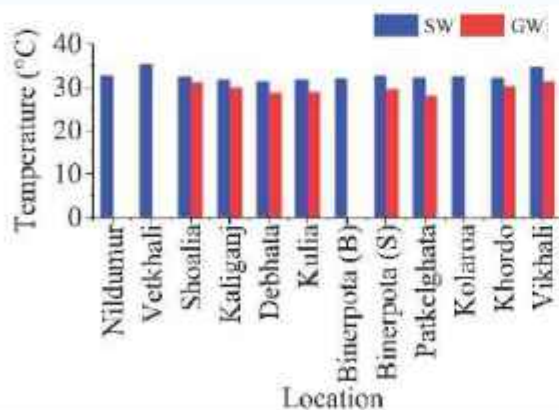


Figure 3. Spatial variation of Temperature of surface water and groundwater

Spatial variation of temperature value shows a slight decrease in temperature of surface water due north but

even trend of temperature in the groundwater as shown in Figure 3.

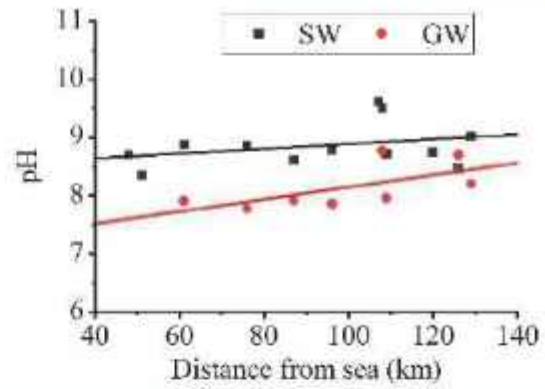
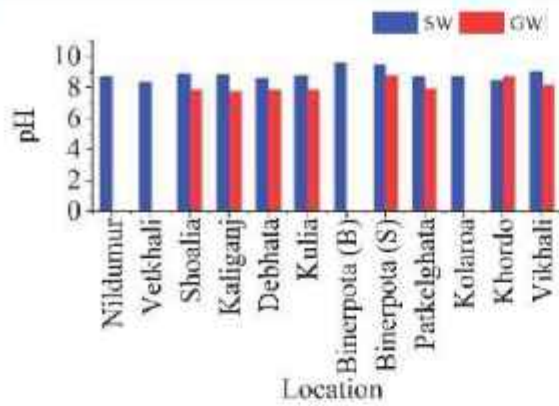


Figure 4. Spatial variation of pH of surface water and groundwater.

Both the surface water and groundwater have an increasing trend of pH value away from the sea, but the change is sharper for the groundwater. Although most of

the points have a normal range of pH for drinking water for groundwater, the surface water has a higher pH in almost every sampling point as shown in Figure 4.

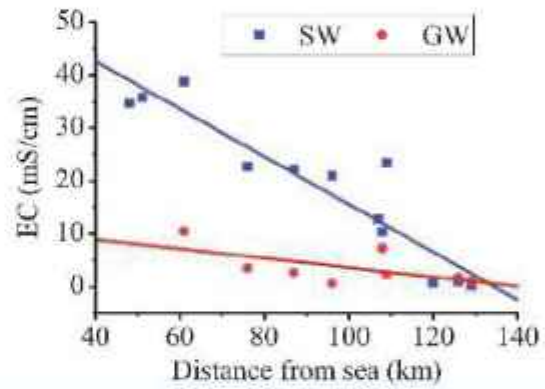
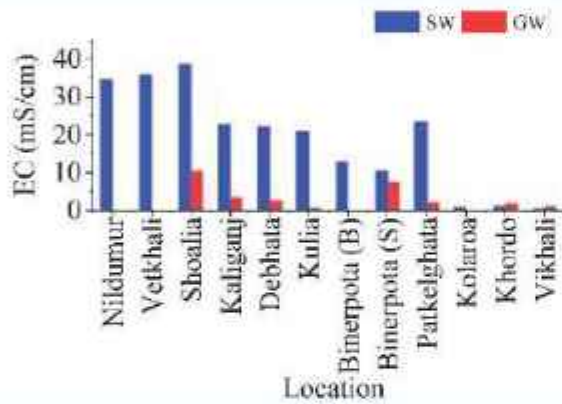


Figure 5. Spatial variation of EC of surface water and groundwater.

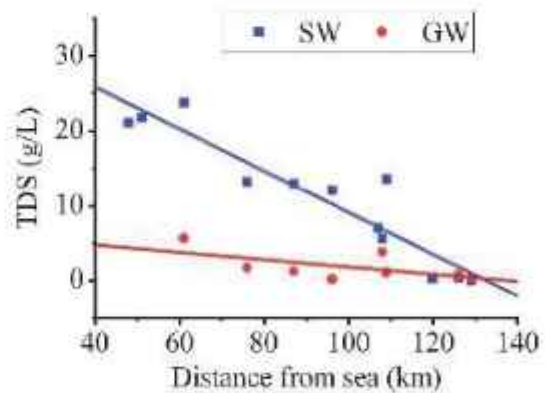
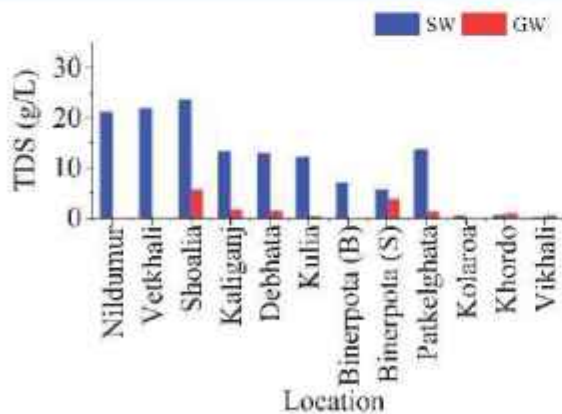


Figure 6. Spatial variation of TDS of surface water and groundwater.

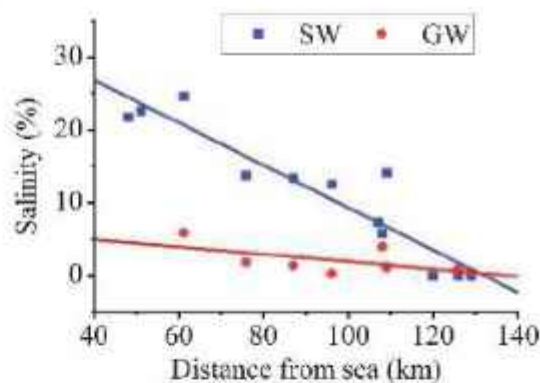
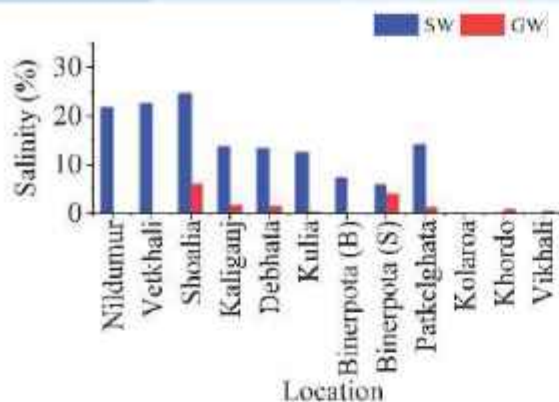


Figure 7. Spatial variation of Salinity of surface water and groundwater.

The EC values for the surface water are much more than the values of groundwater near the sea. As it goes away from the sea, the EC value decreases rapidly for the surface water than the groundwater and becomes

equivalent to each other at nearly 120km from the sea as shown in Figure 5. TDS and Salinity level also follows the similar trend of EC as shown in Figure 6 and 7 respectively.

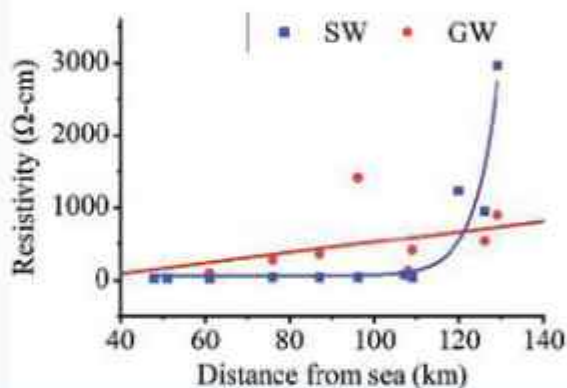
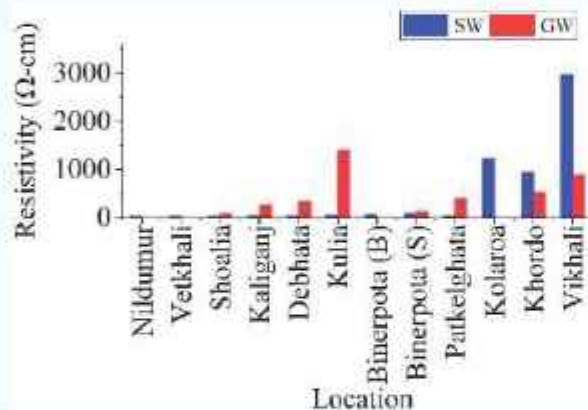


Figure 8. Spatial variation of Resistivity of surface water and groundwater.

The resistivity value shows the opposite trend of EC as it is the reciprocal of EC. For groundwater it follows a linear increasing trend with the distance from sea, but for surface

water it grows exponentially as shown in Figure 8. The reason could be the disconnection of the river due to siltation.

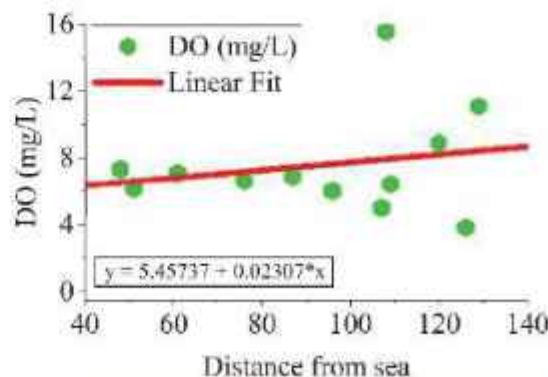
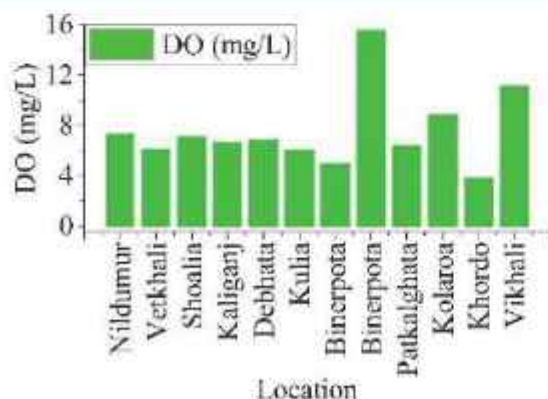


Figure 9. Spatial variation of DO of surface water.

Dissolved Oxygen (DO) value shows a slight increase with the distance from the sea for the surface water as

shown in Figure 9. The groundwater DO was not measured as it is a disturbed sample.

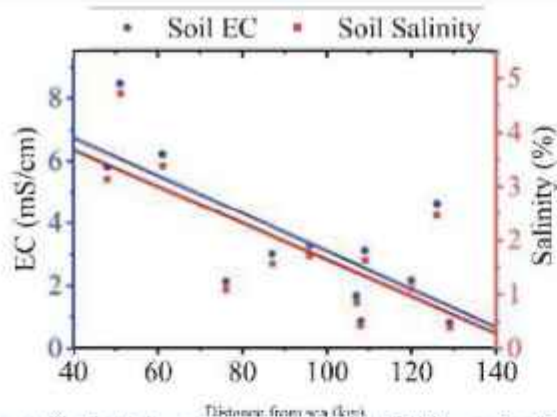
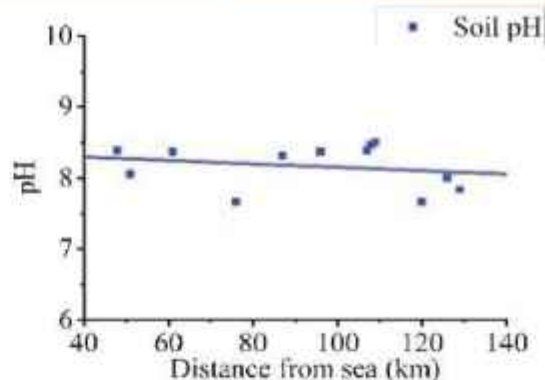


Figure 10. Spatial variation of soil EC, Salinity and pH.

Variation of soil EC and Salinity shows the same decreasing trend from the sea, while pH shows slight decrease from the sea. The decrease in EC and Salinity is



much sharper than the pH. To assess the temporal variation of soil and water salinity, the research team will soon visit the study area for soil and water sampling.

### Research and Development Projects in Pipeline

The River Research Institute (RRI) has undertaken three major research and development projects aimed at addressing river erosion and promoting sustainable river management in Bangladesh. The titles of the projects are mentioned below. The first one is approved by planning commission, but last two projects are in line for approval.

1) Development of a cost-effective and sustainable erosion protection strategy for the medium and small rivers of Bangladesh, and enhancement of the research facilities of the River Research Institute.

Duration: July 2025 to June 2029

Budget: 45.08 crores.

2) Evaluation of the impact of river erosion on the meandering characteristics of the Arial Khan River, identification of erosion prone areas and possible sustainable remedial measures and upgradation of research facilities of the River Research Institute.

Duration: July 2025 to June 2029

Budget: 42.52 crores.

3) Nature-based sustainable solution for river bank protection for medium sized rivers of Bangladesh.

The first project focuses on developing cost-effective and sustainable erosion protection strategies for medium and small rivers, along with strengthening RRI's research facilities. The second project emphasizes evaluating the impact of river erosion on the meandering characteristics of the Arial Khan River, identifying erosion-prone areas, and exploring sustainable remedial measures, while also upgrading research facilities at RRI. The third project is designed to promote nature-based sustainable solutions for riverbank protection in medium-sized rivers of Bangladesh, reflecting the growing emphasis on eco-friendly and resilient approaches to river management. Collectively, these initiatives are expected to enhance RRI's research capacity and contribute significantly to sustainable river training and erosion management in the country.

## HUMAN RESOURCES DEVELOPMENT

RRI has been putting special emphasis to human resources development since its establishment in order to achieve its goals as mandated by the Government of the People's Republic of Bangladesh. Scientists and engineers are working at RRI whose efforts are being put with a view to reach the research standard through innovation of new technologies and ideas in the related fields of activities. RRI is a relatively new organisation of this kind of research in the country. As the technologies of the disciplines concerned are fast developing, the necessity of higher studies and advanced on the job training of the

research personnel in the academic and research institutions of similar activities at home and abroad (especially in developed countries) has strongly been highlighted in order that it can keep them abreast of the latest development in the related fields of research. Some of the RRI personnel attended higher studies and training program both at home and abroad. RRI scientists and officers participated in different trainings and workshops during the 2024-2025 fiscal year at RRI and outside of RRI. The title and duration of these training programs and seminars were as the following:



Photo: A view of the in-house training entitled “Training on Budget and Audit” held at Madhumati conference room, RRI.

**List of training RRI officers and staffs attained in the fiscal 2024-2025**

SL. NO.	Title of the Training / Seminar	Duration
1	Seminar on Water Disaster Prevention for Bangladesh	18.06.2025-01.07.2025
2	Ocean Prosperity: Catalyzing Blue Economy in Bangladesh	03.07.24
3	Procurement Management Course	14.07.24 – 25.07.24
4	Workshop on Election Manifesto 2024	18.07.24
5	Fundamental Training Course	04.08.24 – 22.08.24
6	Conduct and Discipline Course	18.08.24 – 22.08.24
7	Financial Management Course	01.09.24 – 12.09.24
8	Workshop on Women and Child Rights	19.09.24
9	Office Management and ICT Course	22.09.24 – 03.10.24
10	Mathematical Modelling and GIS Technology for Feasibility Study of Water Development Projects.	29.09.24 – 10.10.24
11	Financial Management Course	20.10.24 – 31.10.24
12	Workshop on National Integrity Strategy (NIS)	24.10.24
13	Climate Risk and Vulnerability Assessment (CRVA)	28.10.24
14	Fundamental Training Course	03.11.24 – 28.11.24
15	Management for New Manager	10.11.24 – 14.11.24
16	Conduct and Discipline Course	10.11.24 – 14.11.24
17	Skill Transformation for Industry 4.0: Application of AI & Design Thinking	19.11.24 – 22.11.24
18	Workshop on Public Procurement Emphasizing on e-GP	19.12.24
19	Fundamental Training Course	29.12.24 – 09.01.25
20	TWAVE National Consultation Workshop	02.02.25 – 03.02.25
21	Workshop on Bangladesh Delta plan 2100	13.02.25
22	Workshop on Potential Resources of Bangladesh	24.04.25

23	Sectorial Consultation Workshop on Investment Roadmap of Climate Resilient Infrastructure	07.05.25
24	Future ICT trends in water Sector	22.05.25

### Conferences attended by the RRI scientists

In the year 2024-2025 RRI scientists have attended several scientific conferences and presented their research findings in those conferences. The list of the conferences attended by the RRI scientists has been shown below:

Sl.	Publication Details	Corresponding Author
1	Md. Moniruzzaman, Sumiya Ferdhous, Bikash Roy, Md. Masuduzzaman and S M Abu Horayra, "Estimating River Discharge and Suspended Sediment Concentration Using Landsat Images and Google Earth Engine Cloud Computing for the Arialkhan River in Bangladesh" 7th International Conference on Advances in Civil Engineering (ICACE2024), 12-14 December 2024, CUET, Chattogram, Bangladesh.	Md. Moniruzzaman Senior Scientific Officer
2	Bikash Roy, Omar Al Maimun, Md. Johurul. Islam, Md. Shahabuddin, S M Abu Horayra, Pintu Kanungoe, "Physical Model Study of The Intake Structure of Rajshahi Wasa Surface Water Treatment Plant Project" 10th International Conference on Water and Flood Management (ICWFM-2025), 22-24 February 2025, Institute of Water and Flood Management (IWFM) of Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh during.	Bikash Roy Senior Scientific Officer



Photo: A view of the in-house training titled "Training on Scientific Article Writing" held at Mādhumati conference room, RRI

## SIGNING OF MEMORANDUM OF UNDERSTANDING (MoU)

To strengthen and increase the prospect and potential of an institution it is very crucial to avail all relevant up for grabs resources. In this era of 4IR every single institution should care about the activities of similar institutions. To

achieve this objective, an MoU can play a vital role in this connection. In the fiscal year 2024-2025 River Research Institute signed MoU with one prominent institution, CELESTIAL TECH, DHAKA-1212.



Photo: S M Abu Horayra, DG, RRI and Mr. Shahi Kabir, CEO, Celestial Tech are seen signing MoU on behalf of respective authority

## FINANCIAL MANAGEMENT

River Research Institute is a national organization having mandate of a statutory Public Authority under the Ministry of Water Resources, Government of the People's Republic of Bangladesh. The annual expenses are being borne by its own income and some grant from the Government revenue budget.

The main sources of RRI's own income are revenue received from model studies (physical and mathematical model), and geo-technical testing fee (testing of soil, concrete, water and sediment sample). Detailed budgetary information (income and expenditure) for the fiscal year 2024-2025, 2024-2025 and 2022-2023 are given hereafter

### Earnings and Expenses for the fiscal year 2024-2025

Earnings		Expenses		
Items	Taka (Lakh)	Items	Taka (Lakh)	
Govt. grant	2121.40	Establishment:	2159.59	
		Officers' salary		250.36
		Staffs' salary		364.65
		Special benefits		28.70
		Lump grant		35.47
		Allowances		407.79
		Goods and services		349.48
		Retirement benefit assistance		305.00
		Research Grant		82.27
		Other Grant		120.00
		ICT Grant	2.95	
		Capital Expenditure	24.97	
		Reserved in PL Account	154.76	
		Retirement benefit assistance	38.19	
		(Expensed from self-income)		
Model study	169.48	Model study	142.75	
Geotechnical testing fee	26.16	Geotechnical testing	18.02	
Others	24.08	Surplus (+)	20.76	
<b>Total</b>	<b>2341.12</b>	<b>Total</b>	<b>2341.12</b>	

### Earnings and Expenses for the fiscal year 2023-2024

Earnings		Expenses	
Items	Taka (Lakh)	Items	Taka (Lakh)
Govt. grant	1763.97	Establishment:	
		Officers' salary	273.18
		Staffs' salary	407.14
		Special benefits	29.03
		Allowances	403.65
		Goods and services	300.70
		Retirement benefit assistance	150.00
		Research Grant	45.40
		Other Grant	79.99
		ICT Grant	8.25
		Capital Expenditure	16.87
Reserved in PL Account	47.21		
Non expensed money	2.55		
Retirement benefit assistance (expensed from self income)	93.10		
Model study	240.79	Model study	194.56
Geotechnical testing fee	49.05	Geotechnical testing	23.50
Others	22.62	Surplus (+)	1.30
<b>Total</b>	<b>2076.43</b>	<b>Total</b>	<b>2076.43</b>

### Earnings and Expenses for the fiscal year 2022-2023

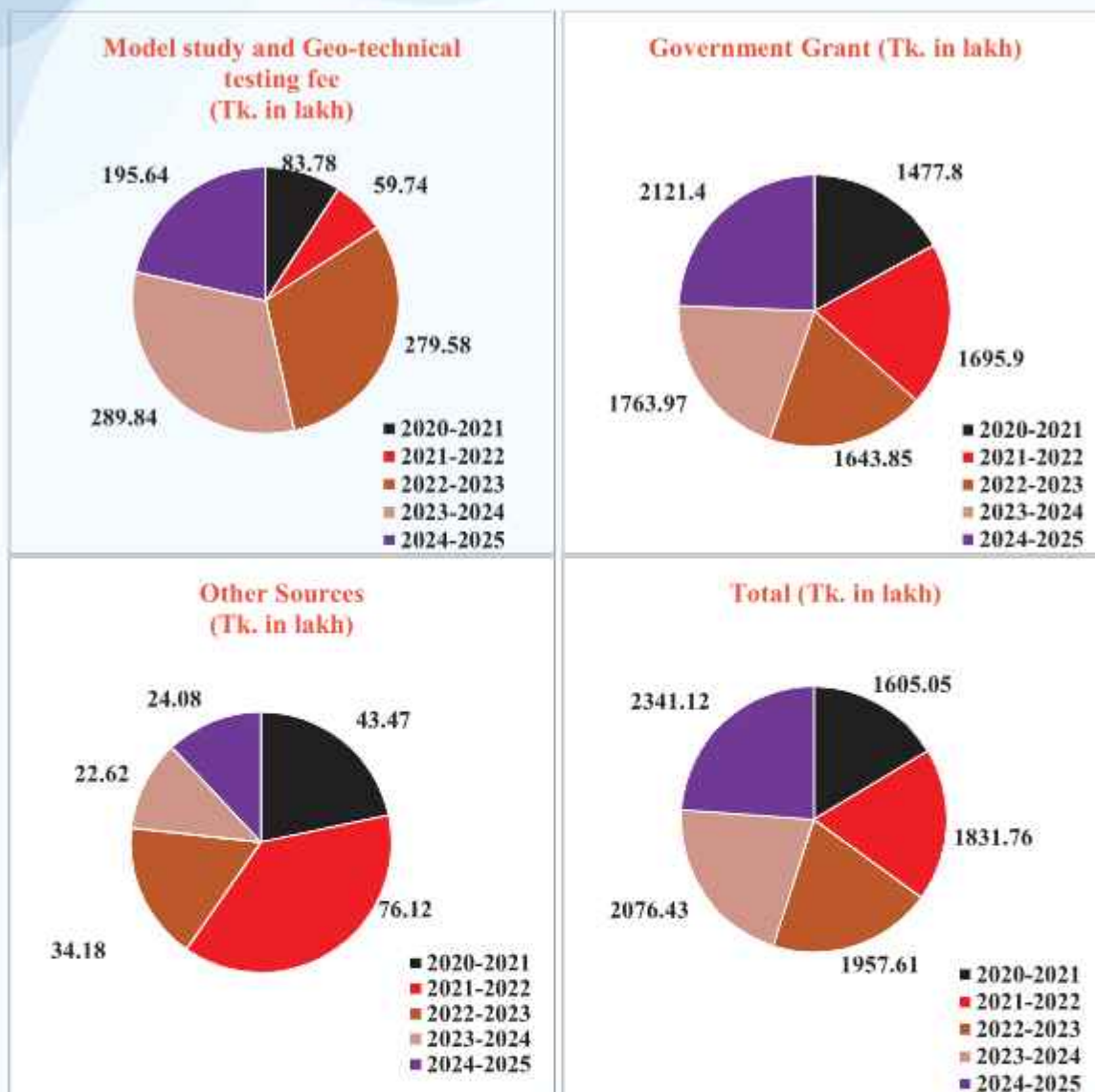
Earnings		Expenses	
Items	Taka (Lakh)	Items	Taka (Lakh)
Government grant	1643.85	Establishment:	
		Officers salary	281.87
		Staff salary	331.71
		Allowances	395.98
		Supply and services	253.22
		Retirement benefit assistance	100.00
		Research Grant	41.69
		Other Grant	72.66
		ICT Grant	9.56
		Capital Expenditure	6.92
		Reserved in PL Account	147.53
Non expensed money	2.71		
Retirement benefit assistance (expensed from self income)	56.42		
Model study	263.63	Model study	186.45
Geotechnical testing fee	15.95	Geotechnical testing	8.17
Others	34.18	Surplus (+)	62.72
<b>Total</b>	<b>1957.61</b>	<b>Total</b>	<b>1957.61</b>

Significant features of RRI's earnings, expenses and closing balance in recent years (last 5 years) are given here.

#### Scenario of earnings for last five years

Sources of income	Total (Tk. in lakh)				
	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
Model study & geo-technical testing fee	83.78	59.74	279.58	289.84	195.64
Govt. grant	1477.80	1695.90	1643.85	1763.97	2121.40
Other Sources	43.47	76.12	34.18	22.62	24.08
<b>Total</b>	<b>1605.05</b>	<b>1831.76</b>	<b>1957.61</b>	<b>2076.43</b>	<b>2341.12</b>

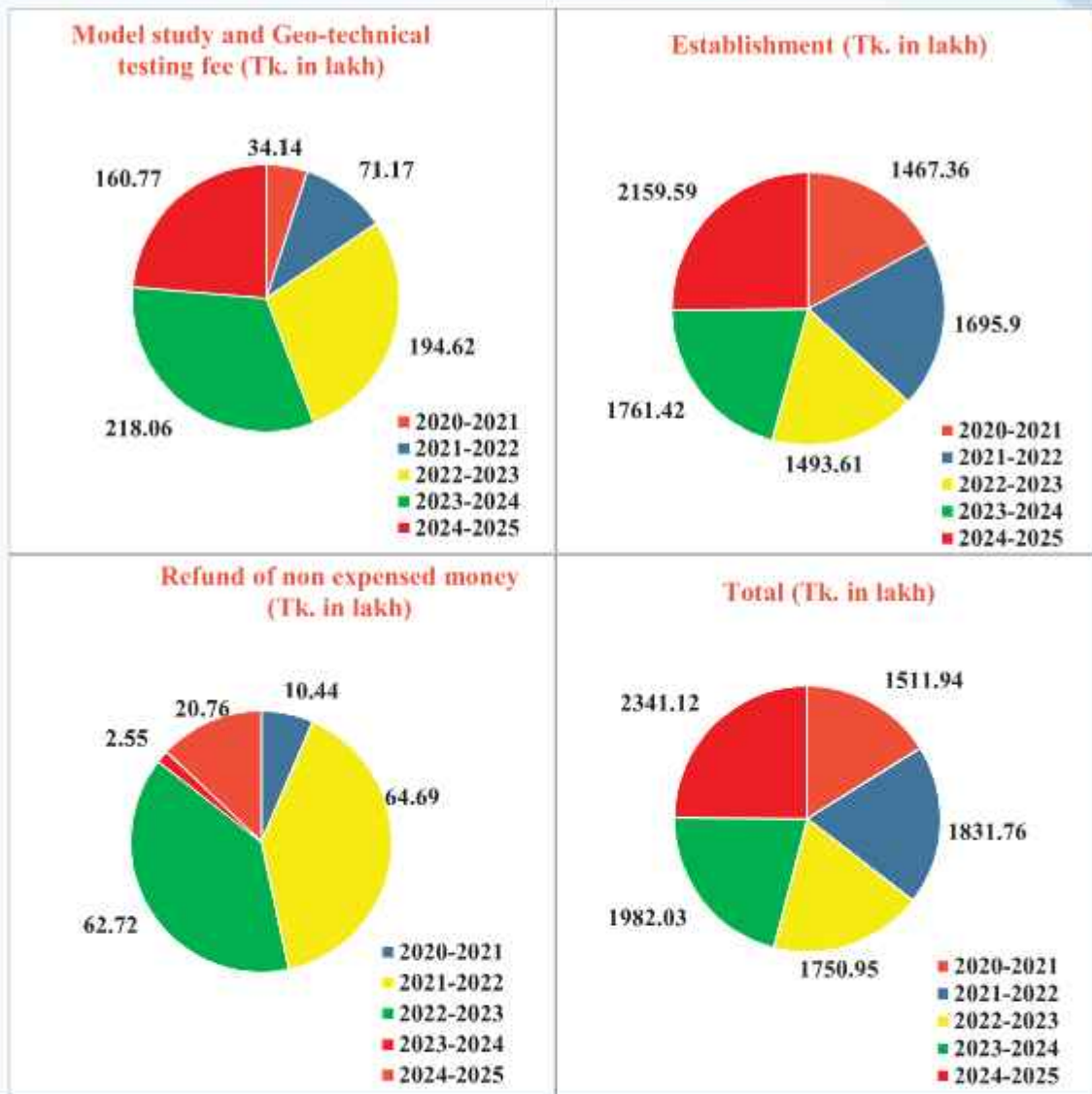
### Graphical representation of scenario of earnings for last five years



### Scenario of expenses for last five years

Sl. No.	Description	Total (Tk. in lakh)				
		2020-2021	2021-22	2022-2023	2023-2024	2024-2025
1	Model study and Geo-technical testing	34.14	71.17	194.62	218.06	160.77
2	Establishment	1467.36	1695.90	1493.61	1761.42	2159.59
3	Refund of non-expended money	10.44	64.69	62.72	2.55	20.76
<b>Total</b>		<b>1511.94</b>	<b>1831.76</b>	<b>1750.95</b>	<b>1982.03</b>	<b>2341.12</b>

**Graphical representation of scenario of expenses for last five years**

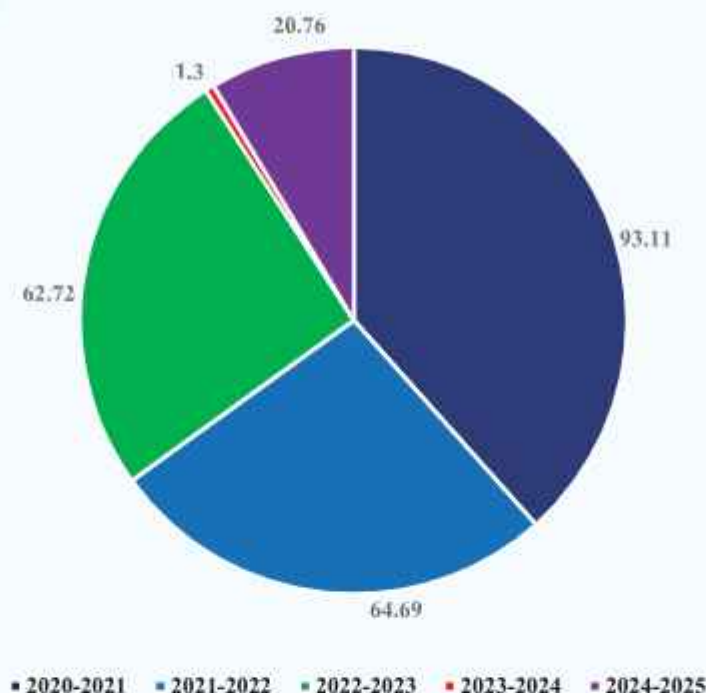


**Scenario of closing balance for last five years**

Sl. No.	Description	Total (Tk. in lakh)				
		2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
1	Closing balance on the basis of self-earnings and govt. grant	(+) 93.11	(+) 64.69	(+) 62.72	(+) 1.3	(+) 20.76

NB: (+) indicates surplus

### Closing Balance



## FUTURE PROSPECTS AND PLANNING

Since its establishment as a national organization with distinct mandates for rendering services to deal with river related problems and to devise economic and sustainable solutions to the problem RRI has been discharging its responsibilities using established facilities and available man power. At the beginning, the main focus was physical modelling and soil and material testing mainly to support planning and design of different water infrastructures and Bangladesh Water Development Board (BWDB) was the main client. With the passage of time physical modelling technology has been applied to address wide range of river related issues namely sediment management at the off-take, river restoration, bridge and barrage hydraulics, river dredging etc. However, the application of physical modelling technology was very limited for tidal and coastal systems due to lack of required modelling facilities. In order to meet the growing need for comprehensive and multidisciplinary studies RRI adopted mathematical modelling technology in 2007 as a tool for conducting model studies side by side physical modelling technology. At the same time a number of RRI scientists pursued higher education in different disciplines and many of them are trained at home and abroad to enable RRI to carry out multidisciplinary studies. Under an institutional development and capacity building project a number of sophisticated equipment were procured to upgrade testing facilities. However, some facilities are yet to be

established to carry out all mandated activities as well as to deal with new challenges and emerging issues in water sector. With this end in view the second phase of institutional development and capacity building project has begun in the financial year 2017-18.

For RRI to function as a pioneering organization in water sector and to cope with the increasing demand of the time in the competitive market; institutional development, instrumentation, sustainable technology and highly trained manpower are very essential to enhance the standard of service to international level. From this point of view the following future development prospects are important to be mentioned:

Now-a-days, Information Technology (IT) has become a very useful tool for research and studies, sound management and transparent administration in the world. RRI has to encounter this new challenge to meet the demand for quality services.

RRI has already established a network system by connecting all the activities of this institute. For this RRI has completed all the installations and collected software, hardware and networking components required. By this time, LAN is working at RRI. A complete wing (manpower & logistics) wing will be required to govern the IT sector in RRI.

Two Material Testing and Quality Control field laboratories at Bogura and Barisal have already been established. A liaison office is situated at 72, Green Road, Dhaka. In the liaison office soil, building materials, sediment & water samples are being received from BWDB and other Govt, Semi-Govt, NGOs and consulting firms. There is system for bringing the collected samples to RRI headquarter in Faridpur within a short period of time to complete the tests in due time. The test results are furnished to the clients in report form to execute the work of the projects in scheduled time. RRI is contemplating to establish field laboratory in all district headquarters of the country to make its services easily available.

RRI has already established well-equipped Math Model LAB with internet facilities and uninterrupted power supply required to support mathematical modelling. However, existing facilities need to be expanded and upgraded by purchasing more computers and accessories, installing updated modelling softwares, introducing modelling in new areas and imparting training to the modellers. Some of the needs are expected to be fulfilled under the on-going IDCB project. It is understood that in order to further expand the RRI mathematical modelling services a full-fledged Math Model LAB has to be established in Dhaka.

RRI successfully completed the physical model studies of some of the biggest projects of Bangladesh namely Bangabandhu Railway Bridge Project, Paira Bridge Project, Bangabandhu Bridge Project, Padma Multipurpose Bridge Project, Ganges Barrage Project, Gorai River Restoration Project, Arial Khan Roadway Bridge Project, 3rdKarnafullyRoadway Bridge Project, Kusthia Town Protection Project etc. However, due to lack

of needed facilities RRI could not do much in physical modelling of coastal systems. Initiatives have already been taken to establish the tidal and coastal modelling facilities and to train scientists in this field.

RRI may act as a focal institution of its peripheral region to investigate regional water resources problems. A monitoring cell may be established at RRI to monitor the natural hazards like flood, draught, bank erosion, earthquake etc. As a focal institution, RRI may provide consultancy services to the Government, Local Authority of any organizations or may directly advise the beneficiaries to take precautionary measures against those hazards.

RRI is working in collaboration with BUET and is willing to work with similar foreign institutions like CWPRS (India), DHI (Denmark), Delft Hydraulics (The Netherlands), HR Wallingford (UK), NHC (Canada), SMEC (Australia), LHI (Sri Lanka) etc. Efforts are being made by RRI to start joint venture/bi-lateral study/research projects with these similar international institutions.

More opportunities should be extended for RRI research personnel for imparting higher studies leading to MS/Ph D degree and other advanced on-job training. There should also have enough scope for RRI officials to participate in the national/international seminar, symposium, congress, workshop etc.

It can be mentioned here that though RRI is primarily catering the needs for national agencies, with the gradual development of manpower and technology, the institute will fulfil the demands for international bodies and organizations in future.



Photo: The River Research Institute, Faridpur, features diverse varieties of flowers that create an appealing environment and draw the attention of visitors

## NATIONAL DAYS OBSERVATION

National Days in Bangladesh are momentous occasion celebrated with great pride and enthusiasm across the country. So as a national institute, no exception is the River Research Institute in this regard. RRI marks the anniversary of Bangladesh's independence and victory day on 26th March and 16th December respectively every year. On these days, RRI is adorned with the national flag, and various ceremonies and events are held to honor the courage and sacrifice of those who fought for independence of Bangladesh. February 21st, known as Martyrs' Day and International Mother

Language Day, is a day of profound significance in Bangladesh. RRI commemorates the Language Movement of 1952, when students and activists sacrificed their lives to preserve the right to speak and write in their mother tongue, Bengali. On this day, RRI honour the martyrs of the movement by laying flowers at Shaheed Minar (martyrs' monuments) in a solemn and respectful manner. The day begins with the singing of the national anthem and the offering of prayers for those who lost their lives. Cultural programs, poetry recitations, and discussions are held to celebrate the richness of the Bengali language and culture.



Photo: A View of Victory Day Rally of 2024 organized by RRI



Photo: DG, RRI along with staff pay tribute to Martyrs on the occasion of Martyrs and International Mother Language Day



Photo: A View of National and Independence Day rally, 2025 held at RRI

## YOUTH FESTIVAL, SOCIAL AND CULTURAL ACTIVITIES

Sports, Social and cultural activities play a vital role in the holistic development of individuals and communities. They foster physical health, mental well-being, and social connections by encouraging teamwork, discipline, and perseverance. Participation in sports enhances physical fitness and teaches valuable life skills like leadership and resilience. Meanwhile, cultural activities nurture creativity, critical thinking, and an appreciation for diversity, helping individuals connect with their heritage

and the broader world. Together, these activities contribute to a balanced, enriched life, promoting harmony, understanding, and a sense of belonging within society. During the fiscal year 2024-2025 volleyball tournament, football tournament and table tennis tournament have been held on the occasion of victory day and youth festival celebration. As part of the cultural activities a Bashanta Baran and Pitha Utsab was celebrated in fiscal year 2024-2025.



Photo: Teams of football tournament organized by RRI for celebrating 'Youth Festival-2025'



Photo: Dr. Md. Alauddin Hossain, Director (AC), GR received Raffle draw prize from Mrs. DG, Kohinur Horayra Moni



### KEEPING THE ENVIRONMENT CLEAN AND SUSTAINABLE

Keeping the environment clean and sustainable is crucial for the health and well-being of all living beings and the planet itself. A clean environment ensures that air, water, and soil remain free of harmful pollutants, which are essential for maintaining biodiversity and supporting ecosystems. Tree plantation plays a pivotal role in keeping the environment clean and sustainable. Trees act as natural air purifiers, absorbing carbon dioxide and releasing oxygen, which helps combat air pollution and reduces the effects of climate change. They also stabilize soil, prevent

erosion, and maintain water cycles, ensuring the health of ecosystems. Additionally, trees provide habitats for countless species, supporting biodiversity and contributing to the balance of nature. RRI conducts regular cleaning program to keep the campus premises clean and beautiful. All officers and staffs take part in the cleaning program. Every year RRI carry out tree plantation program to keep the campus green and environmentally friendly.



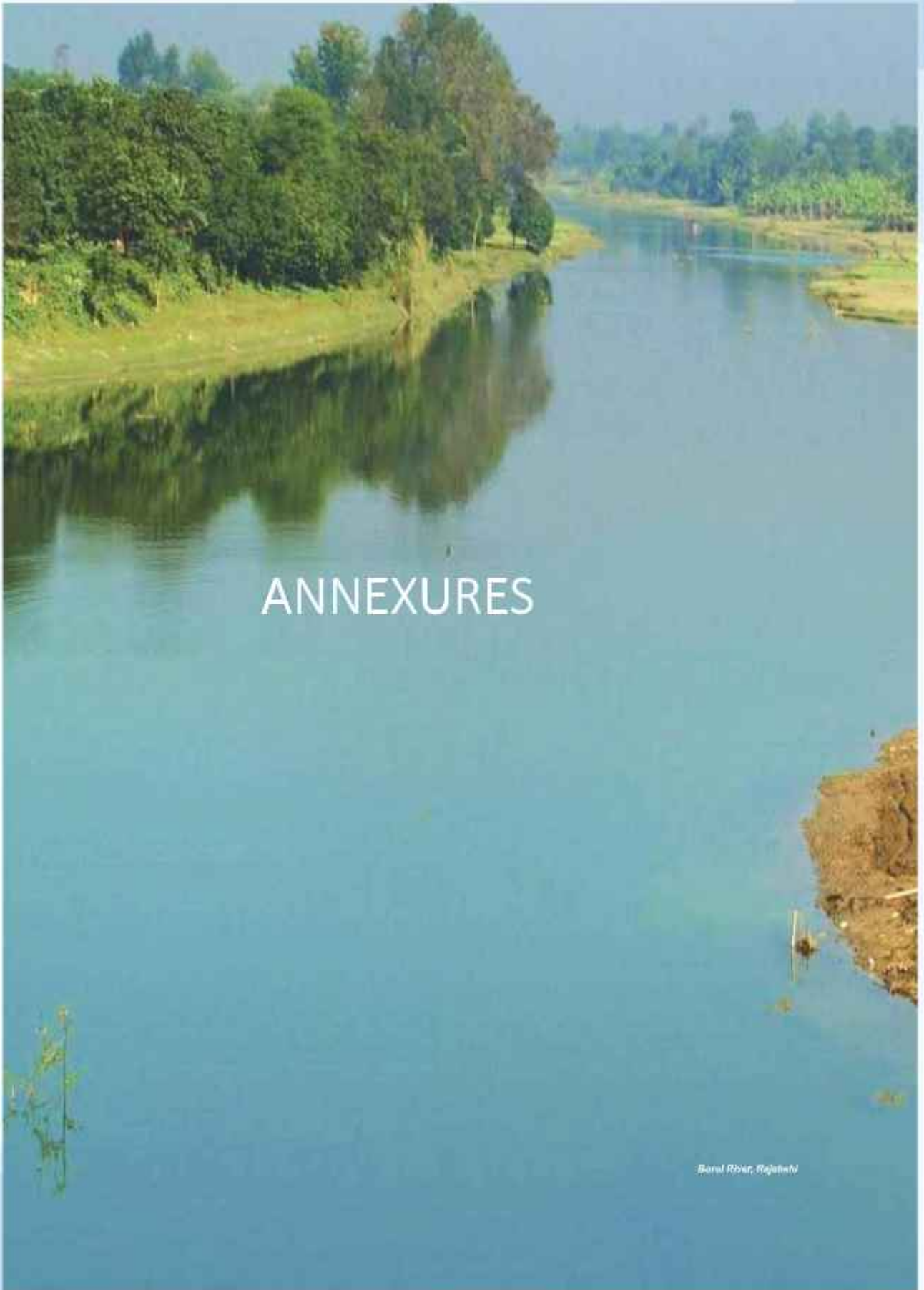
Photo: Plantation of Thai Longan fruit tree at RRI



Photo: A view of Monthly Cleaning Programme organized by RRI



Photo: Beautification, Stormwater Drainage and Rainwater Harvesting-Three in One at RRI Campus.



# ANNEXURES

*Bansal River, Rajasthan*

## WHO'S WHO

### RRI PERSONNELS



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## ABBREVIATIONS AND ELABORATIONS

<b>A</b>	AC	Additional Charge	
	AD	Assistant Director	
	AP	Assistant Programmer	
	ADB	Asian Development Bank	
	AFPM	Active Flood Plan Management	
	A & F	Administration and Finance	
	AIT	Asian Institute of Technology	
	ASTM	American Society for Testing Materials	
	<b>B</b>	B.A	Bachelor of Arts
		BAU	Bangladesh Agricultural University
BARD		Bangladesh Academy for Rural Development	
BCA		Bangladesh Crystallographic Association	
BCSIR		Bangladesh Council of Scientific and Industrial Research	
BIAM		Bangladesh Institute for Administrative Management	
BIM		BIM Bangladesh Institute of Management	
BIT		Bangladesh Institute of Technology	
BIWTA		Bangladesh Inland Water Transport Authority	
BIWTC		Bangladesh Inland Water Transport Corporation	
BoG		Board of Governors	
BPAIC		Bangladesh Public Administration Training Centre	
BPI		Bangladesh Photographic Institute	
BPS		Bangladesh Physical Society	
BRRP		Buriganga River Restoration Project	
BUET		Bangladesh University of Engineering & Technology	
BWDB		Bangladesh Water Development Board	
<b>C</b>		CBM	Concrete Block Mats
		CBR	California Bearing Ratio
		CC/ Cc	Certificate Course / Current Charge/ Compression Index
		CCFGIS	Certificate Course on Fundamentals on Geographic Information System
		CCFRS	Certificate Course on Fundamentals on Remote Sensing
		CCPGIS	Certificate Course on Professional Geographic Information System
	CERP	Coastal Embankment Rehabilitation Project	
	CEGIS	Centre of Environmental and Geographic Information Services	
	CPT	Cone Penetration Test	
	CPU	Central Processing Unit	
	CPTU	Central Procurement Training Unit	
	CSO	Chief Scientific Officer	
	CT	Concrete Technician	
	CUET	Chittagong University of Engineering & Technology	
	CWPRS	Central Water and Power Research Station	
	CZEM	Coastal Zone Engineering and Management	
	DC	Deputy Commissioner	
	DD	Deputy Director	
	DG	Director General	
	DHI	Danish Hydraulic Institute	
	DIFPP	Dhaka Integrated Flood Protection Project	
	Dip.	Diploma	
	DPP	Development Project Proforma	
	D/S	Downstream	
	DU	Dhaka University	
	<b>E</b>	EC	Electrical Conductivity
		EEE	Electrical & Electronics Engineering
		EGCB	Electricity Generation Company of Bangladesh Ltd
		e-GP	e-Government Procurement
		EIA	Environmental Impact Assessment

<b>E</b>	EMP	Environmental Management Plan	
	ESIA	Environmental impact statement	
	ENGG.	Engineering	
<b>F</b>	FAP	Flood Action Plan	
	FCDI	Flood Control, Drainage & Irrigation	
	F-IEB	Fellow of the Institution of Engineers, Bangladesh	
<b>G</b>	F.M.	Fineness Modulus	
	FPM	Farm Power and Machinery	
	GBSP	Ganges Barrage Study Project	
	GDP	Gross Development Profit	
	GeoSRF	Geospatial Science & Research Foundation	
	GHH	Ground Water Hydrology	
	GIS	Geographic Information System	
	GO	Government Order	
	GoB	Government of Bangladesh	
	GR	Geotechnical Research	
	GRRP	Gorai River Restoration Project	
<b>H</b>	GWC	Ground Water Circle	
	Hons	Honours	
	HP	Horse Power	
	IIR	Hydraulic Research	
	HRL	Hydraulic Research Laboratory	
<b>I</b>	HS	Hojung Solutions	
	IAD	Integrated Agricultural Development	
	IBAIS	International Business Administration and Information System	
	ICP-OES	Inductively Coupled Plasma-Optical Emission Spectrometer	
	IDCB	Institutional Development and Capacity Building	
	IEB	Institution of Engineers, Bangladesh	
	IHE	International Institute for Infrastructural, Hydraulic and Environmental Engineering	
	IIT	Indian Institute of Technology	
	IMED	Implementation, Monitoring and Evaluation Department	
	IRD	Integrated Rural Development	
	ITC	International Institute for Aerospace Survey and Earth Sciences	
	IUSS	International Union of Soil Science	
	IWFM	Institute of Water and Flood Modelling	
	IWM	Irrigation and Water Management	
	IWRM	Integrated Water Resources Management	
	<b>J</b>	JOCL	Japan Overseas Consultants Limited.
		JU	Jahangirnagar University
JnU		Jagannath University	
<b>K</b>	KUET	Khulna University of Engineering & Technology	
	KUL	Katholic University of Leuven	
	KVA	Kilo Volt Ampere	
<b>L</b>	LA	Laboratory Attendant	
	LAB	Laboratory	
	LGB	Left Guide Bund	
	LHI	Lanka Hydraulic Institute	
	LLB	Bachelor of Law	
	LM	Life Member	
	LOI	Letter of Intent	
	LT	Laboratory Technician	
	LTU	La Trobe University	
	<b>M</b>	M.A	Master of Arts
M-ASCE		Member of American Society of Civil Engineer	
M-BAAS		Member of Bangladesh Association for Advancement of Science	
MBA		Master of Business Administration	
M-BCS		Member of Bangladesh Computer Society	

<b>M</b>	M-BES	Member of Bangladesh Environmental Society	
	MC	Main Consultant/Moisture Content	
	M-IEB	Member of the Institution of Engineers, Bangladesh	
	MIS	Management Information System	
	M-JSCE	Member of Japan Society of Civil Engineers	
	MKFCDI	Muhuri-Kahua Flood Control, Drainage and Irrigation	
	M-NOAMI	Member of National Oceanographic and Maritime Institute	
	MoU	Memorandum of Understanding	
	MoWR	Ministry of Water Resources	
	MNPs	Magnetic Nanoparticles	
	MP	Member of the Parliament	
	MPA	Mongla Port Authority	
	MS	Mild Steel	
	M.S/M.Sc.	Master of Science	
	M. Phil.	Master of Philosophy	
	M. Engg	Master of Engineering	
	mPWD	meters above Public Works Department (PWD) datum	
	<b>N</b>	NHC	North Hydraulic Consultants Limited
		NIS	National Integrity Strategy
		NMC	Natural Moisture Content
NU		National University	
NAHRIM		National Hydraulic Research Institute Malaysia	
NHC		North Hydraulic Consultants Limited	
NOAMI		National Oceanographic and Maritime Institute	
<b>O</b>		O & M	Operation & Maintenance
		OTM	Open Tendering Method
		<b>P</b>	PABX
PATC	Public Administration Training Centre		
PC	Personal Computer		
PD	Project Director		
PGD	Post Graduate Diploma		
PGT	Post Graduate Training		
PhD	Doctor of Philosophy		
PLOI	Provisional Letter of Intent		
PPM	Parts per Million		
PS	Private Secretary		
P.S.O.	Principal Scientific Officer		
PU	Prime University		
PWD	Public Works Department		
<b>R</b>	RAC		Regional Accounts Centre
	RDPP		Revised Development Project Proforma
	REBRFM		Research on the Effect of Bandalling on River Flow and Morphology
	RFQ		Request for Quotation
	RGB		Right Guide Bund
	RHD		Roads & Highways Department
	RPATC	Regional Public Administration Training Centre	
	RRI	River Research Institute	
	RO	Reverse Osmosis	
	RS	Remote Sensing	
	RTW	River Training Work	
	RU	Rajshahi University	
	RUET	Rajshahi University of Engineering & Technology	
	<b>S</b>	SAE	Sub-Assistant Engineer
SICT		Support to Information and Communication Technology	
SMEC		Snowy Mountain Engineering Corporation	
S.O.		Scientific Officer	
SRNDP		Southwest Road Network Development Project	

T	SSD	Submerged Soil Density	
	S.S.O.	Senior Scientific Officer	
	ST	Soil Technician	
	SWH	Surface Water Hydrology	
	SWMC	Surface Water Modelling Centre	
	TDS	Total Dissolved Solids	
	ToR	Terms of Reference	
U	TU	Technical University	
	UAV	Unmanned Aerial Vehicle	
	UGC	University Grant Commission	
	UK	United Kingdom	
	UNESCO	United Nations Educational, Scientific and Cultural Organization	
	U/S	Upstream	
	USA	United States of America	
	UCT	Unconfined Compression Test	
	USV	Unmanned Surface Vehicle	
	UTM	Universal Testing Machine	
	V	VAT	Value Added Tax
	W	WR	Water Resources
		WRD	Water Resources Development
WRDP		Water Resources Development Project	
WRE		Water Resources Engineering	
WRM		Water Resources Management	
WRS		Water Resources Survey	



Photo: Beauty of Nature at RRI, Faridpur Campus. The River Research Institute, Faridpur, offers a range of aesthetic views that draw the attention of visitors.

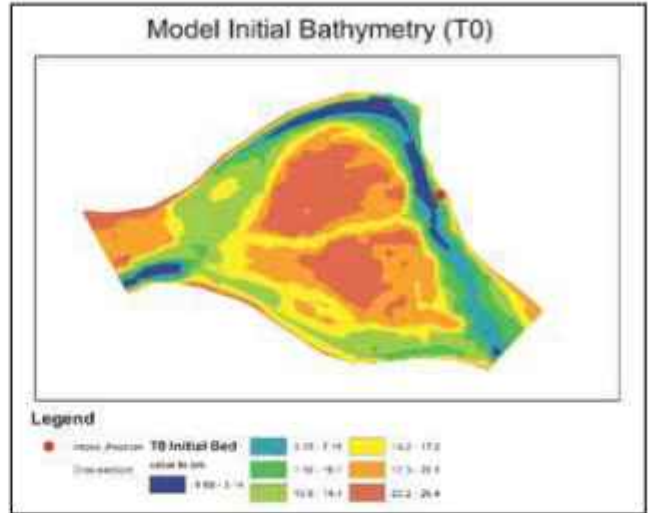


Photo: 3D View of Proposed Flume with Structural Steel Shed for Physical Modelling Study at RRI



**Rainwater Harvesting at the RRI Lake**  
*A Living Model of Sustainability*



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