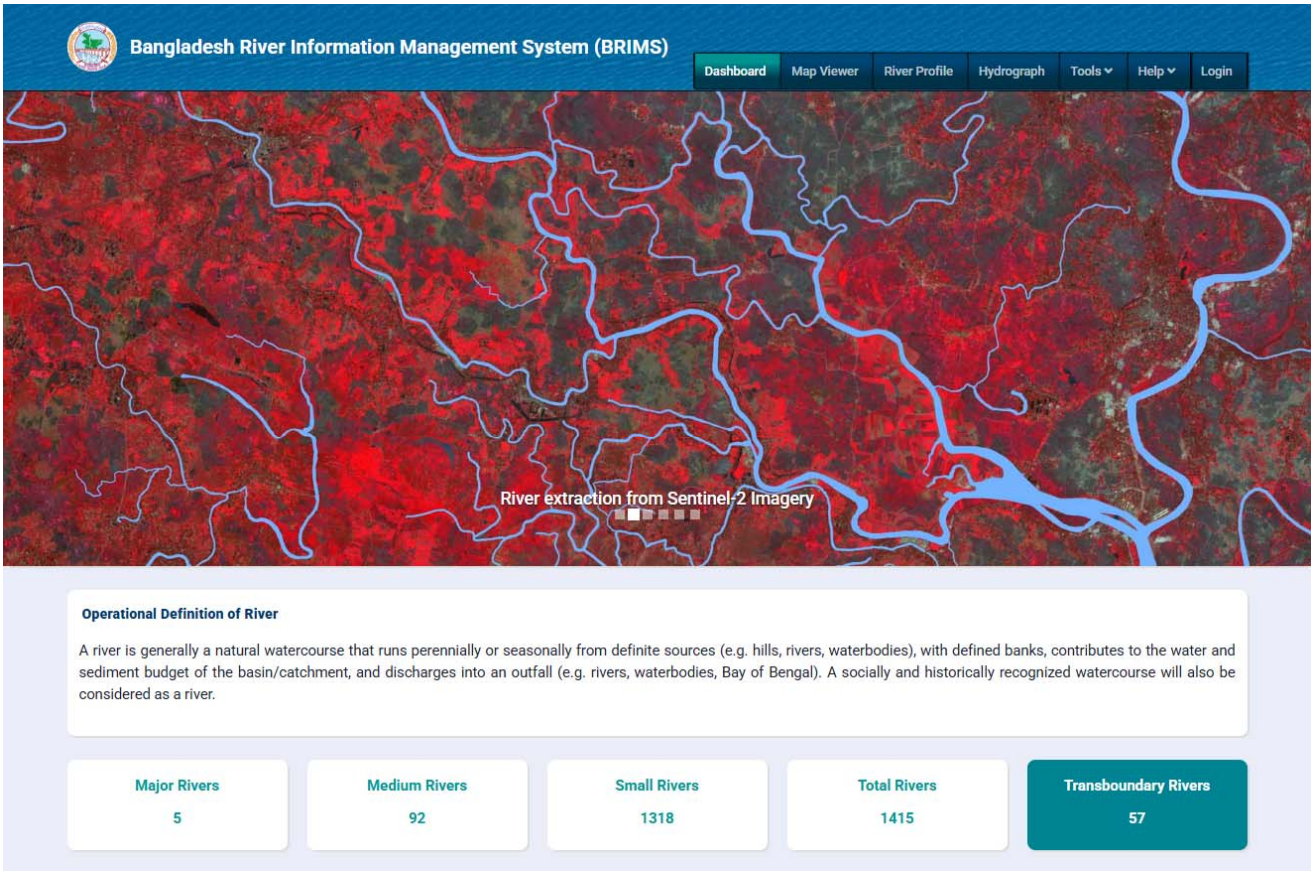
USER MANUAL
ON
BANGLADESH RIVER INFORMATION MANAGEMENT SYSTEM (BRIMS)



Developed by
Center for Environmental and Geographic Information Services (CEGIS)

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1. Introduction

The Bangladesh River Information Management System (BRIMS) is a comprehensive web-based GIS application developed to provide detailed information and management tools related to rivers in Bangladesh. BRIMS aims to facilitate efficient management and decision-making regarding Bangladesh's river systems. It is a centralized platform for accessing and analyzing river-related data for various stakeholders, including government agencies, researchers, and policymakers. BRIMS integrates diverse river-related datasets, including hydrological, ecological, and socio-economic data. Data sources may include satellite imagery, remote sensing data, ground-based measurements, and government databases. BRIMS provides interactive maps that display various river features, including river networks, tributaries, water quality parameters, and flood risk zones. Users can visualize spatial data layers and overlay different datasets to gain insights into river dynamics and associated phenomena. The system is designed to be user-friendly, with intuitive interfaces and interactive features for easy navigation. BRIMS provides essential tools for river management, offering integrated data, mapping, analysis, and decision support to support sustainable development and resilience.

1.1 System Architecture of the Portal

The portal has been designed and developed using the standard four-tier architecture of software development It consists of the following layers:

- Presentation Layer
- Web server
- Application server
- Data server

- ***Presentation Layer***

  The presentation layer includes the user interfaces that users interact with within the application. This layer was created using ASP .Net and utilizes HTML5 and CSS3 with jQuery for the user interface development. The design of the interfaces prioritizes simplicity and user-friendliness.

- ***Web server***

  The key service component of a web-based application is the web server. This program manages and delivers web pages and enables users to communicate with the server for data service via the Internet or an intranet. The web server is configured using Internet Information Services.

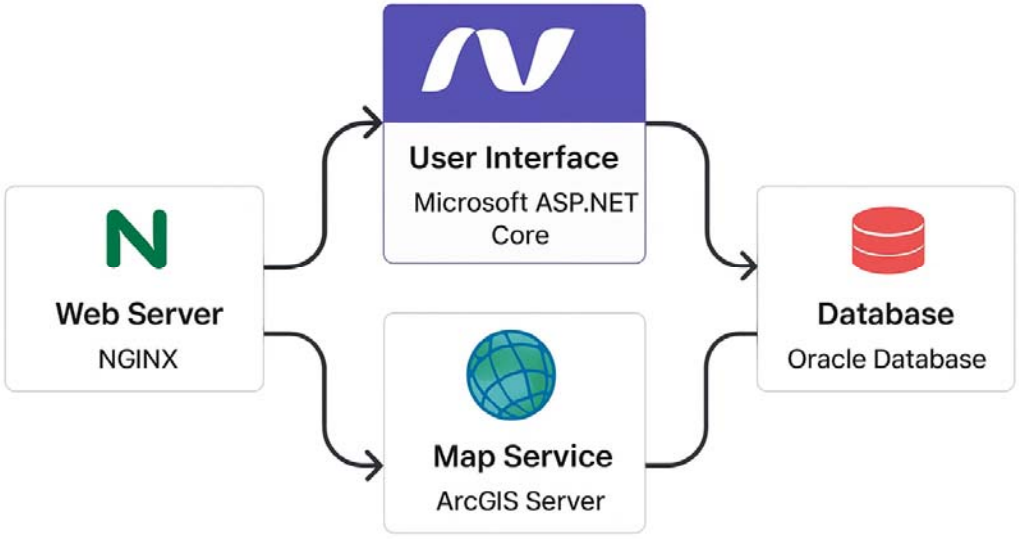


Figure 1.1: System Architecture

- ***Application Server***

  The primary development area in the application layer consists of business and data components. The business component is utilized to enforce various business rules and logic, while the data component is responsible for retrieving data from the server. The application layer has been developed using ASP .NET Core.

- ***Data Server***

  The data server contains data, views, triggers, and stored procedures. It executes SQL statements, views, triggers, and stored procedures for data manipulation and presentation. A relational database Oracle is used to store and organize data.

1.2 Technology Used

The following technology has been used to develop BRIMS in different components:

- Programming Language: ASP.Net Core with C#, Java Script
- User Interface: HTML5, CSS Bootstrap 5.
- Framework: Microsoft .NET Framework 8
- Database: Oracle 21c
- Map service: ArcGIS Server

1.3 Software Component

The main interface of the BRIMS is shown in Figure 1.2. To access the BRIMS main home page, simply enter the BRIMS web address (http://ims.cegisbd.com/rims) in any browser's address bar.

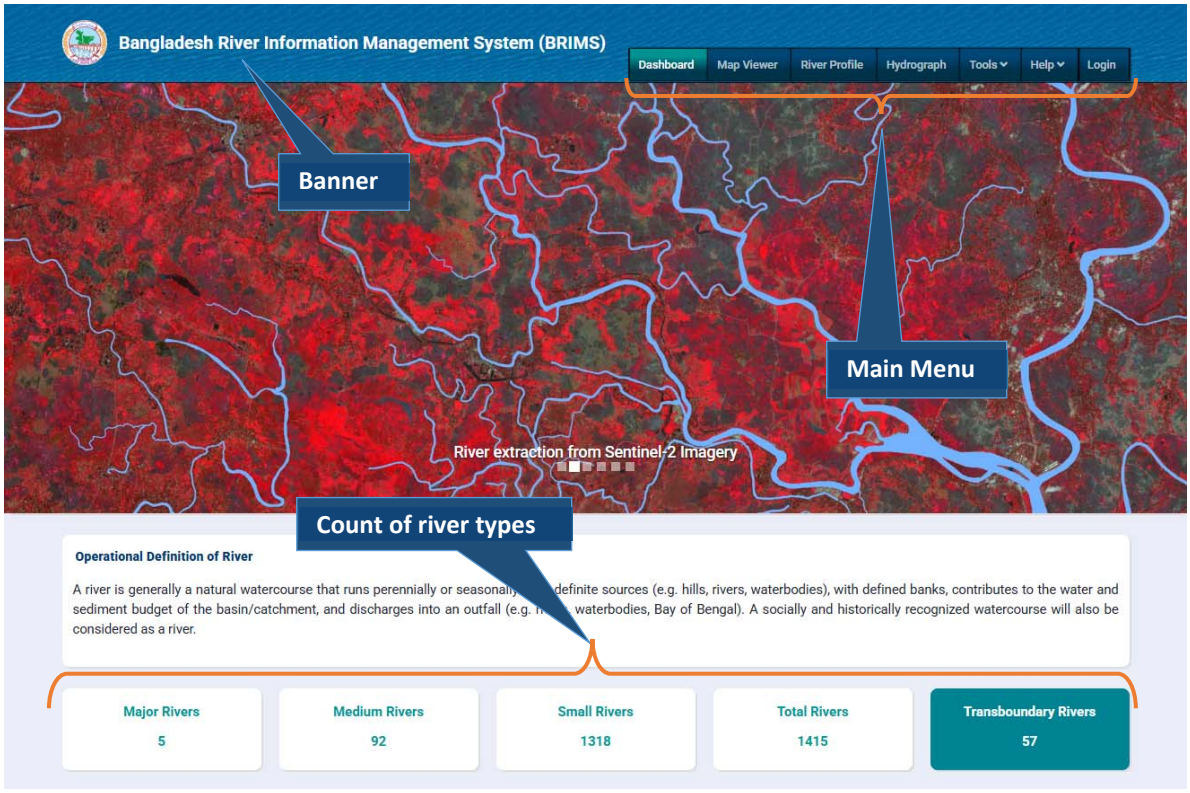


Figure 1.2: Dashboard screen of the BRIMS

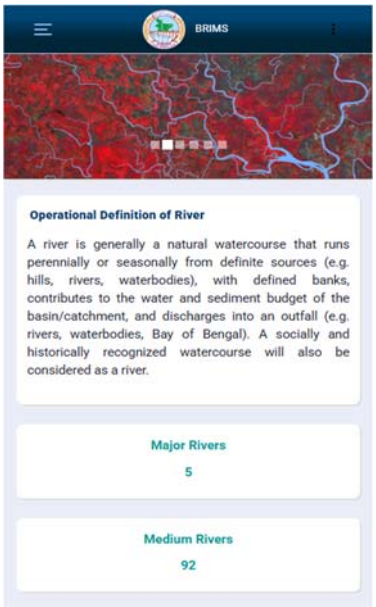


Figure 1.3: Dashboard screen of the BRIMS on Mobile version

2. Major Components of BRIMS

The major components of the BRIMS are as follows:

1. Dashboard
2. River Profile
3. Map Viewer
4. Other (User manual, Video Tutorial, Contacts and Feedback)
5. Login

2.1 User Login

User login is necessary whenever a user adds, edits, or deletes data. To log in, place the mouse pointer on the Login menu and click on Login (Figure 1.3, 1.4).
To access the system, users must confidently follow these steps:
Step 1: Enter the User ID in the provided input field.
Step 2: Input the password securely.
Step 3: Click on the Login button decisively.

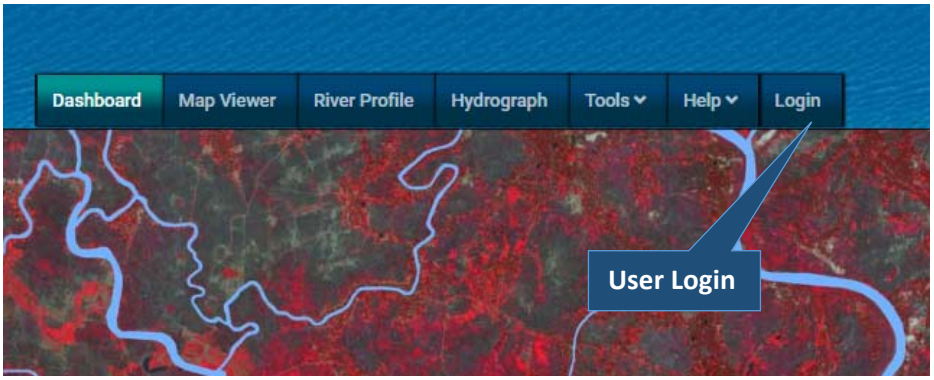


Figure 2.1: Login procedure of the BRIMS Software

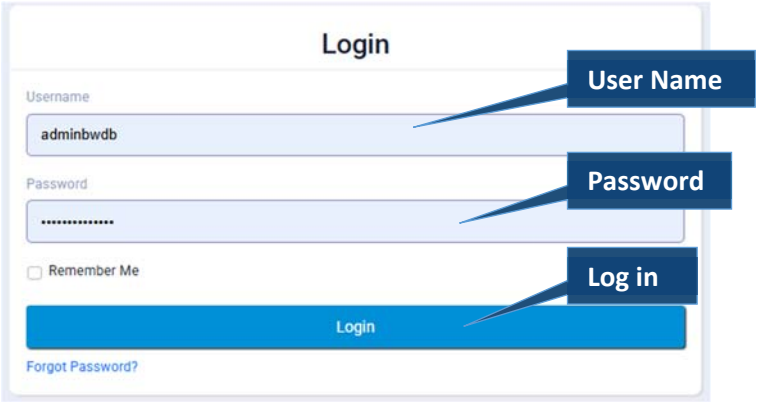


Figure 2.2: Login UI

2.2 Dashboard

The dashboard is the system's home page, with menu options, an image slider, and a comprehensive breakdown of various river types and categories. It includes different summary reports (Figure 2.1) such as a pie chart illustrating the percentage of river types, a tabular format presenting the count of rivers according to hydrological regions, and a digital map visualization.

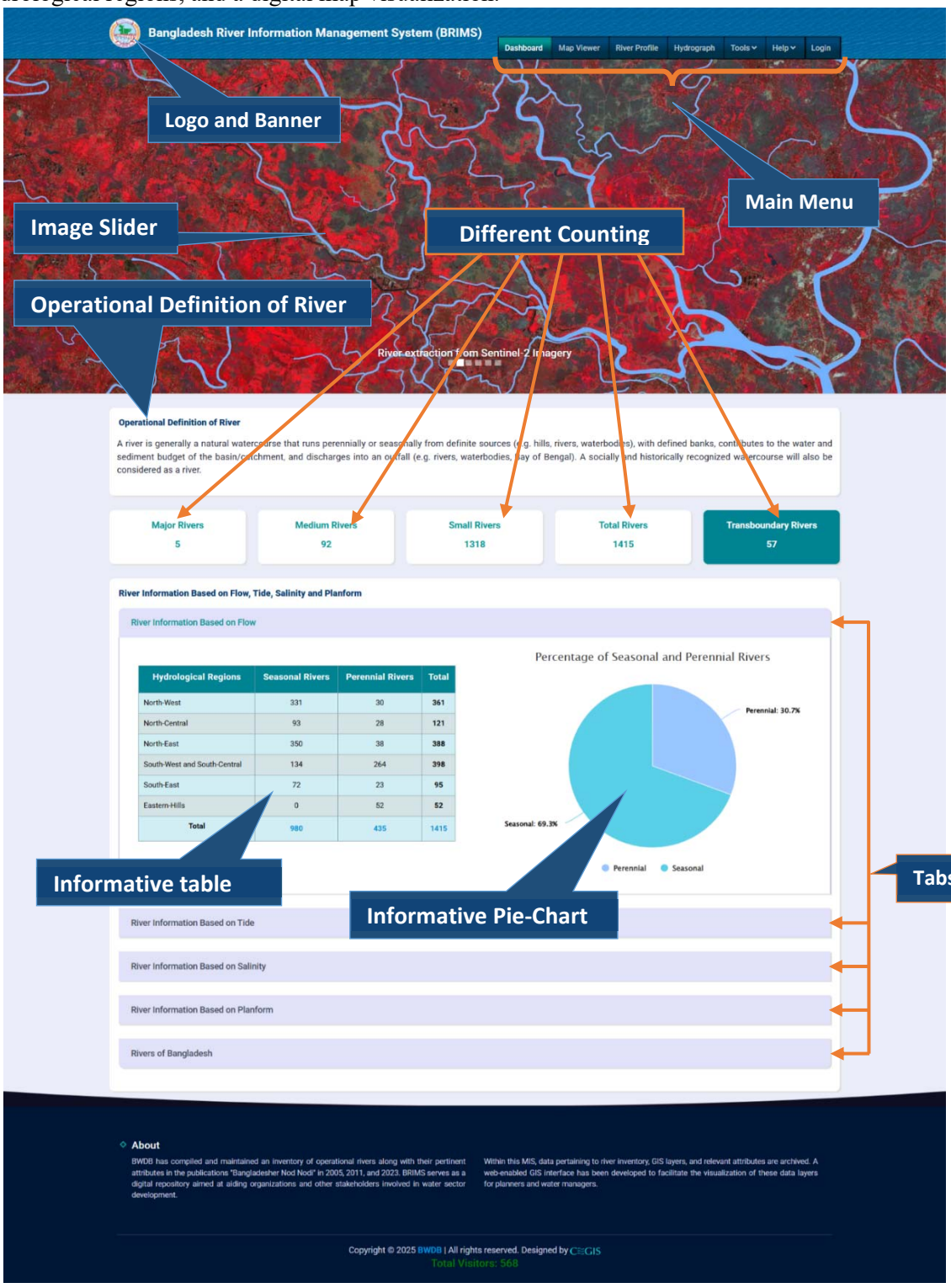


Figure 2.3: Dashboard

In the dashboard, different clickable links enable users to view tabular data (refer to Figure 2.4).

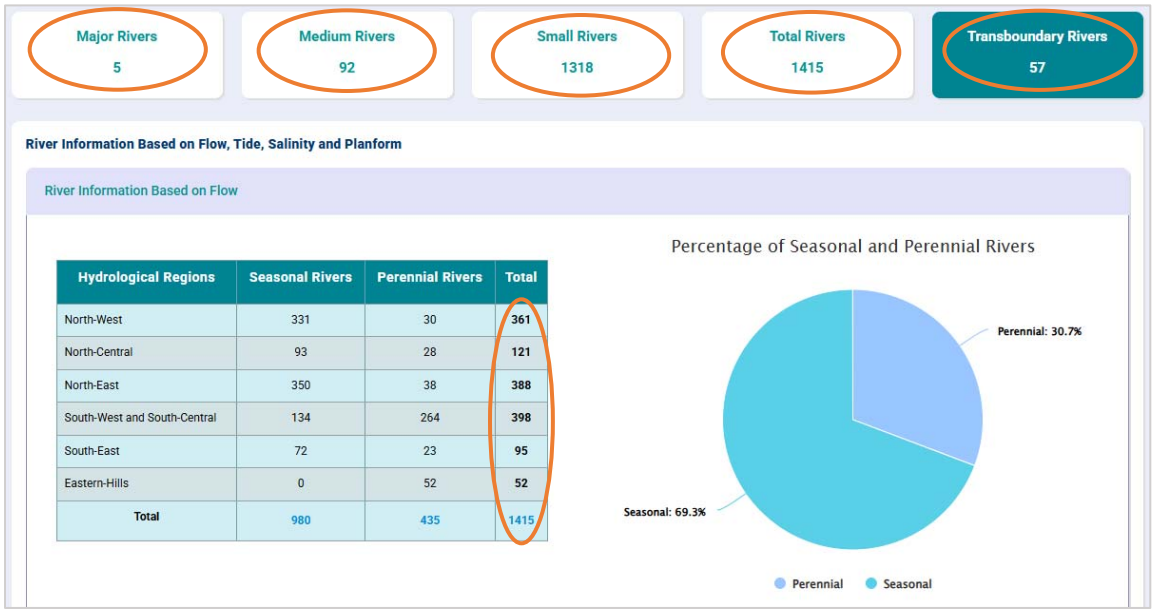


Figure 2.4: Clickable links to view data

Click on these links to view tabular data (Figure: 2.5)

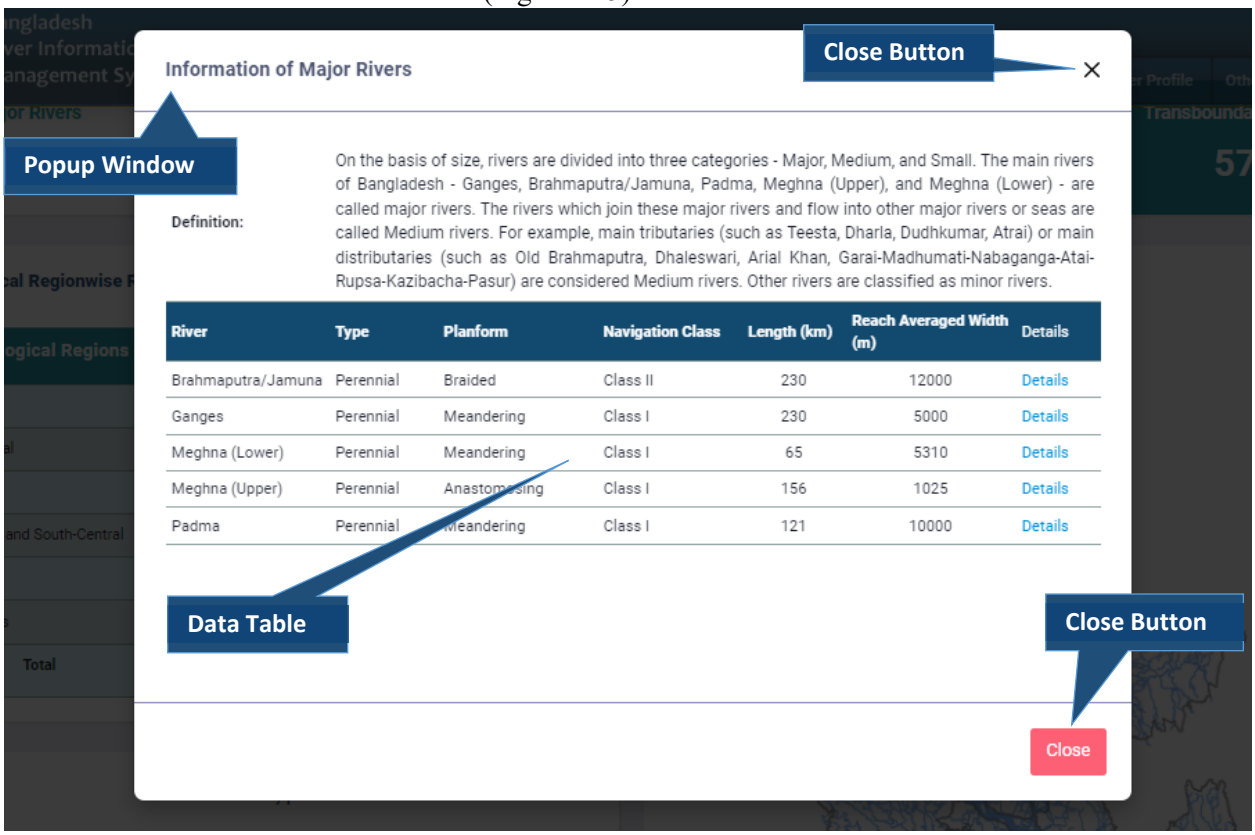


Figure 2.5: River Information using POPUP

3. Map Viewer

This module is designed to display and analyze, spatial data with features such as zoom-in, zoom-out, pan, and superimpose. The Map Viewer also allows users to view identity and attribute information of spatial data layers, and search for rivers using zone, admin boundary, and river as search criteria. All river information is initially loaded into the system. Users can view specific river details by clicking on the target river, triggering a popup view display. The popup view includes information such as water level, discharge, and rainfall, and also provides action buttons to view hydrological status, frequency analysis, and data availability.

When adding data such as water level or discharge, a summary of the parameters is displayed in the left panel. Additionally, the system incorporates a Map Export feature for exporting maps.

3.1 View River Information

In the Map Viewer Module, users can view river data with geological locations and various analytical data on the map dynamically (Figure 3.1).

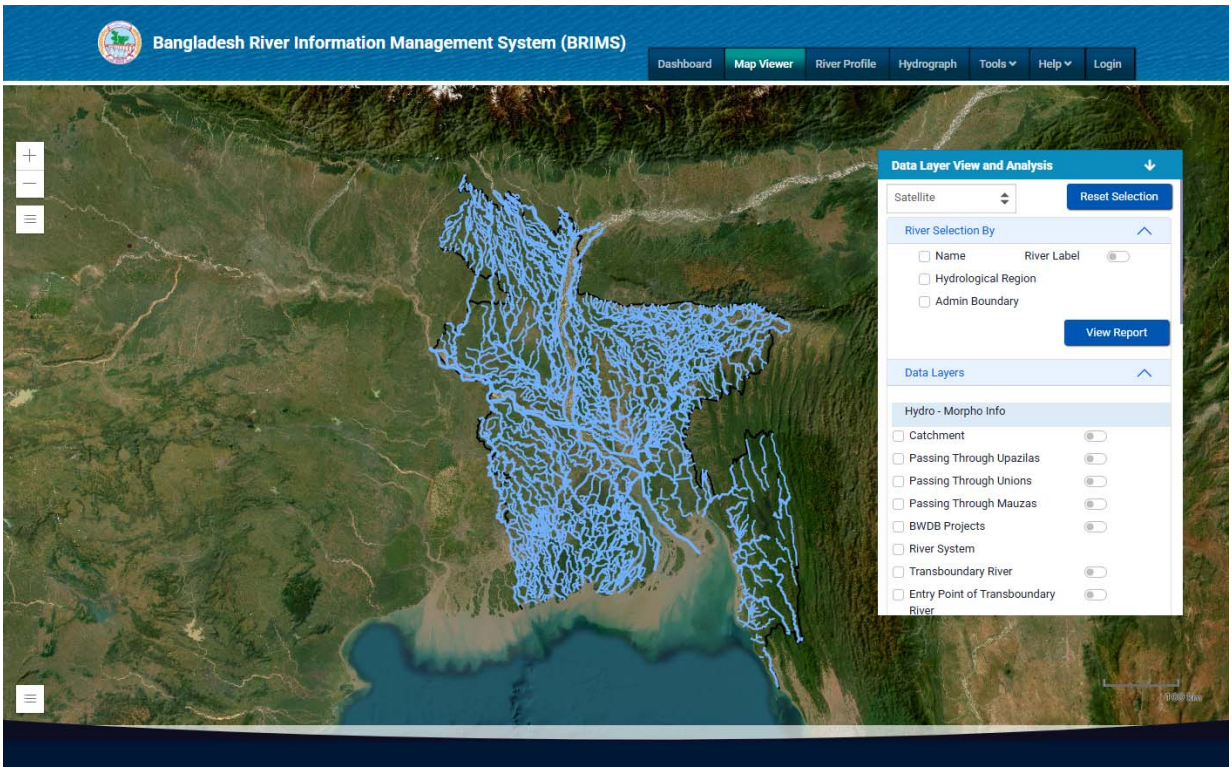


Figure 3.1: Map View Window

A river can be selected by Name, Hydrological Region, and Administrative Boundary (Figure 3.2)

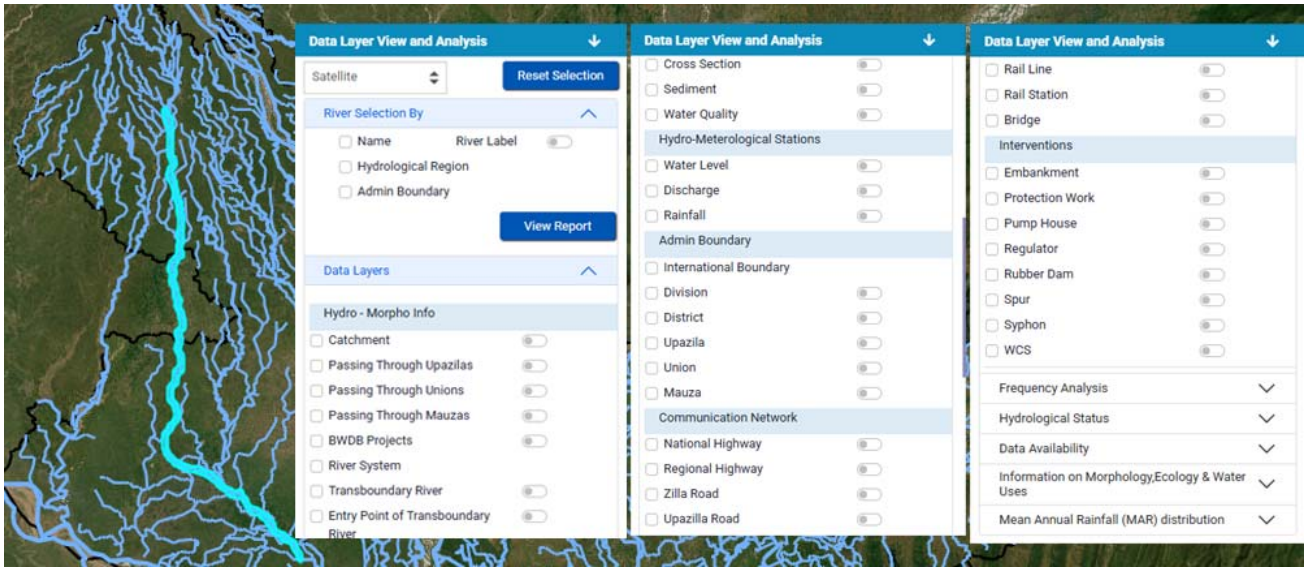


Figure 3.2: River Selection and Data Layers

3.2 Searching River by 'River Name'

Step 1: Select the "Name" option from the search options.
Step 2: Enter the River Name in the search box to search for rivers.
Step 3: Choose the river from the list of displayed rivers to view it on the map (see Figure 3.4).

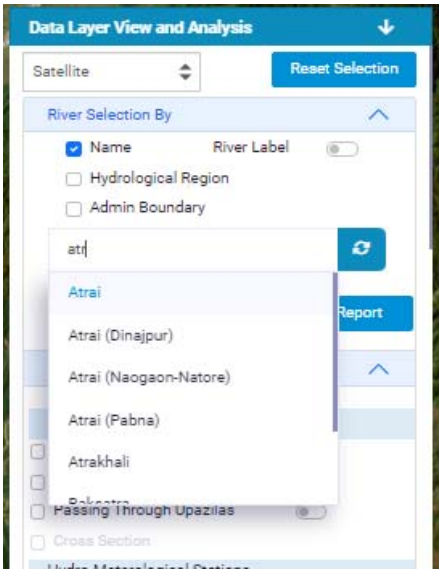


Figure 3.3: Searching River by River Name

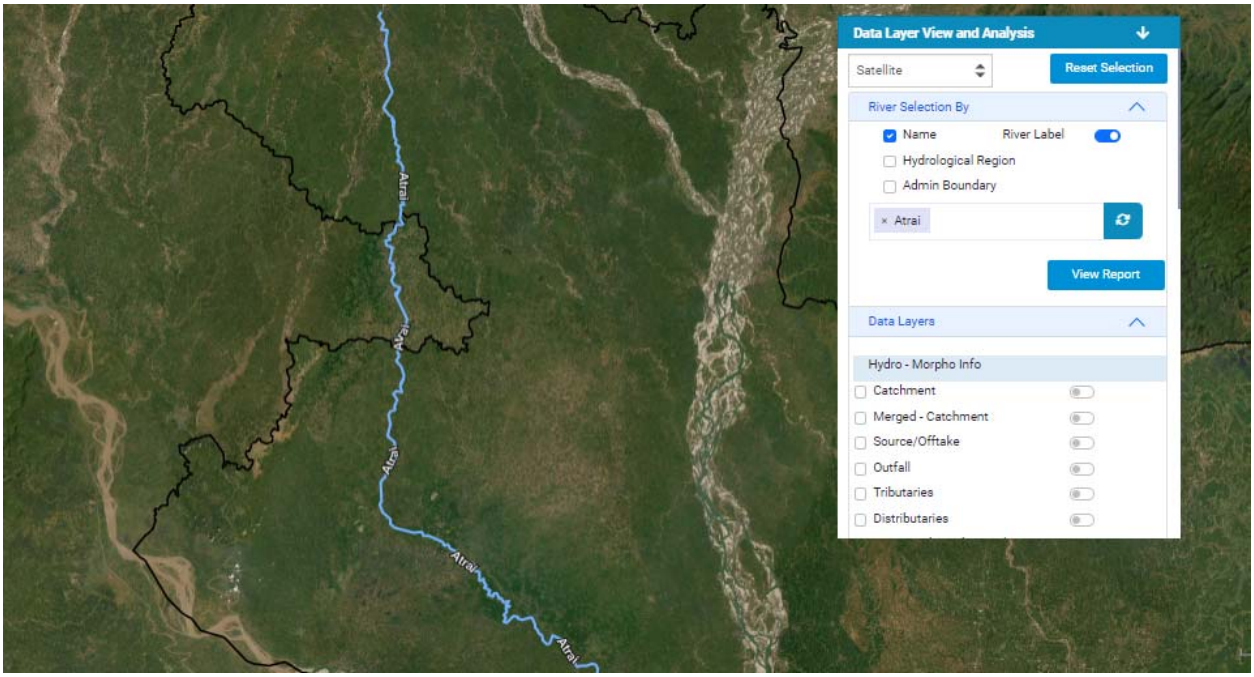


Figure 3.4: Result for Searching River by River Name

3.3 Searching River by 'Hydrological Region'

Step 1: Select the 'Hydrological Region' option from the search option.
Step 2: Select a Zone from the drop-down list and rivers will be displayed on the map.

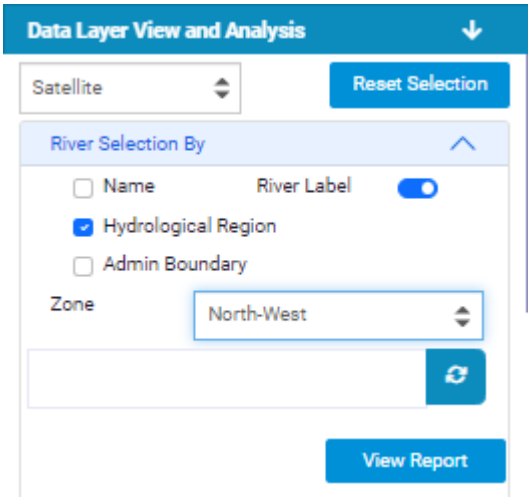


Figure 3.5: Searching River by 'Hydrological Region'

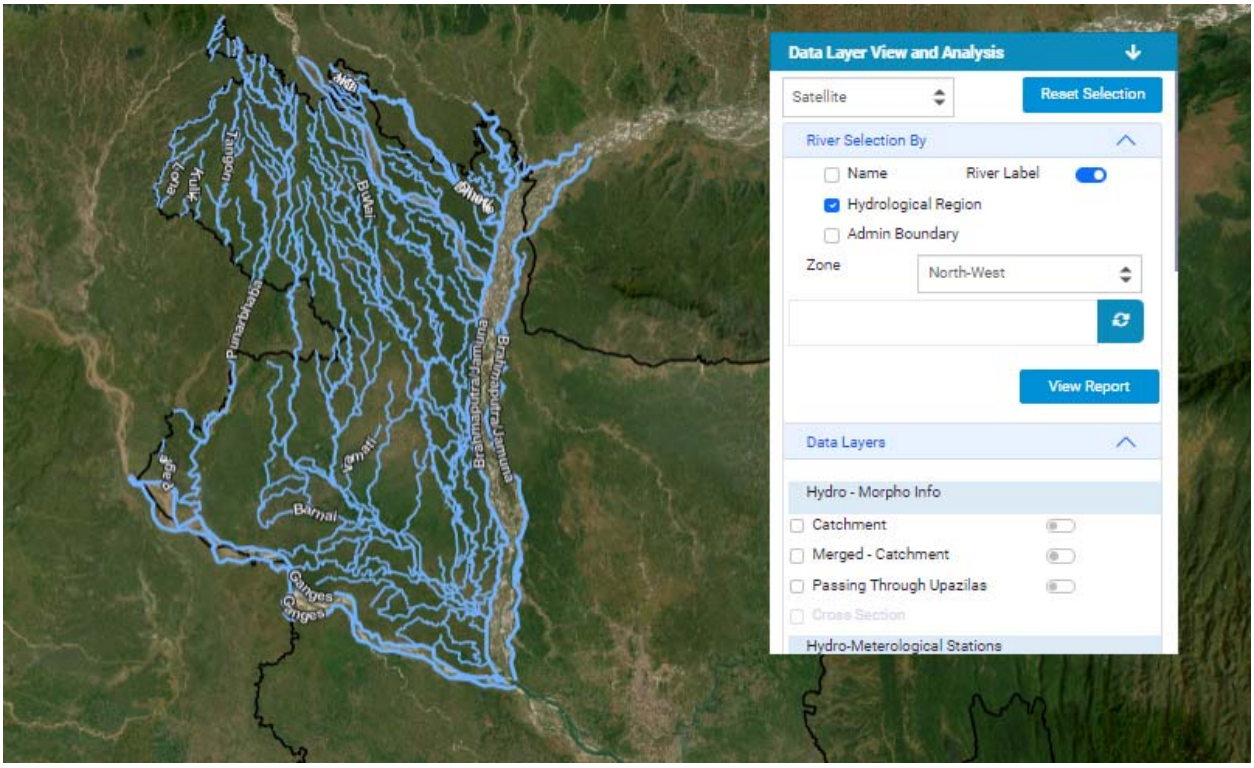


Figure 3.6: Result of Searching River by 'Hydrological Region'

Using the 'Hydrological Region' option instead of searching river by zone, a river can be searched by selecting the river name from the checkbox list. (Figure: 3.7)

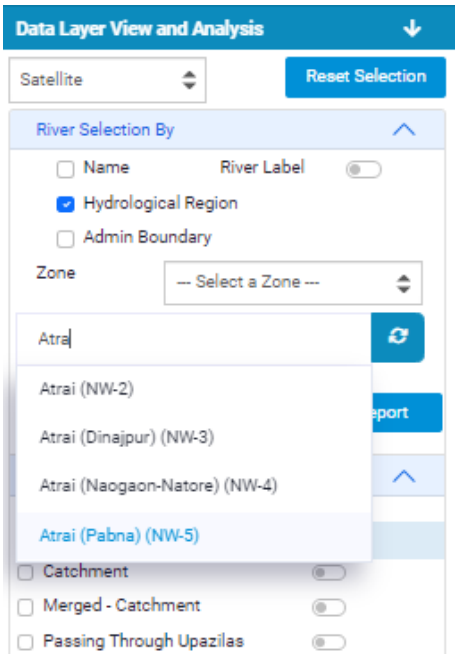


Figure 3.7: Searching River by River Name from the checkbox list in 'Hydrological Region' option

3.3 Searching River by the ‘Admin Boundary’

Step 1: Select the ‘Admin Boundary’ option from the search options
Step 2: Select a Division Name from the drop-down list and maps will be zoomed to the selected Division.
Step 3: Select a District Name from the drop-down list and maps will be zoomed to the selected District.
Step 4: Select an Upazila Name from the drop-down list and a map of the source will be displayed.

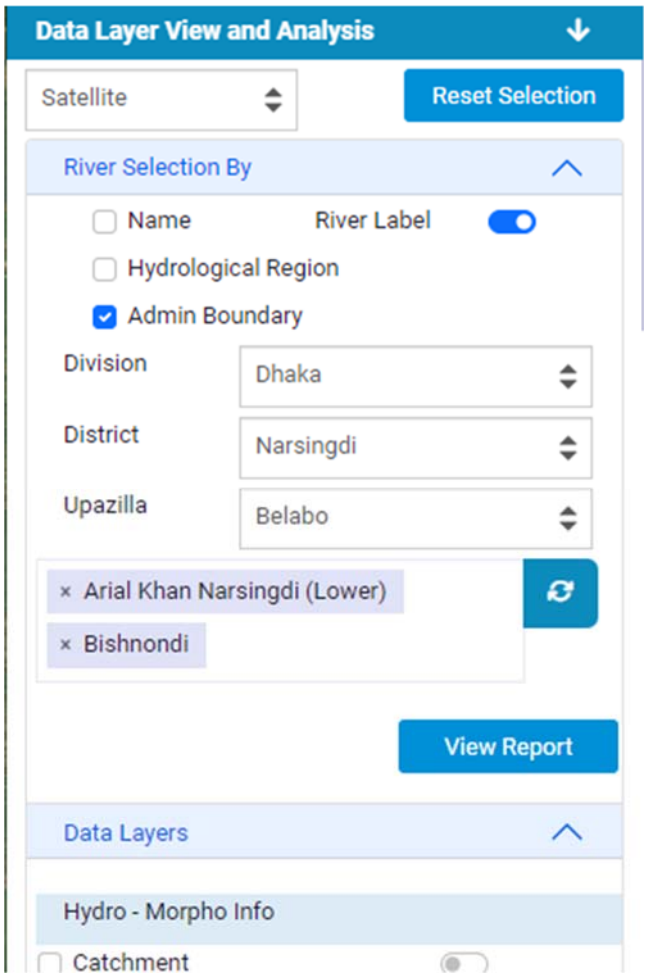


Figure 3.8: Searching River by using the ‘Admin Boundary’ option

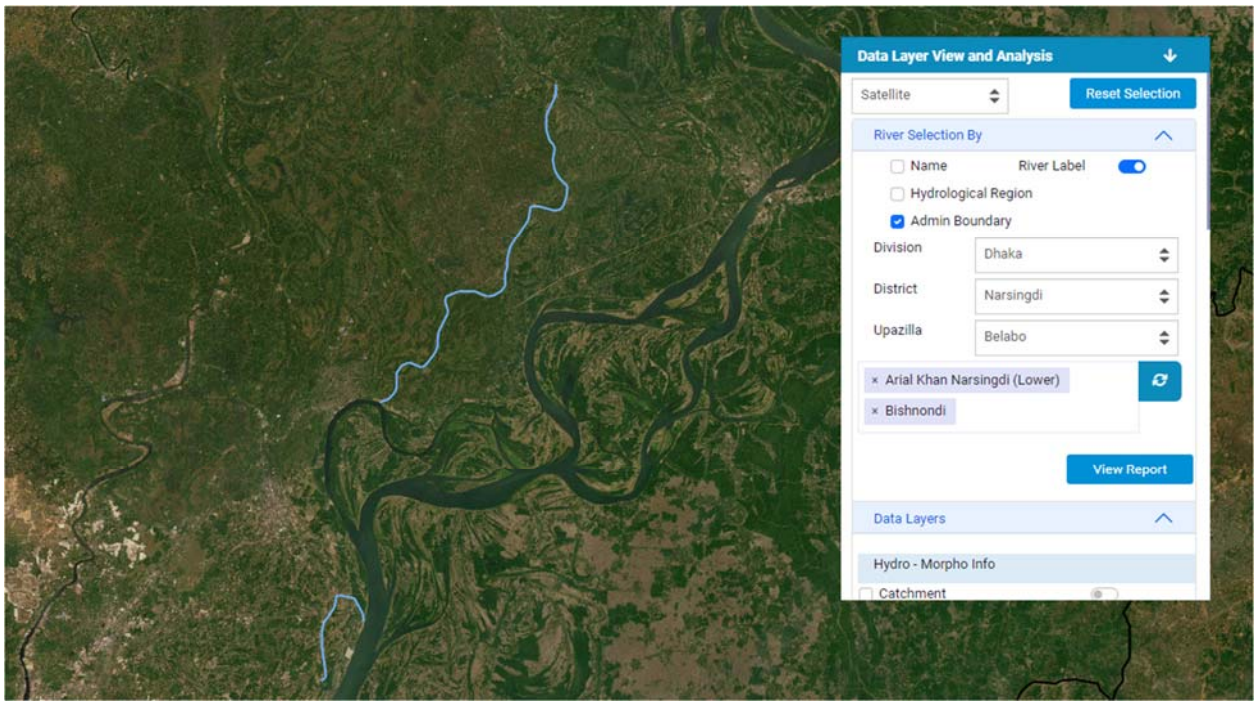


Figure 3.9: Display the Result of Searching River by 'Admin Boundary' option

3.4 View River Information

After selecting a river, users can view specific information about the river, including details (Figure 3.10).

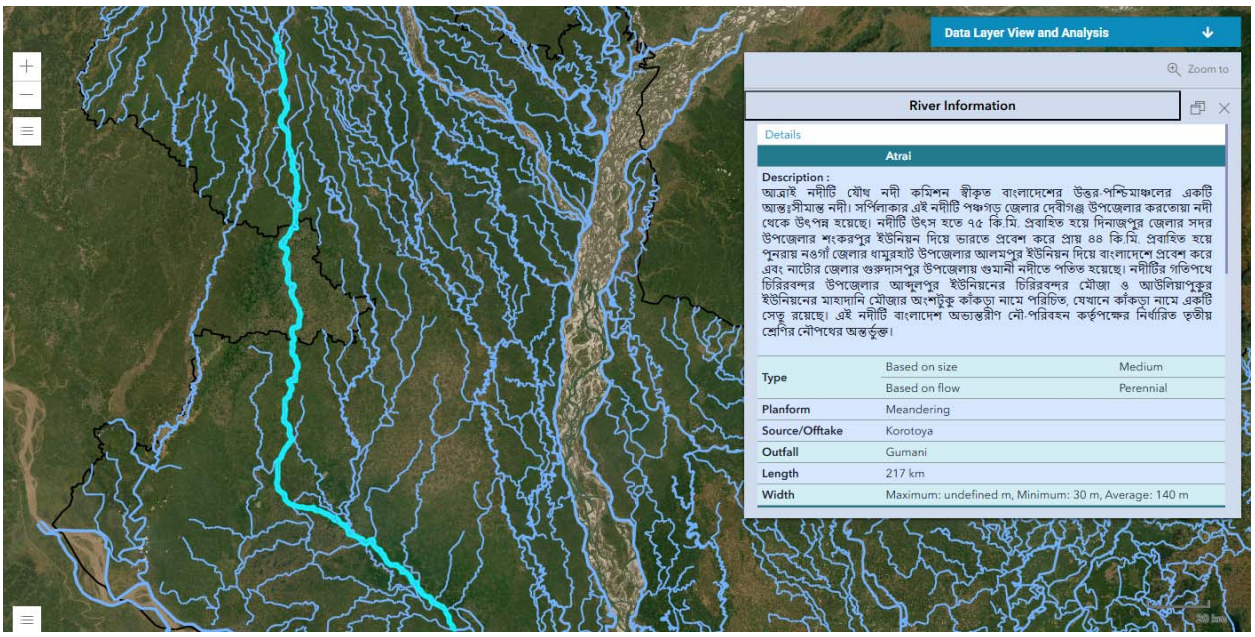


Figure 3.10: Viewing River Information by Selecting River

3.5 Adding Multiple Layer

On the map of the selected river users can add various layers such as Catchment, Sub-Catchment, Offtake, Outfall, Tributaries, and Distributaries. This can be done by following these steps:

Step 1: Select the river from the River Selection section. (Figure: 3.11)

Step 2: Choose the desired layers from the Data Layers section. For example, Water Level and Discharge stations have been included to view information. (Figure: 3.12)

Step 3: Click on the target station on the map to display a data table with all the river information. Each river Information Table has three more features. (Figure: 3.13)

(a) Data Availability.

(b) Statistical Info.

(c) Frequency Analysis.

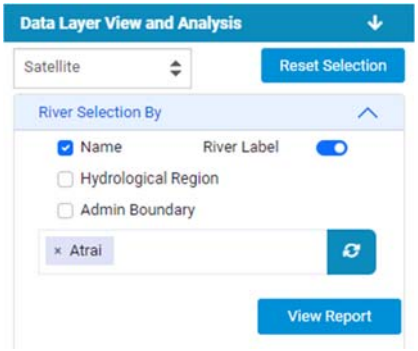


Figure 3.11: Selecting River Name from River Selection Panel

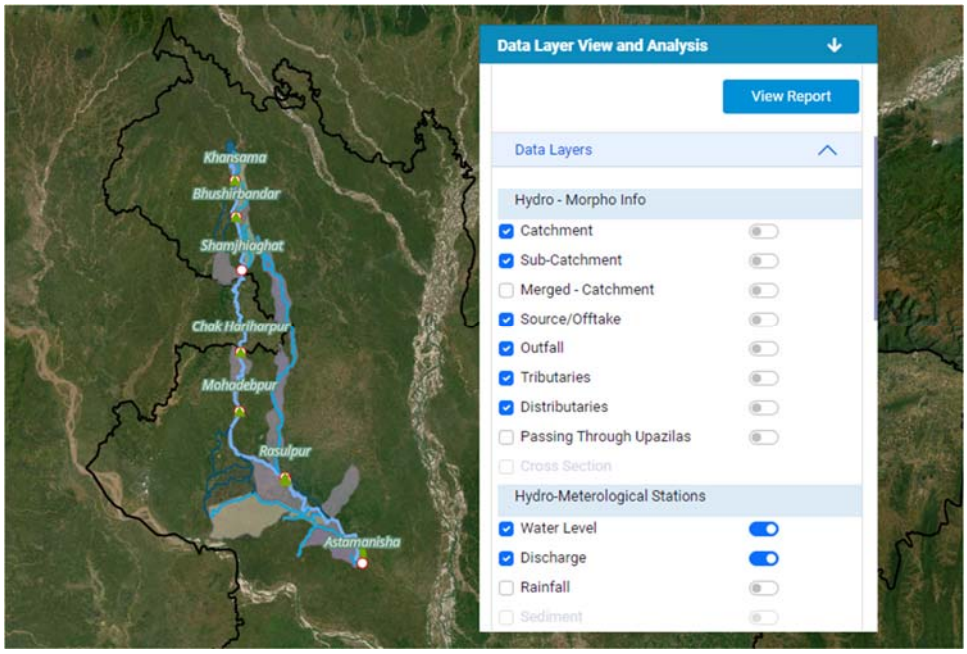


Figure 3.12: Selecting Different Layers from Data Layers

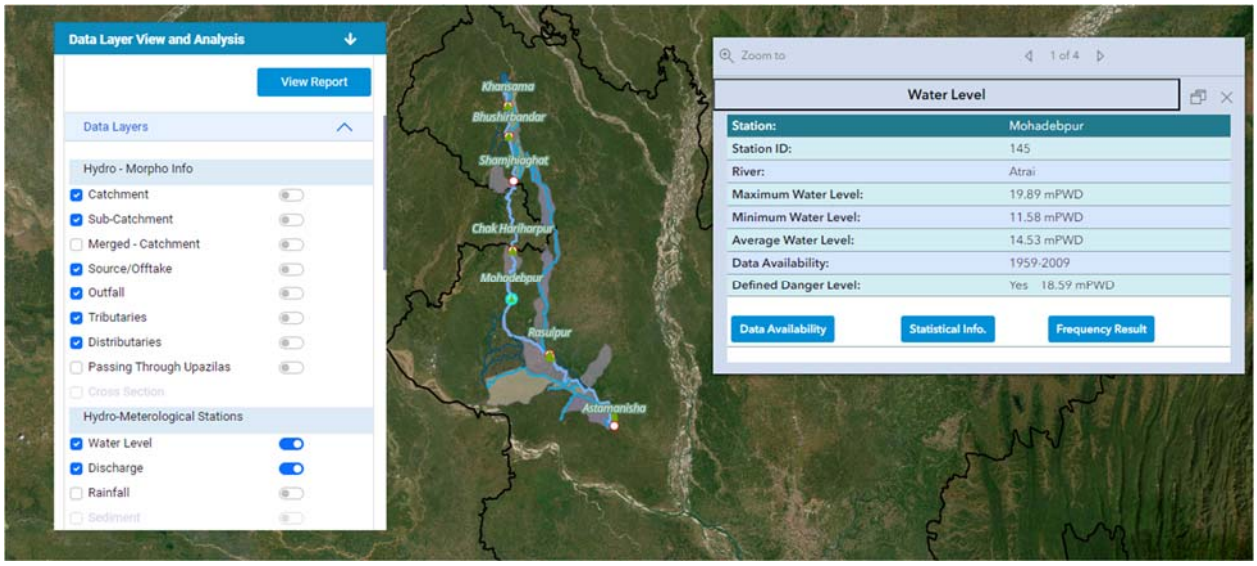


Figure 3.13: River Information Table by Clicking Map Point

(a) Data Availability

To view data Availability, click on the 'Data Availability' Button and the status will be displayed in Tabular and Graphical Format. (Figure 3.14 and 3.15)

Data Availability

Discharge of Chak Hariharpur Station

Year	January	February	March	April	May	June	July	August	September	October	November	December
1989	0	0	0	30	31	30	31	31	30	31	30	31
1990	31	28	31	30	31	30	31	31	30	31	30	31
1991	31	28	31	30	31	30	31	31	30	31	30	31
1992	31	29	31	30	31	30	31	31	30	31	30	31
1993	31	28	31	30	31	30	31	31	30	31	30	31
1994	31	28	31	0	0	0	0	0	0	0	0	0
2006	31	28	31	30	31	30	31	31	30	31	30	30
2010	2	0	0	0	0	0	2	3	2	0	2	2
2011	3	0	0	0	0	0	3	2	2	3	2	2
2012	2	0	0	0	0	0	3	2	3	2	1	1
2013	0	0	0	0	0	0	2	3	3	2	2	2
2014	0	0	0	0	0	0	2	2	2	2	2	2
2015	0	0	0	0	0	0	2	2	2	2	3	2
2016	0	0	0	0	0	0	2	2	2	3	1	0
2017	0	0	0	0	0	2	3	2	2	0	0	0
2018	0	0	0	0	0	0	2	2	2	0	0	0
2019	0	0	0	0	0	0	2	2	3	0	0	0
2020	0	0	0	0	0	0	2	3	2	2	2	2
2021	3	2	0	0	2	2	2	2	2	3	2	2
2022	2	2	0	0	2	2	0	0	0	0	0	0

Figure 3.14: Record of Data Availability in Tabular Format.

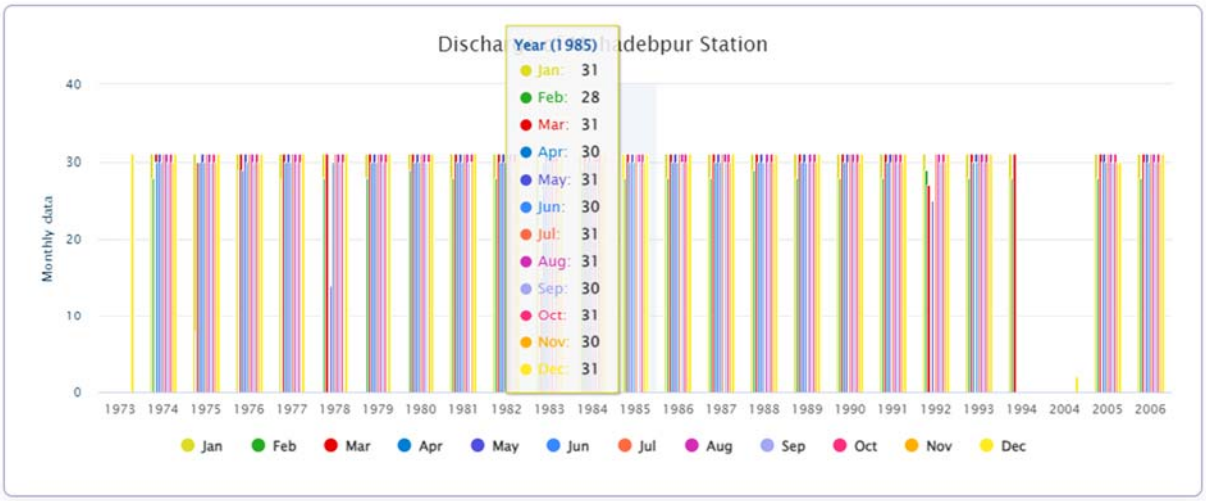


Figure 3.14: Record of Data Availability in Graphical Format.

(b) Statistical Info.

To view data Availability, click on the 'Statistical Info.' button and the status will be displayed in Tabular and Graph Format. (Figure 3.16 and 3.17)

Statistical Information

Discharge of Mohadebpur Station

Station	Year	Maximum Value (m^3/sec)	Minimum Value (m^3/sec)	Average Value (m^3/sec)	Sum (m^3/sec)
145	1973	37.60	29.10	32.49	1007.10
145	1974	1180.00	15.40	195.38	71313.40
145	1975	708.00	1.75	102.58	35287.39
145	1976	1080.00	3.85	114.52	41798.13
145	1977	818.00	3.62	99.56	36337.84
145	1978	978.00	5.91	111.87	35575.41
145	1979	1190.00	2.74	110.09	40183.62
145	1980	871.00	7.59	125.43	45906.19
145	1981	776.00	5.23	118.33	43191.78
145	1982	647.00	5.89	88.19	32191.05
145	1983	831.00	6.61	138.15	44760.38
145	1984	1030.00	7.43	150.99	55262.23
145	1985	1070.00	3.80	149.50	54569.18
145	1986	890.00	8.62	119.01	43438.27
145	1987	1160.00	8.87	197.19	71972.71
145	1988	1170.00	8.73	152.47	55804.86
145	1989	1040.00	5.51	176.17	64301.84
145	1990	929.00	10.90	146.86	53602.60
145	1991	1620.00	10.90	193.34	70567.90
145	1992	1200.00	12.10	140.05	45656.50
145	1993	1140.00	13.10	145.48	53101.00

Figure 3.16: Record of 'Statistical Info.' In Tabular Format.

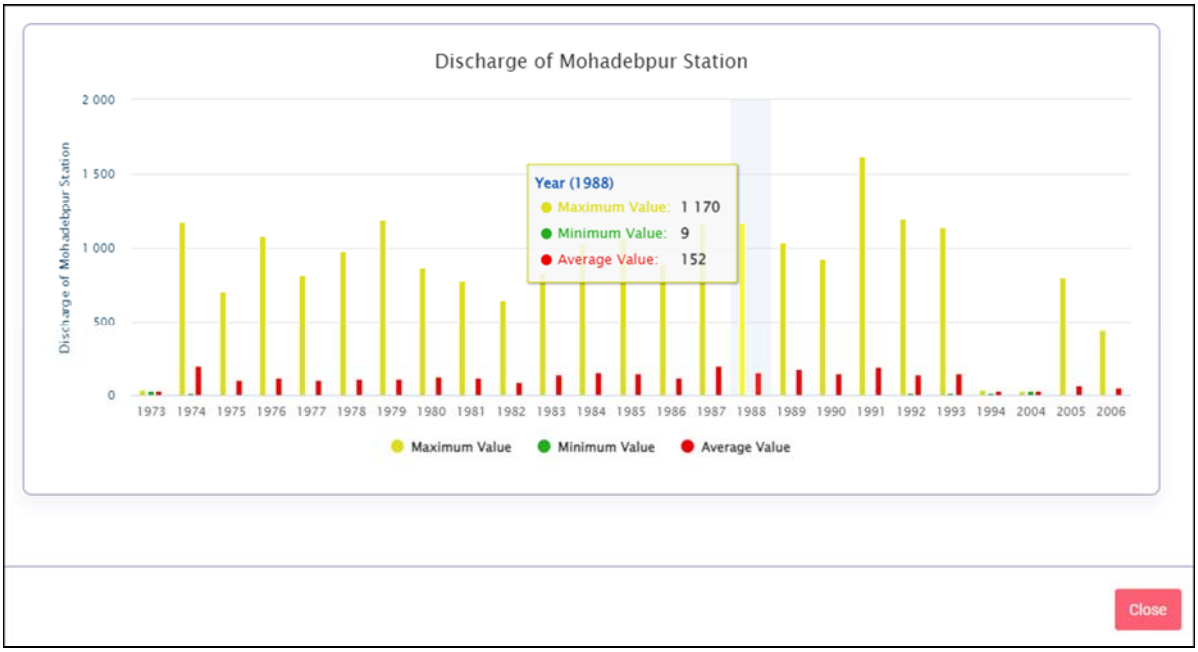


Figure 3.17: Record of 'Statistical Info.' in Graphical Format.

(c) Frequency Analysis

To view data Availability, click on the 'Data Availability Status' Button, and the status will be displayed in Tabular and Graph Format. (Figure 3.18)

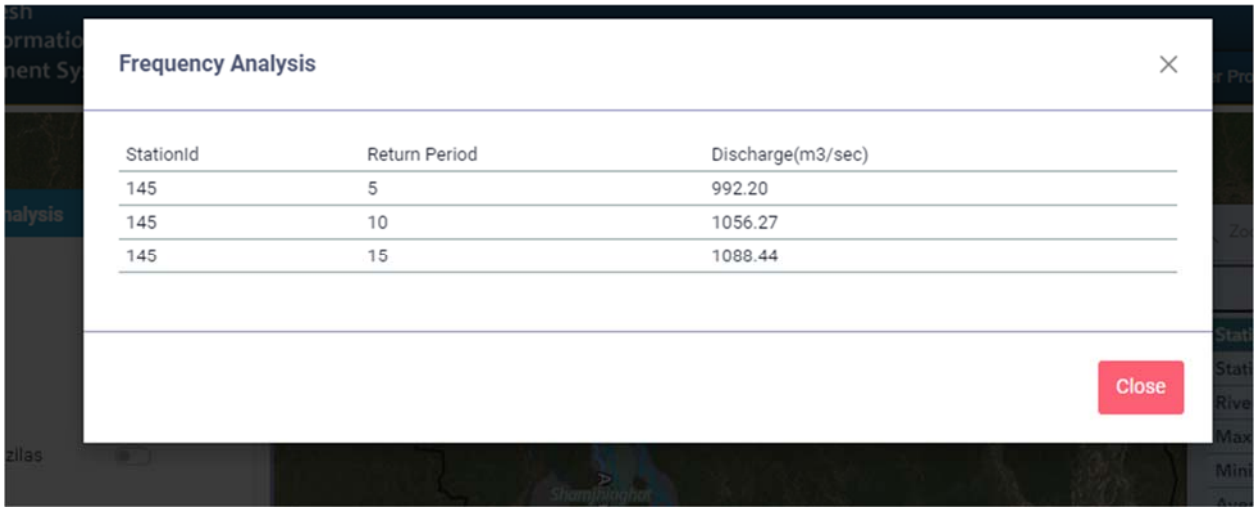


Figure 3.18: Resultant Table of Frequency Analysis

3.6 Data Availability

Select the required option from the Data Availability Panel to view the scenario in graphical and tabular format. The figures display the monthly number of records for different parameters such as Water Level, Discharge, and Rainfall available in the system.

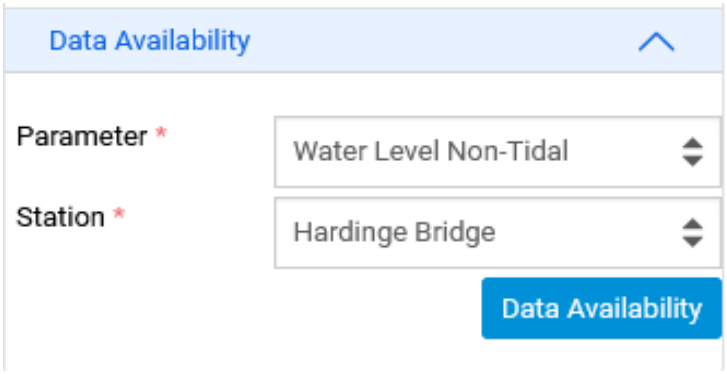


Figure 3.19: Selecting the Required Option from the Data Availability Panel

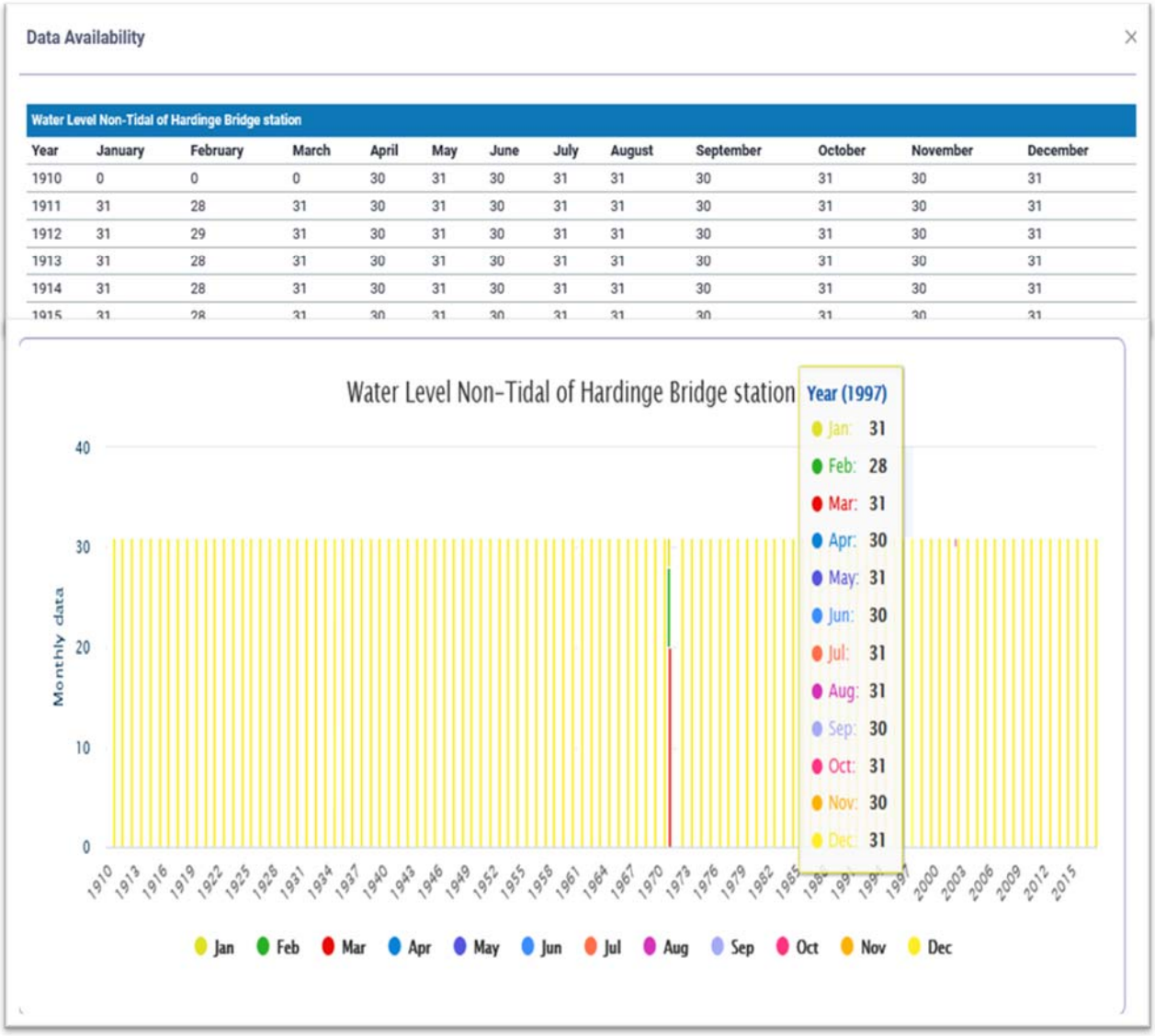


Figure 3.20: Monthly Record of Data Availability in Graphical and Tabular Format.

3.5 Hydrological Status

Selection required option from the Hydrological Status Panel to view the scenario in Graph and Tabular format. (Figure: 3.21)

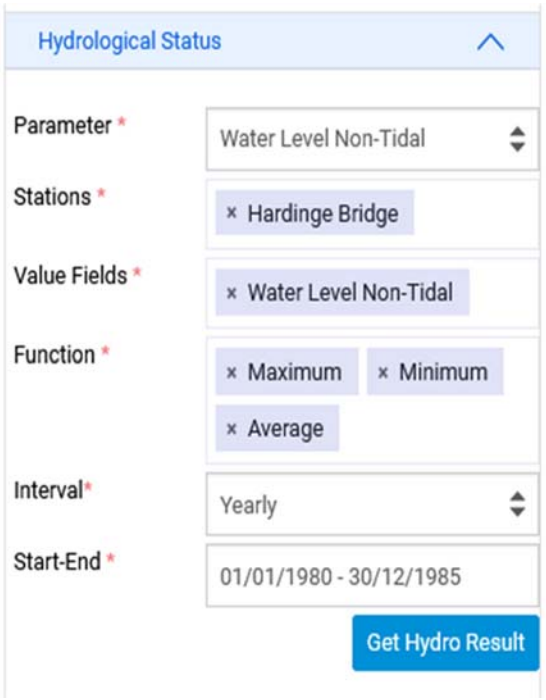


Figure 3.21: Selecting the Required Option from the Hydrological Status Panel

Figure 3.22: View Hydrological Status

3.5 Frequency Analysis

Select the required option from the Frequency Analysis Panel to view the result in Graphical and Tabular format. (Figure: 3.23) The result can be shown with stationid, Return Period, and Parameter name. (Figure: 3.24)

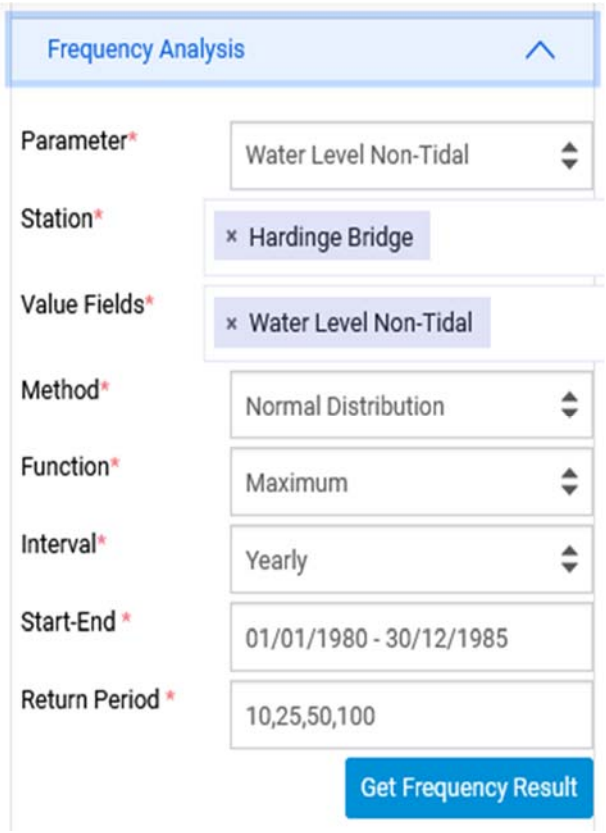
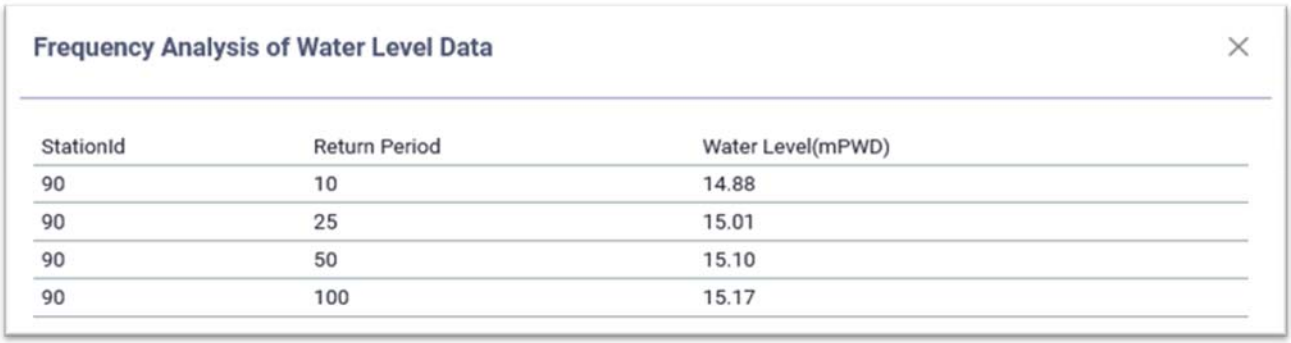


Figure 3.23: Selecting the Required Option from the Frequency Analysis Panel



Frequency Analysis of Water Level Data

StationId	Return Period	Water Level(mPWD)
90	10	14.88
90	25	15.01
90	50	15.10
90	100	15.17

Figure 3.24: Resultant Table of Frequency Analysis

4. River Profile

Users can search and view river information by Hydrological Region or Administrative Boundary.

Step 1: Click on the Hydrological Region and select a region from the dropdown (Figure: 4.1)
Step 2: A list of rivers from the selected region will be loaded into the river list (Figure: 4.1).
Step 3: A data table will load below as a search result with selected River list information. (Figure: 4.2)
Step 4: The data table has a search bar at the top right side and three buttons on the right side of each row for View Details in English/Bangla and other one for View Full Details (Figure: 4.3).
Step 5: In the List of River Panel, there are three buttons to view river details: first two for river details report based on availability and other for river details report based on the data fields (Figure: 4.3).

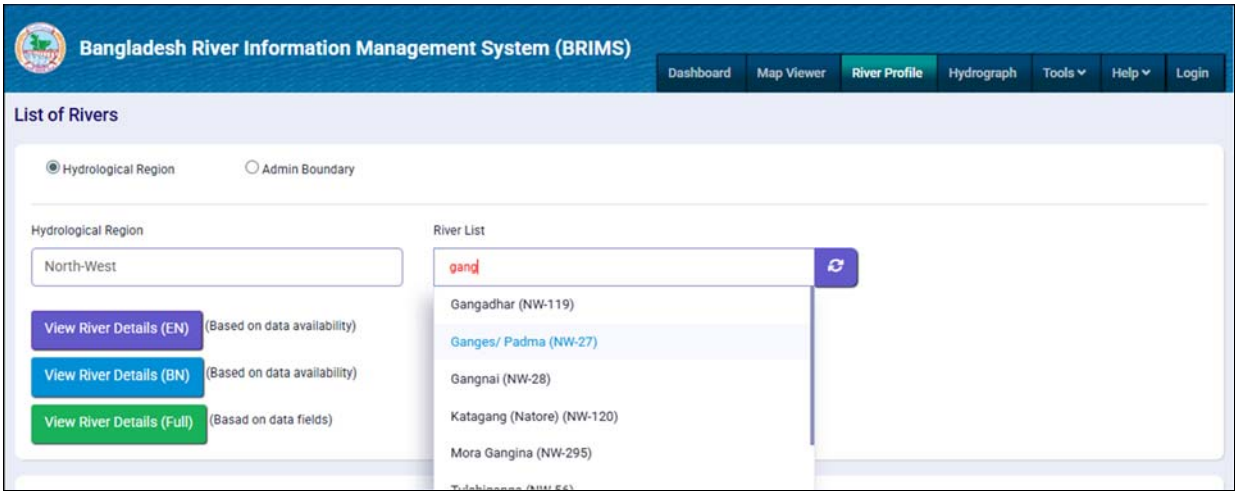


Figure 4.1: Selection of river from List of Rivers Panel

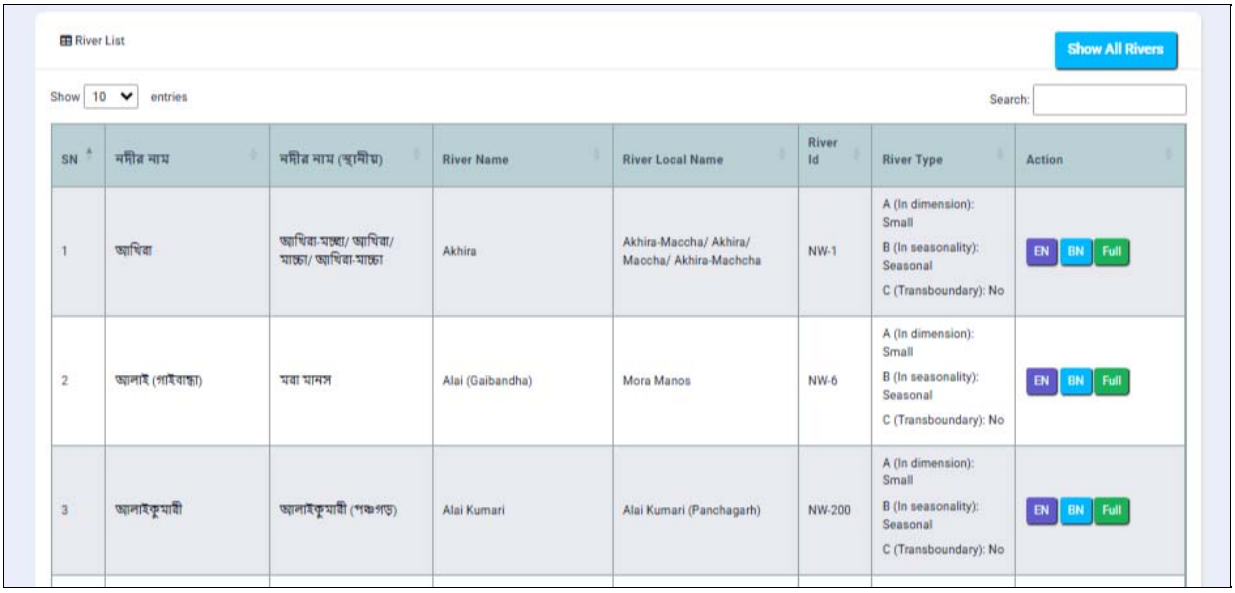


Figure 4.2: View River Information in a customized way as per user.

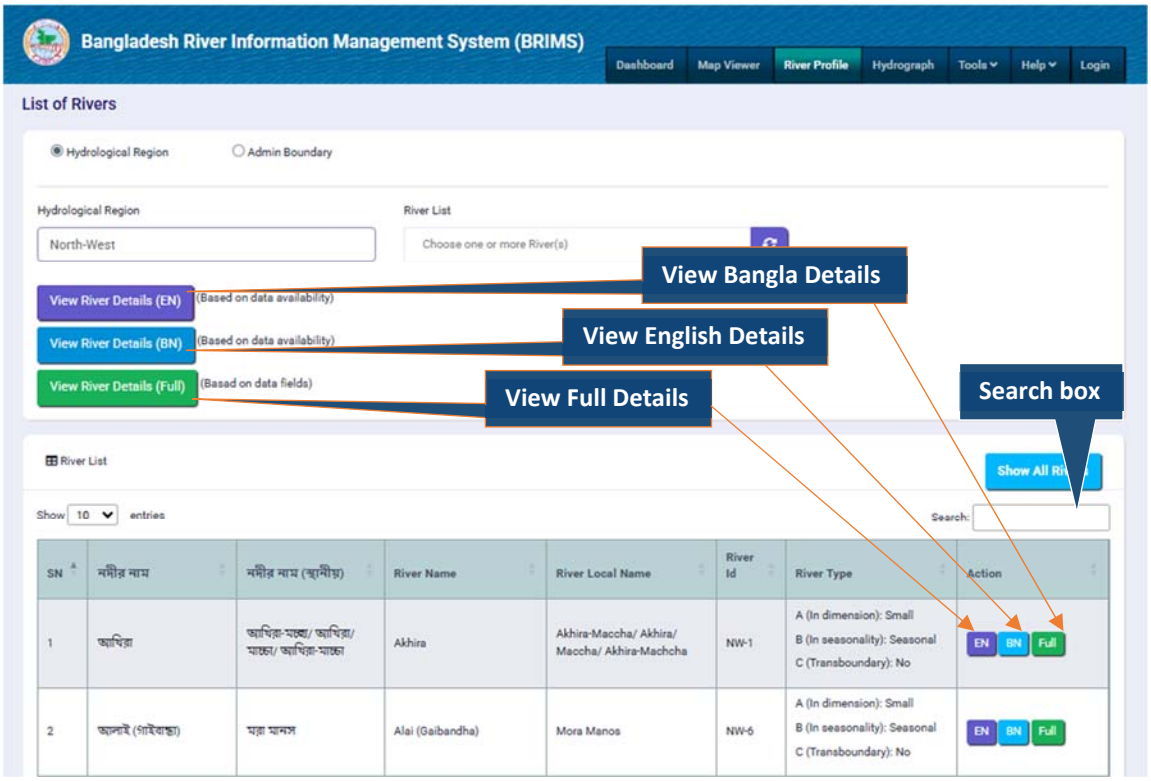


Figure 4.3: River Information Table

4.1 View Details

Click the View button on the data table to open a new page displaying the selected river information in view mode (Figure 4.4).

- Every view table has a print button at the top to print the river information report.
- There are some checkboxes to filter the information sections in the table to view.
- This report will contain all the selected river information one after the other.

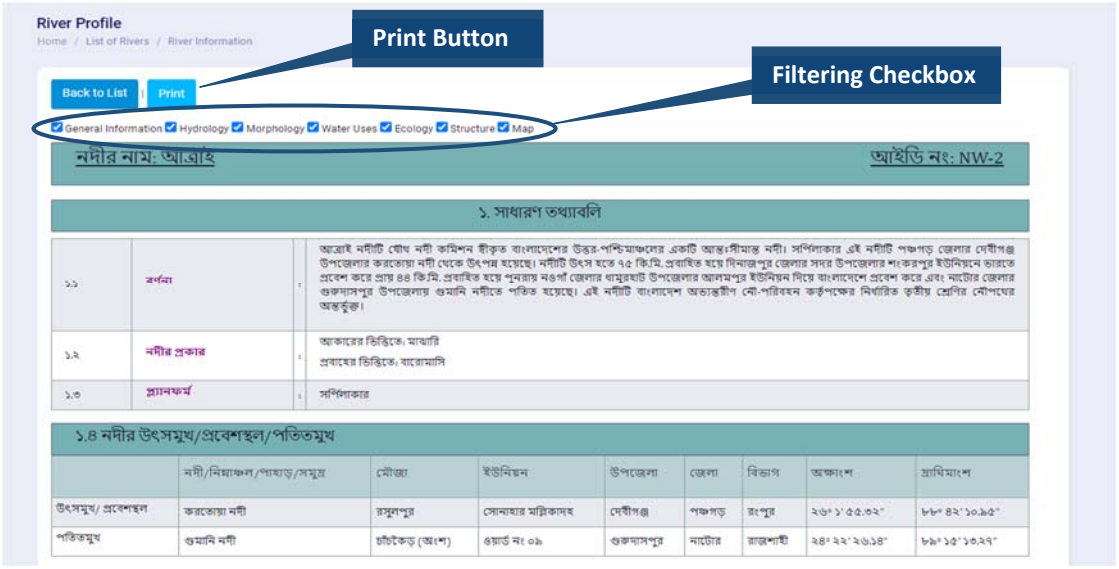


Figure 4.4: View Details

4.2 View River Details (Based on Availability)

By clicking on the View River Details (Based on Availability) button a new page will load with selected river information based on the available data in the database.

- Every view table has a print button at the top to print the river information report.
- There are some checkboxes to filter the information table to view.
- This report will contain all the selected river information one after the other.

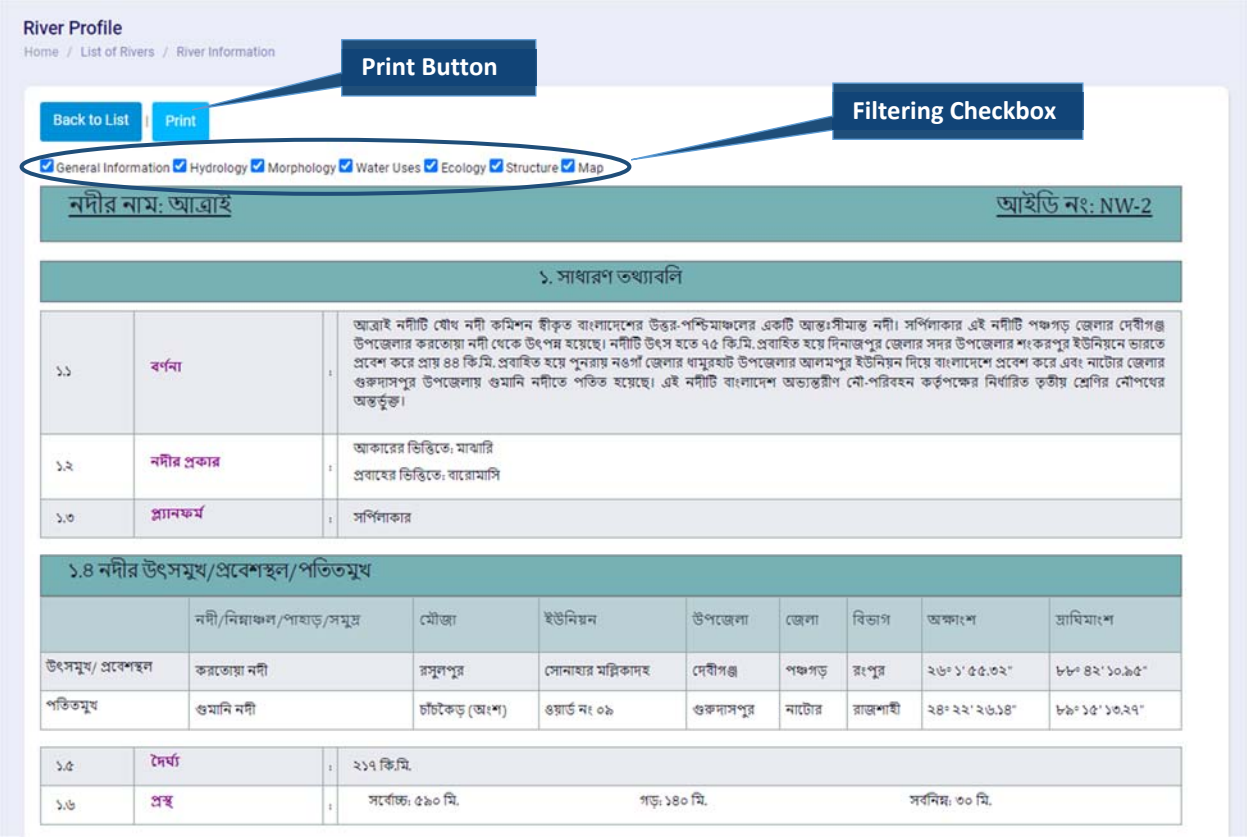


Figure 4.5: View River Details (Based on Availability)

This river detail report contains all the fileds with or without data. If any field has no data, then it shows empty field with caption only.

4.3 Edit/Update River information

Step 1: To update/edit data, there must be an authentic user need to **login**. Then another button will be visible in the River Information Table, which is the Edit button (Figure 4.6).
Step 2: Now click on the Edit button, the actino will take to the Edit/Update page (Figure 4.7).

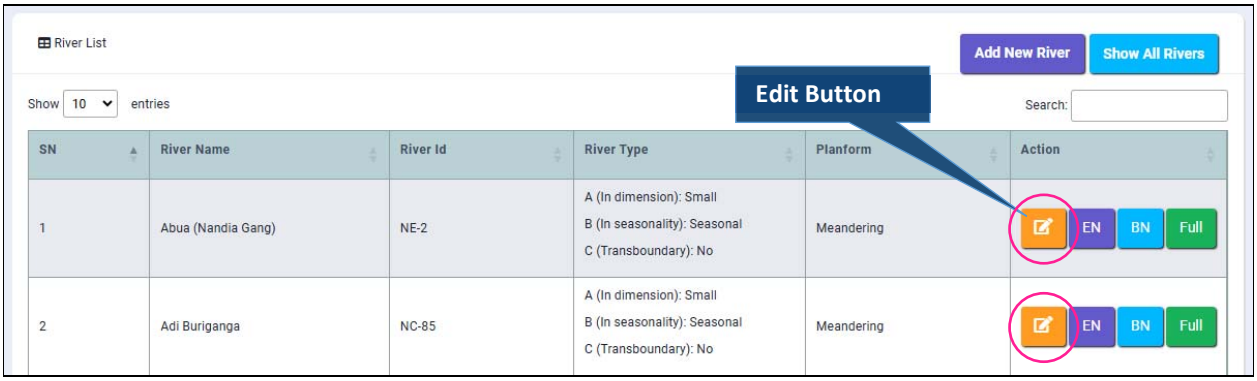


Figure 4.6: River Information Table with Edit button.

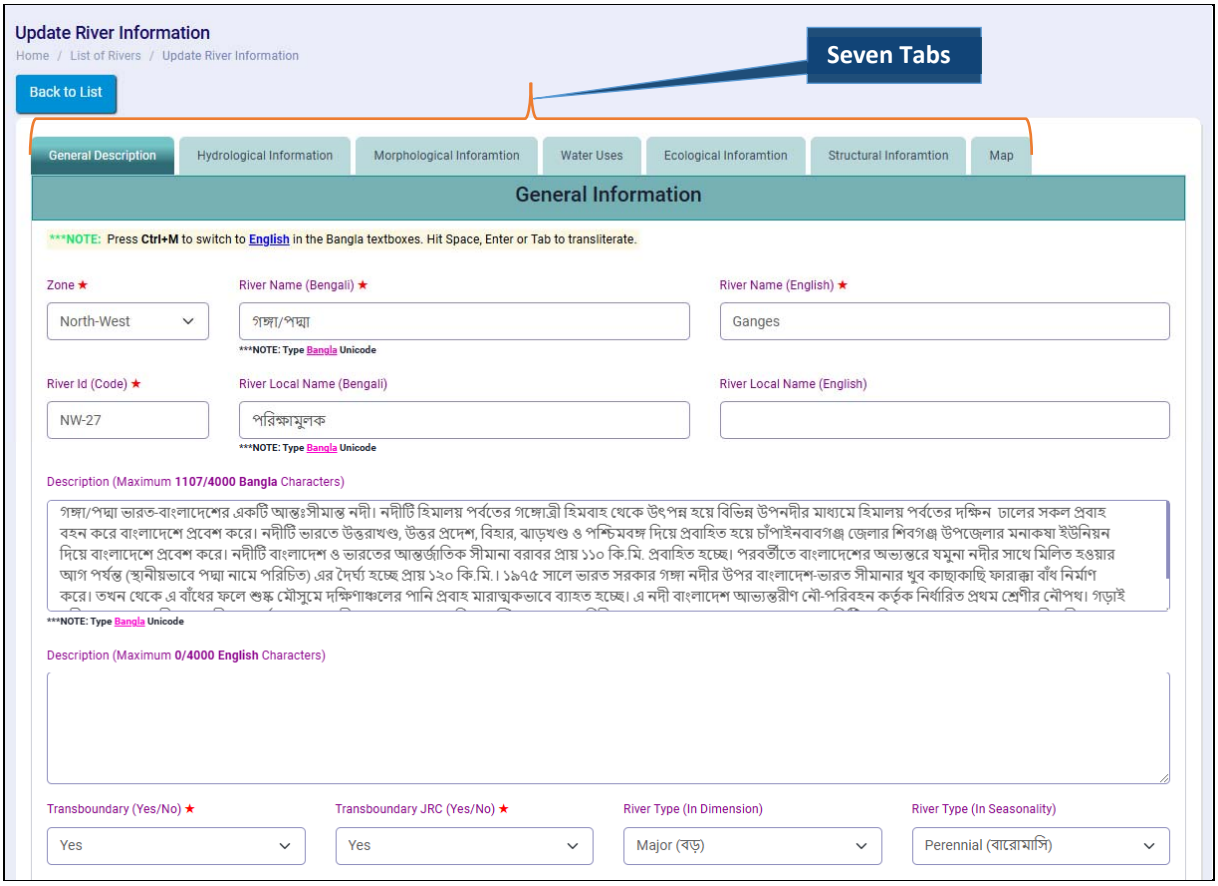


Figure 4.7: River Information Edit/Update page.

Step 3: Change or add necessary information to the input boxes then click on the save button to store the data in the database (Figure 4.8).

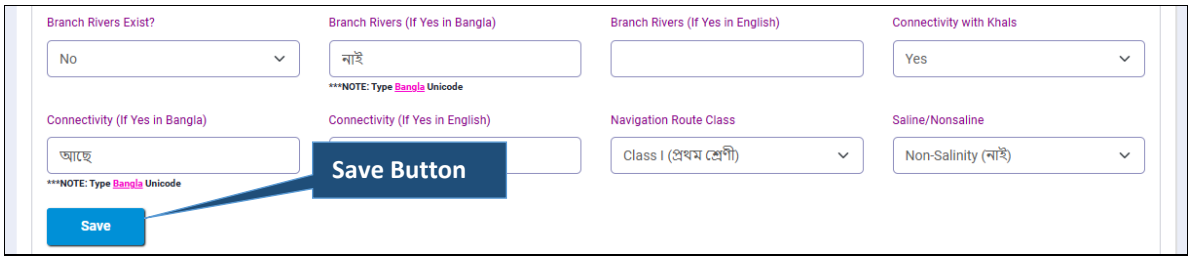


Figure 4.8: Save River Information data.

4.4 Print Report

Users can easily print the river details report from the newly loaded river details page by clicking the print button.

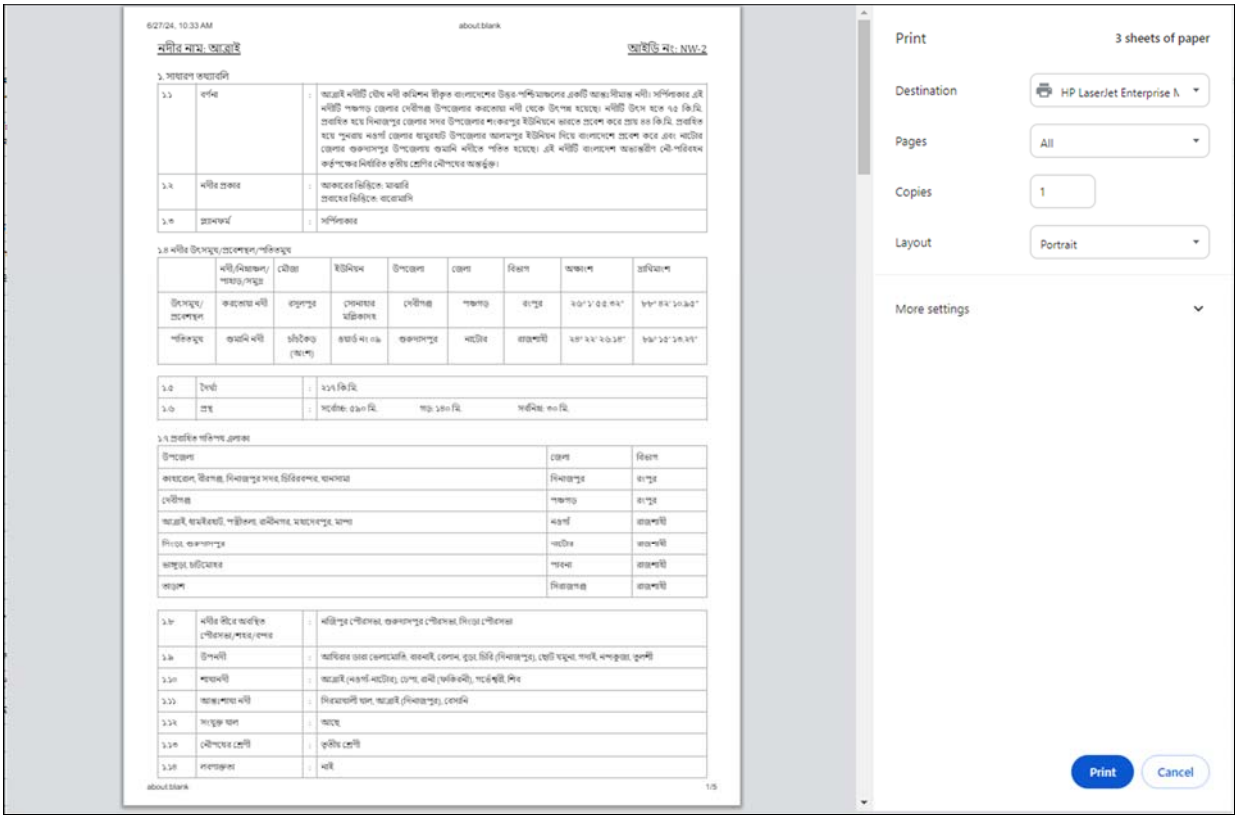


Figure 4.7: Print River Information Report

5. Hydrograph

Select Hydrograph from the **main menu**, then a new page will load with some parameters (Figure 5.1).

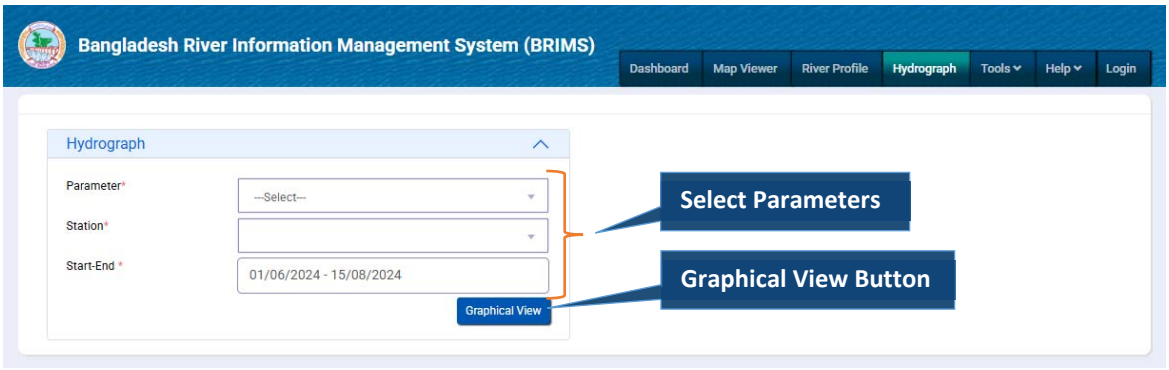


Figure 5.1: Hydrograph page with parameters.

Select a parameter, station and start-end dates then ***click*** on the **Graphic View** button to view graphical data (Figure 5.2).

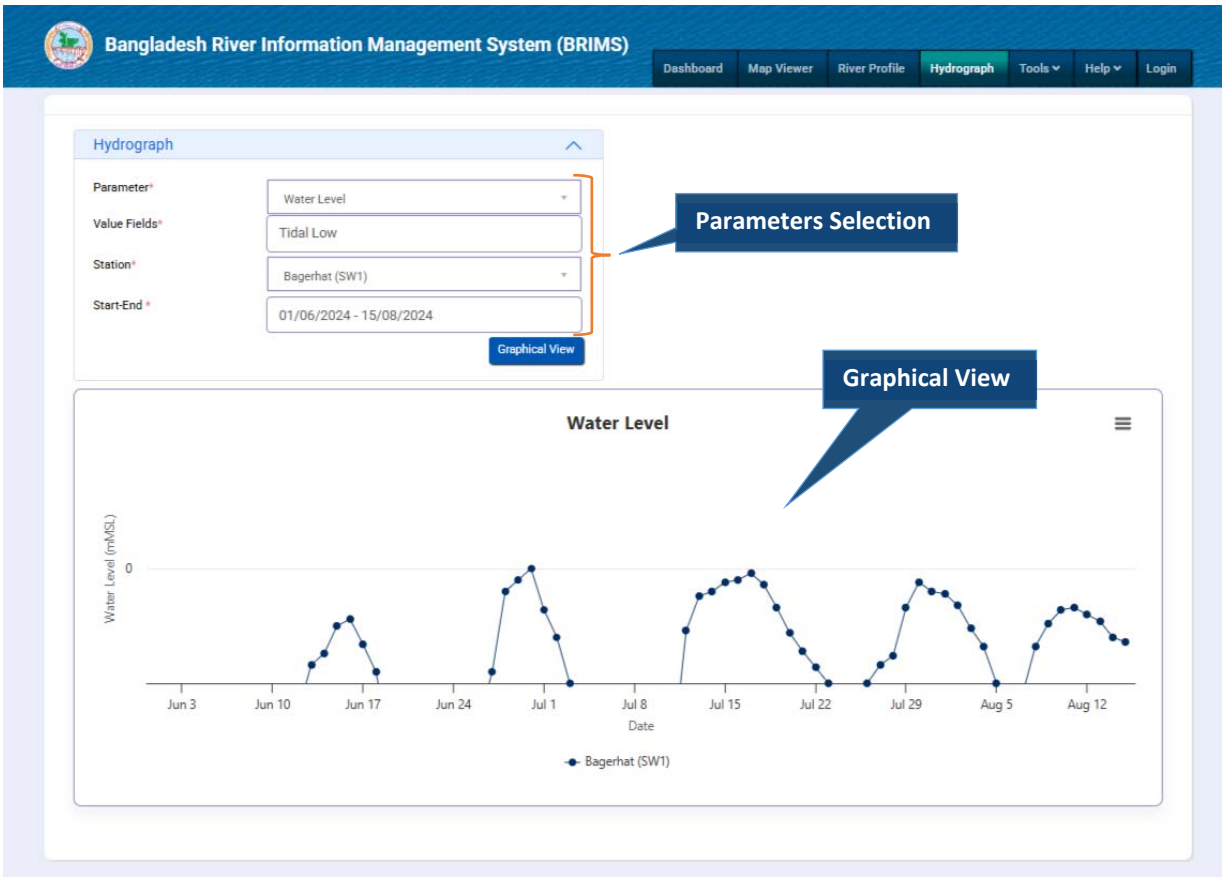
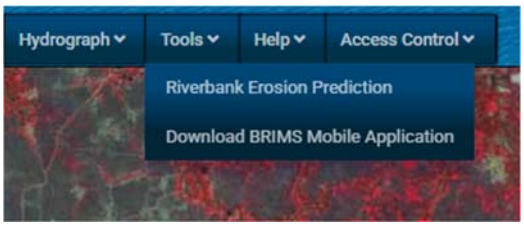


Figure 5.2: Hydrographic Data.

6. Tools

There are two options under the Tools menu. These are:

(1) Riverbank Erosion Prediction
(2) Download BRIMS Mobile Application



6.1 Riverbank Erosion Prediction

Select **Riverbank Erosion Prediction Tools** from the **Tools** menu, then a new page will load in another tab, which is "**Riverbank Erosion Prediction Tools for the Medium Rivers in Bangladesh**" (Figure 6.1).

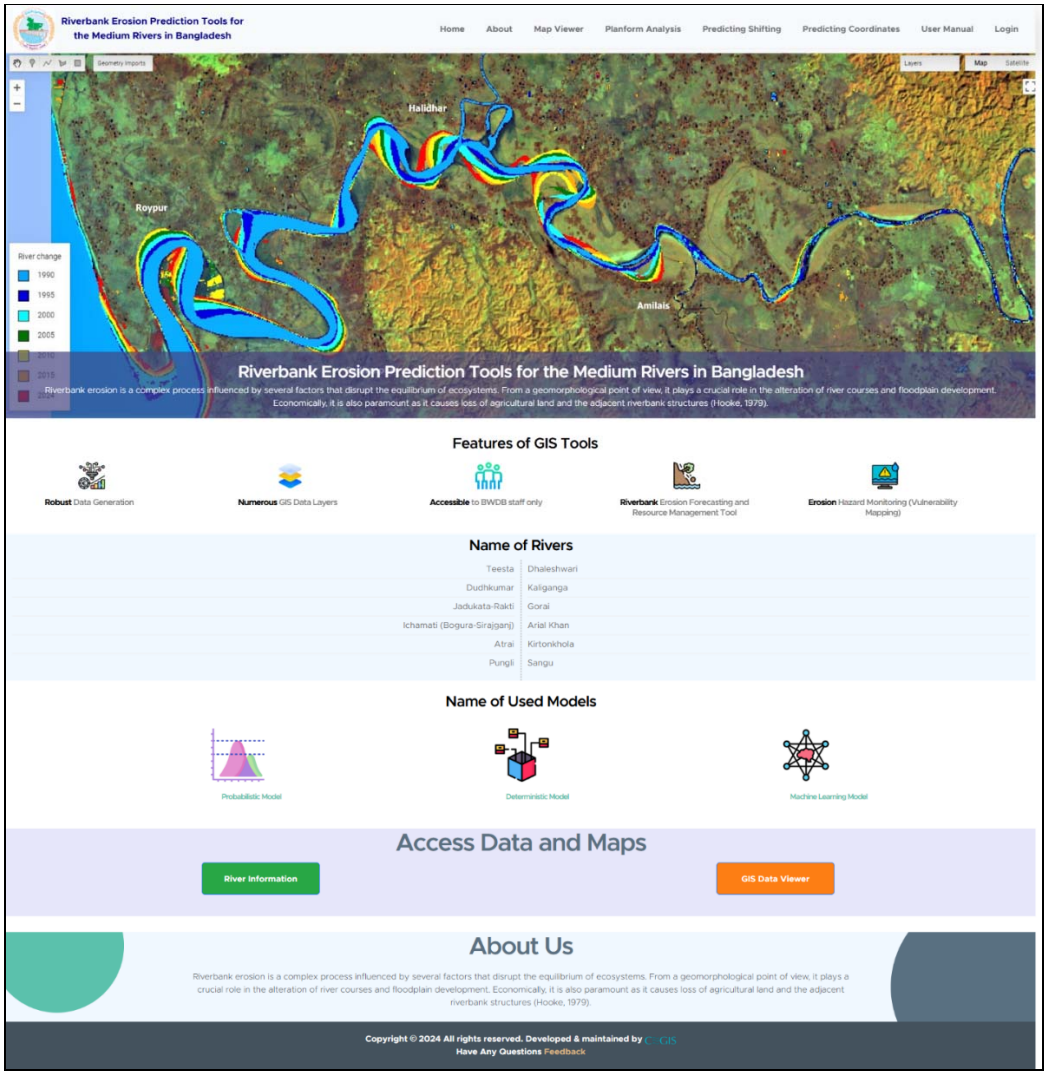


Figure 6.1: Riverbank Erosion Prediction Tool.

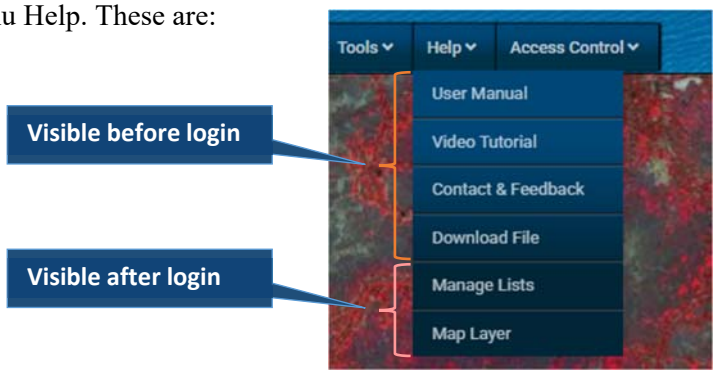
6.2 Download BRIMS Mobile Application

Click on the "**Download BRIMS Mobile Application**" option and then the **BRIMSApp.apk** file will be downloaded, which is an installation app file to install it to an android phone/tab to access the Bangladesh River Information Management System (BRIMS) web application.

7. Help

There are six sub-menus under the main menu Help. These are:

(1) User Manual
(2) Video Tutorial
(3) Contact & Feedback
(4) Download File
(5) Manage Lists
(6) Map Layer



7.1 User Manual

To view the user manual, ***Click*** on the **User Manual** option from the Menu list. The user manual will be open as a PDF file so that, the users can read or download it anytime (Figure 7.2).

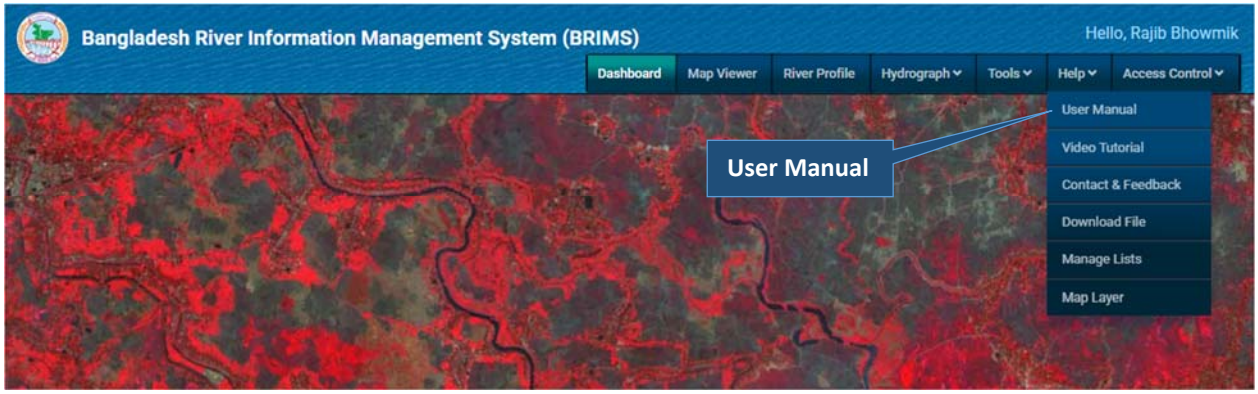


Figure 7.1: Select User Manual

Figure 7.2: User Manual

7.2 Video Tutorial

A video tutorial has also been uploaded for users to easy understanding. To open the video, ***click*** the **Video Tutorial** option from the Menu list (Figure 7.3).

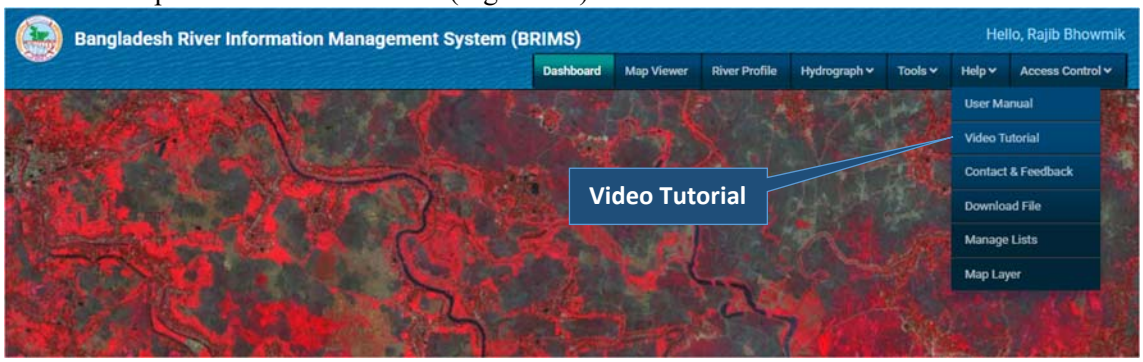


Figure 7.3: Select Video Tutorial

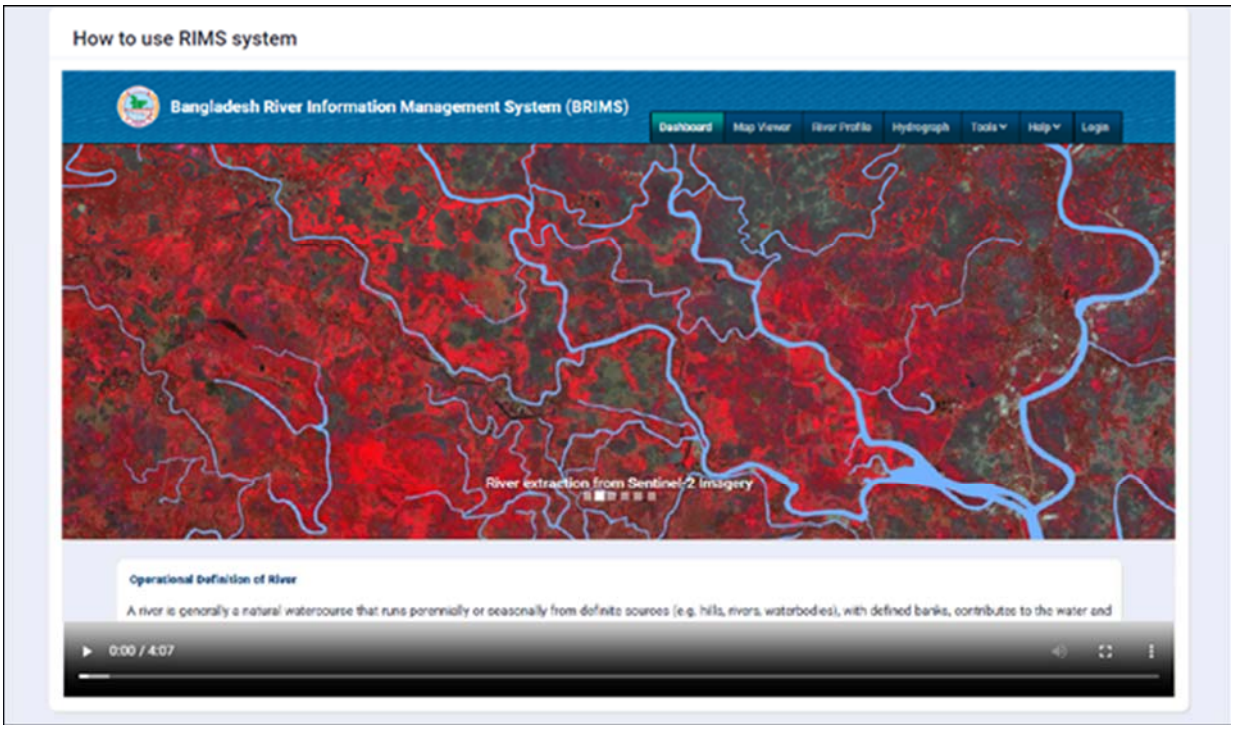


Figure 7.4: Video Tutorial

7.3 Contact and Feedback

Users can contact the RIMS team and submit feedback by clicking "Contact and Feedback" in the Menu List (Figure 7.5).

Figure 7.5: Select Contact and Feedback

Step 1: Fill in the User Information Field.
Step 2: Fill in the Comment Field.
Step 3: Click Submit (Figure 7.6).

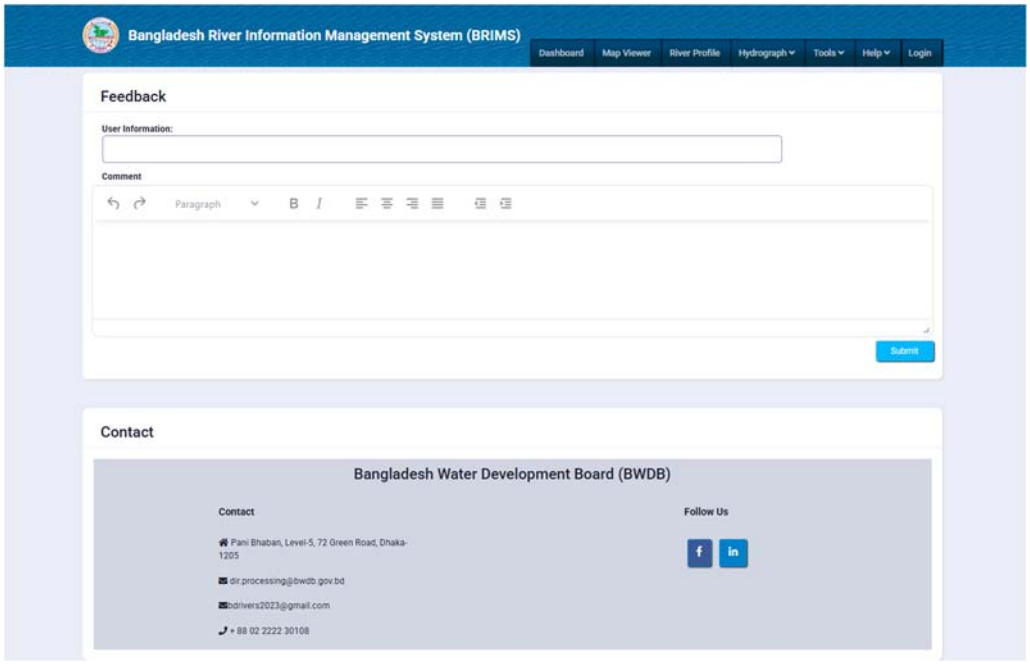


Figure 7.6: Contact and Feedback Form

7.4 Download File

There is a shape file thatuser can download. Only an authorized user can download the file. If any unauthorized user click on the Download File option, it will show Access Denied message (Figure 7.7).

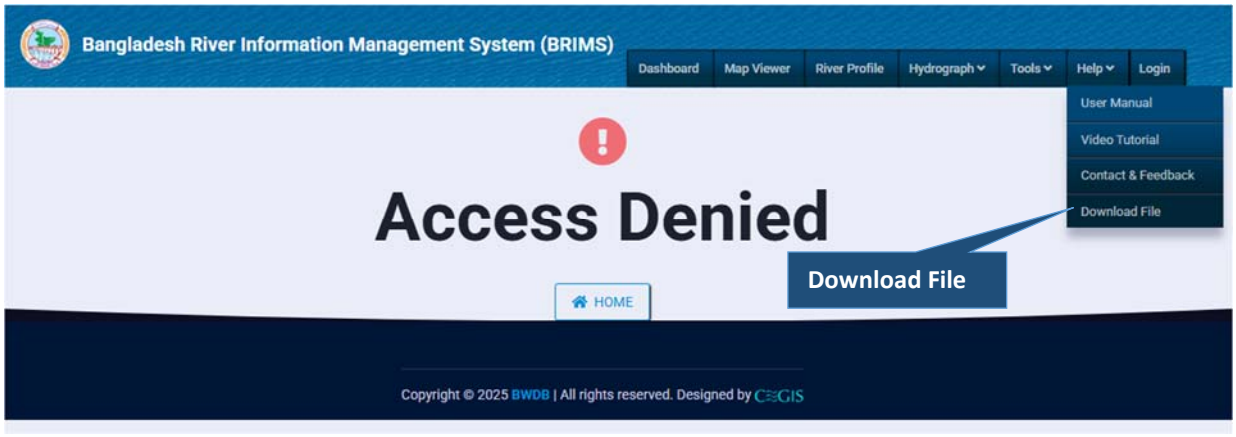


Figure 7.7: Access Denied message

When any authorized user click on the Download File option, then it takes to the download page (Figure 7.8). *Click* on the **Export** button to **download** the shape file.

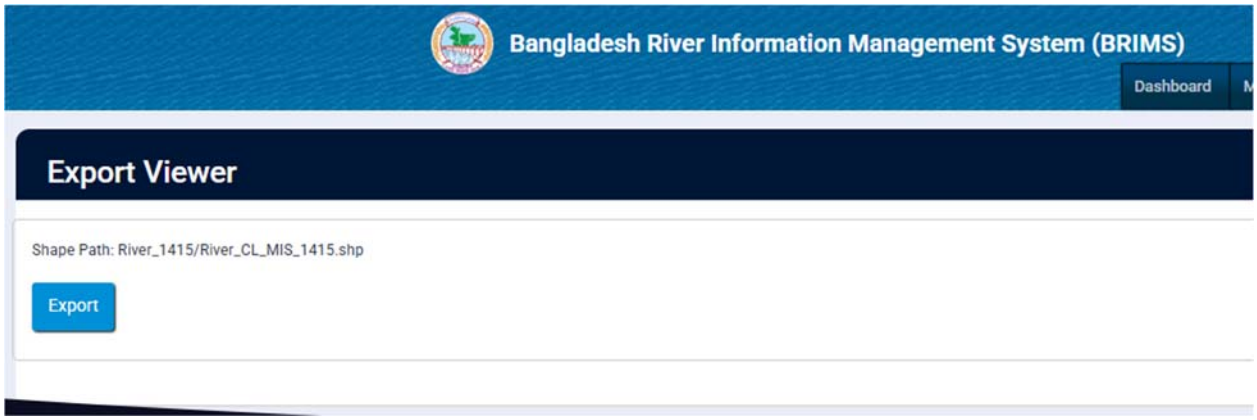


Figure 7.8: Download File

7.5 Manage List

An authorized user can open the **Manage List** page from the sub-menu list (Figure: 7.9). There are two different lists, that user can manage like add, update and delete item(s) (Figure: 7.10, 7.11). These two lists are:

(1) Stations
(2) Indicators

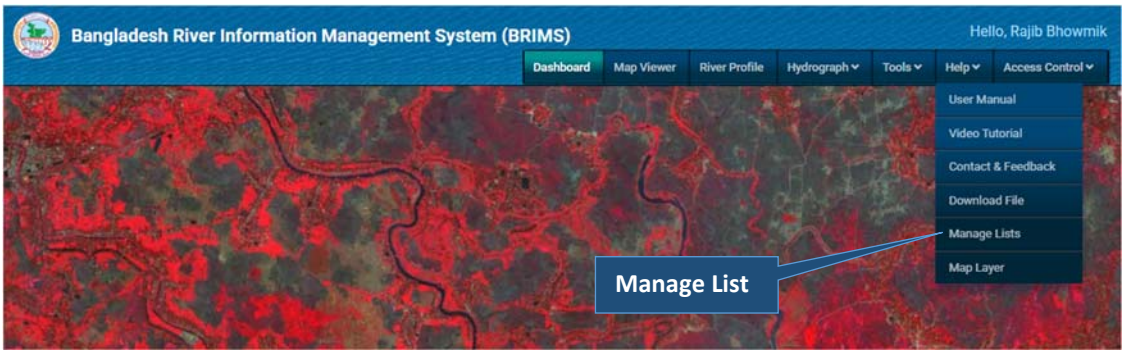


Figure: 7.9: Manage List selection

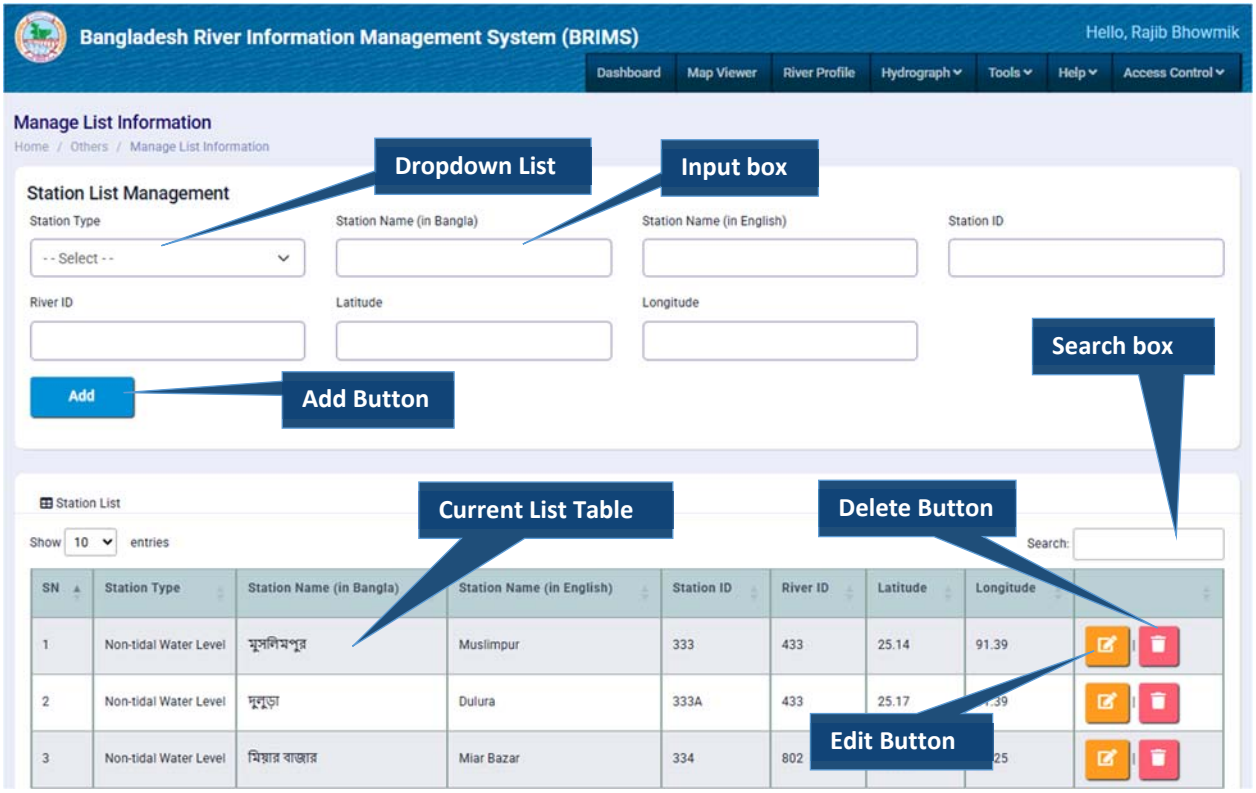


Figure: 7.10: Manage Station List

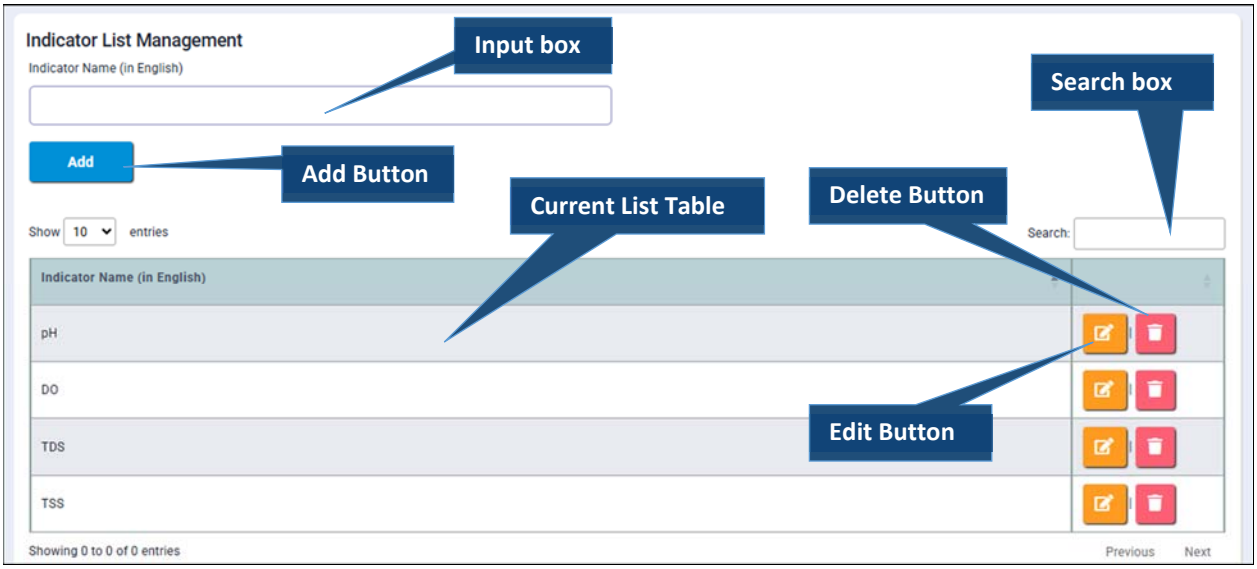


Figure: 7.11: Manage Indicator List

7.6 Map Layer

In the Map Layer page, it contains the information of all the Map Layers that is used in the BRIMS application using ArcGIS Portal. *Select* **Map Layer** from the **Help** menu (Figure: 7.12).

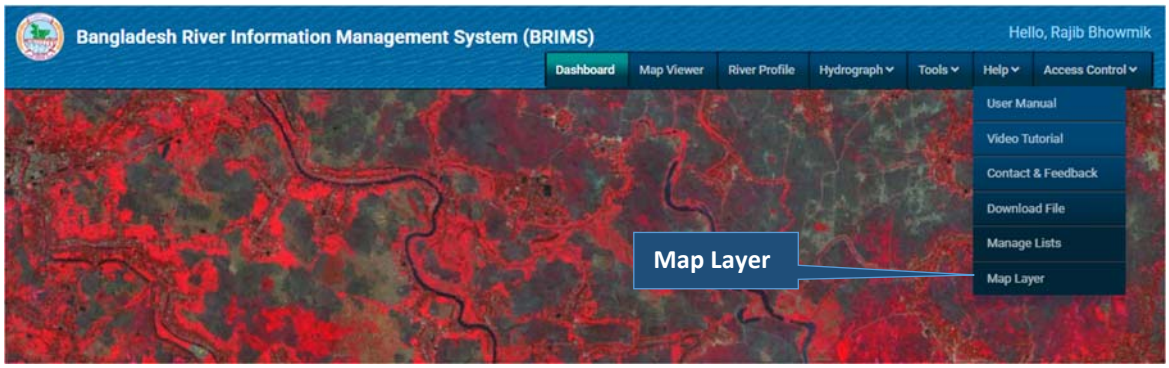


Figure: 7.12: Map Layer selection

The Map Layer page is looks like below (Figure: 7.13):

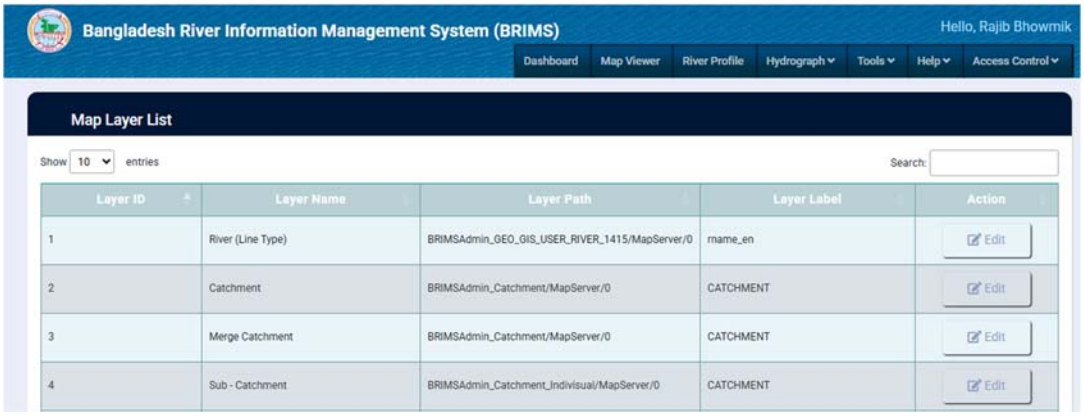


Figure: 7.13: Map Layer Page

If the user needs to update any map layer information, ***click*** on the **Edit** button from the right-side column of the related map layer row. Then a pop-up window will be viewed and there will be all the information of the selected map layer (Figure: 7.14). Then update information and finally, ***click*** on the **Update** button.

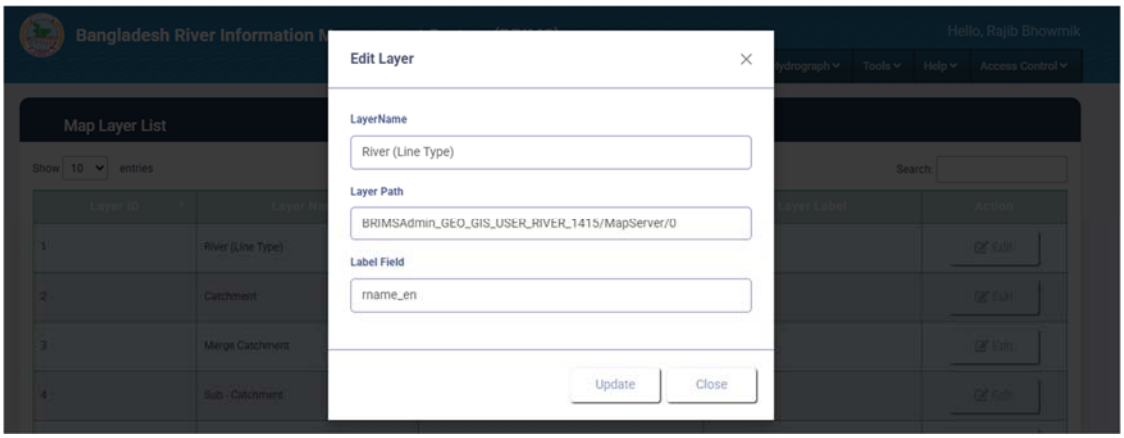


Figure: 7.14: Map Layer Information

8. Access Control

8.1 Add new User / Registration

An unregister user can not register here. Only an Administrator can add new user. To do so, an admin user must login to the appliction. Then under the Access Control main menu, select Register.

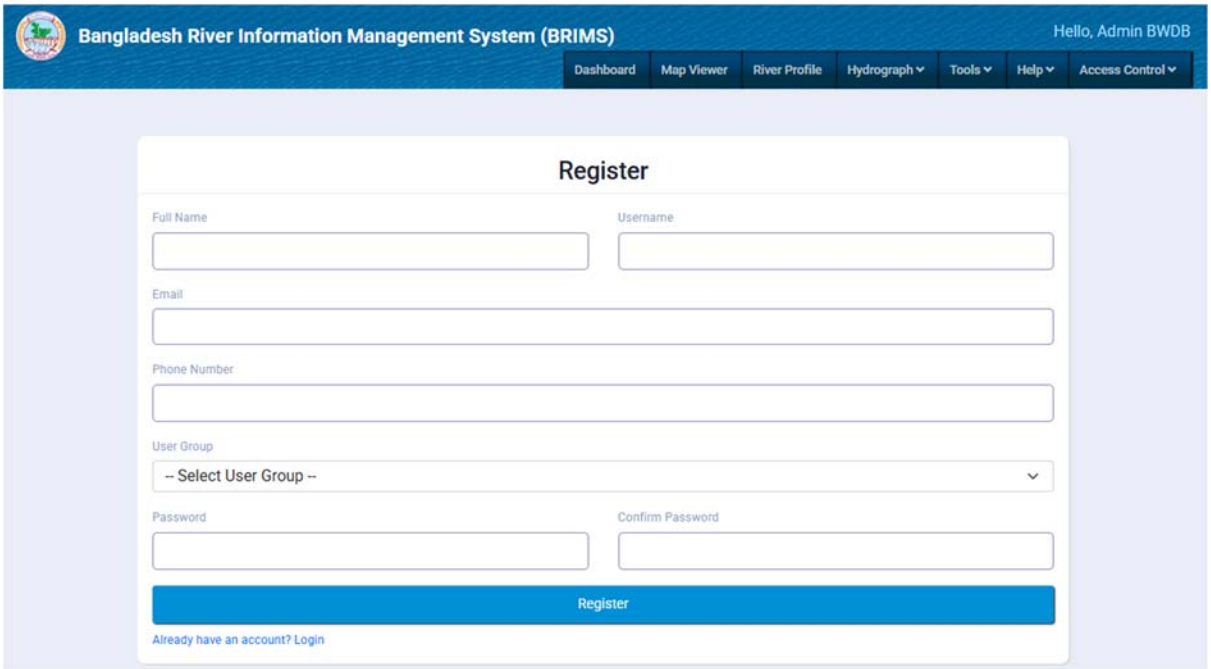


Figure: 8.1: Change Password Page

Now, fill the rquired information including Username, Email, User Group and Password then click on the Register button for adding a new user successfully.

8.2 Change Password

To change password, an authorized user must have logged in, then ***click*** on the **Change Password** from the main menu Access Control. Then enter your current, new and confirmed new passwords then ***click*** on the **Change Password** button (Figure 8.3).

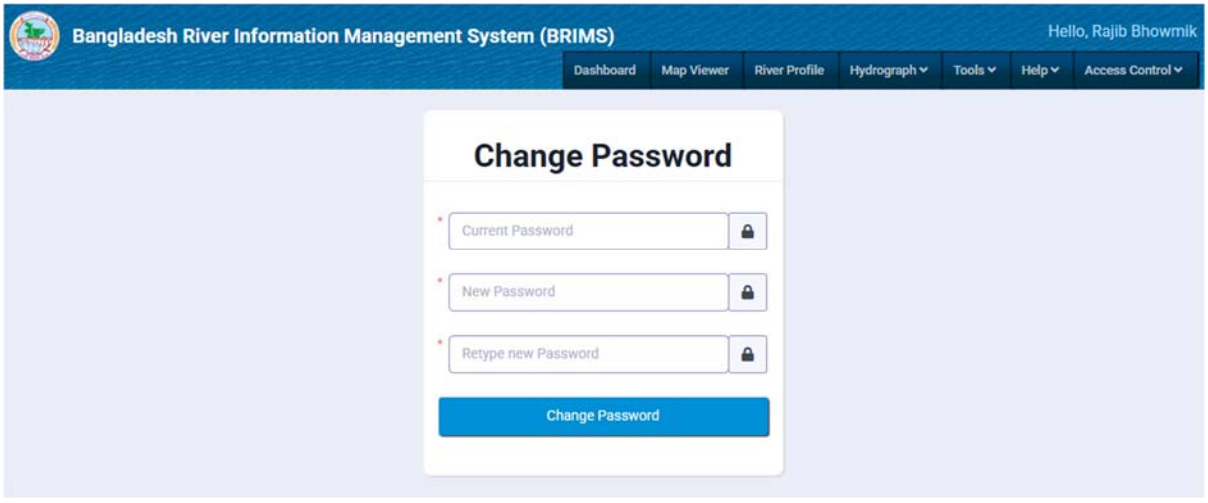


Figure: 8.2: Change Password Page

The End