

A review of current water governance in Bangladesh: A Case study on administrative and performance of water policy

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Abstract: Being a riverine country with a huge population, Bangladesh is facing numerous problems in water governance. Bangladesh is facing unprecedented water pollution, water-borne diseases, river sedimentation, water scarcity in the dry season, flooding in monsoons, and discharging wastewater into the rivers. Most of the southern part is affected by salinity. Groundwater Arsenic contamination has reached the worst level in the world. Ninety-seven percent of the population in the country uses groundwater for drinking and domestic purposes as surface water is mismanaged. Therefore, the purpose of this study is to highlight Bangladesh's water governance current preview and its challenges.

Index Terms: Bangladesh, water governance, water management, river training, riverbank protection, flood control, and good governance.

I. Introduction

Safe drinking water remains inaccessible for about 1.1 billion people in the world, and the hourly toll from biological contamination of drinking water is 400 deaths of children [8]. Due to poor personal hygiene practices, people lack access to clean drinking water. Therefore, prompt action is needed at the household level or in the water supply before it is distributed to the general population. WASH (water, sanitation, and hygiene) is required to achieve health, according to the WHO [5]. Water pollution is one of the major existential issues of the

Anthropocene epoch, as this is the largest environmental cause of diseases and premature death in developing countries.

With 230 tributaries and distributaries, Bangladesh is a densely populated, and riverine country. Since Bangladesh is an agricultural nation, one of the most important resources is water. Sustainable water management is therefore essential for Bangladesh. Due to the alarming rise in salt and sea level, there is an increasing need for fresh water. It entails meeting the needs of the present generation without compromising the needs of the following generation. Currently, groundwater sources provide 77% of the irrigation needs as well as 98% of the population's needs for drinking water. The country withdraws an estimated 32 cubic kilometers (7.7 cubic miles) of groundwater annually, 90% of which is used for irrigation and the rest for domestic and industrial purposes, according to a joint study by the Directorate of Groundwater Hydrology and the World Bank [1]. Also, industrial wastewater mixes with the natural river or lake water makes contaminating soil conditions. For example, toxic effluents coming out from various industries of DEPZ first go to the Dhalai Beel, and the cumulative impact of these effluents affects the waterways and then the environment [2]. This paper seeks to explore the current water governance in Bangladesh based on secondary data and recommends related policies.

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II. Research objectives

The research objective will be satisfied by fulfilling the following objectives-

– to analyze the condition of existing water sources in Bangladesh

III. Literature Review

According to WaterAid, Bangladesh has a substantial amount of water, with 24,000 km of rivers crisscrossing its productive terrain. However, delivering water that is safe for everyone to drink is a difficult nationwide problem. In Bangladesh, natural disasters like floods, cyclones, earthquakes, and droughts frequently occur and wreak havoc on people's lives. The development of universal access to clean water, sanitary facilities, and hygiene services are incredibly challenging; climate change will only make it more challenging.

Water governance as the range of political, social, economic, and administrative systems established for the development and management of water resources and water services at all scales. It needs to be considered at basin and subbasin scales, and within sectors (e.g., agriculture, urban water supply) and intersectionally, and should encompass the management of the land use and hydro connectivities within a basin that affects the characteristics of the resource downstream. Freshwater governance consists of the formal and informal institutions and processes by which multiple actors work together to set rules for water (and to set desirable outcomes) [11].

Based on the analytical procedure of Saleth & Dinar (2004), the Institute of Water Policy at the Lee Kuan Yew School of Public Policy, Singapore, developed the Asia Water Governance Index (AWGI) which was constructed by weighting and aggregating the 20 components comprising the legal, policy and administrative dimensions [14]. In developing the AWGI, about 102 water experts from 20 countries in Asia Pacific were surveyed. The research aimed to enable policymakers to better understand how their countries manage their water resources, compared to other countries in the region in terms of legal, policy, and administrative dimensions.

The most prominent definition of water governance was originally produced by the GWP in 2002 and subsequently utilized in both GWP and UN-Water WWAP documents. It defines water governance as “the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society”. The important bases for evaluating the condition of water governance in a specific region are established by the principles of good or effective water governance, and it is via these assessments that chances for change can be found. The United Nations Development Program’s definition of water governance is useful to contextualize our use of the term in this paper: “the political, economic and social processes and institutions by which governments, civil society, and the

– exploring the scopes and challenges of current water policies
– seeking the opportunities and sustainability of water governance in Bangladesh.

private sector make decisions about how best to use, develop and manage water resources.

Bangladesh and India share around 54 transboundary rivers water that flow from India to Bangladesh. Unfortunately, Bangladesh is mostly dependent on India for its water and has no control over the watershed management policy of the rivers. Bangladesh even cannot influence the watershed management policies due to weak geographical and economic position and faces floods in the rainy season and water scarcity in the summer season, reducing yield production and fish productivity, an ecological imbalance in estuarine areas, saline water intrusion in the southwestern part of Bangladesh and reduced navigation. Bangladesh’s Government is still facing serious diplomatic pressure from India regarding the Teesta dispute.

On the other hand, India has trans-boundary Rivers with China. China belongs to a better geographical position than India. Considering the geo-politics and geo-economics, China is more interested to play hydro-politics for the implementation of her Mega-projects. The utilization of water resources for mega-projects is very crucial for China. Meanwhile, China has built or plans to build large dams on these trans-boundary rivers for hydroelectricity and major water diversion facilities, which has triggered anxiety and complaints from downstream countries and criticism from the international society.

Water politics is now in an intense stage among these three countries. A silent Hydro war is going on in this region and mass people are the worst sufferer for this.

IV. Methodology

To conduct this analysis, a database from primary and secondary sources has been collected, and compiled using publicly available water-related policies that encompass the entire country of Bangladesh. The research project follows an explanatory approach and performance analysis to complete the tasks.

A. Data collection and types of data

As the study focuses on evaluating the significance of the existing water policy in Bangladesh and analyzing the sustainability of this water governance, it will be prudent to choose longitudinal data. Longitudinal data involves data regarding the research topic covering a certain period [7]. After the independence in 1971, this study will incorporate literature and data spanning a 50-year period, which will aid in identifying trends or modifications to the fundamental research components. The study will apply a mixed method to collect the required data for analysis. The mixed method will include literature research and case study methods which will allow access to a wider arena of research in similar fields

contributing to the building blocks of the current study. The study will employ a systematic literature research approach that allows examining the findings of others' works that can be related to the selected research objectives and questions.

B. Study Area

On the other hand, the case study method will help understand how current water policies are dealing with the issues coming forth in practicing environmental sustainability.



Figure 1 Study area, Bangladesh (South Asian country)

V. Discussion

A number of objectives have been established under Goal 6 of the Sustainable Development Goals (SDGs), which aims to assure people availability and sustainable management of water and sanitation for all [14]. But in addition to measurable goals for providing access to clean water and sanitation, the new aims clearly include aspects of water governance. Implementing integrated water resources management (IWRM) as a way to coordinate between various levels and scales of current water governance is one of these goals. The inclusion of IWRM as an objective in the SDGs signals a global shift toward a more methodical approach to problems with water resources, a strategy that considers possibilities and impediments at both the operational level of management and the larger scale of governance. A growing water demand across the entire nation and intense pressure on groundwater sources are some of Bangladesh's main water governance challenges. Additionally, the adverse effects of climate change, such as droughts, floods, and other natural disasters, significantly affect the availability of safe water and water for crop production [6]. However, according to

water user groups, the actual implementation of these policies seems to be far behind what the policy documents indicate and, moreover, this gap has even been increasing over time [9].

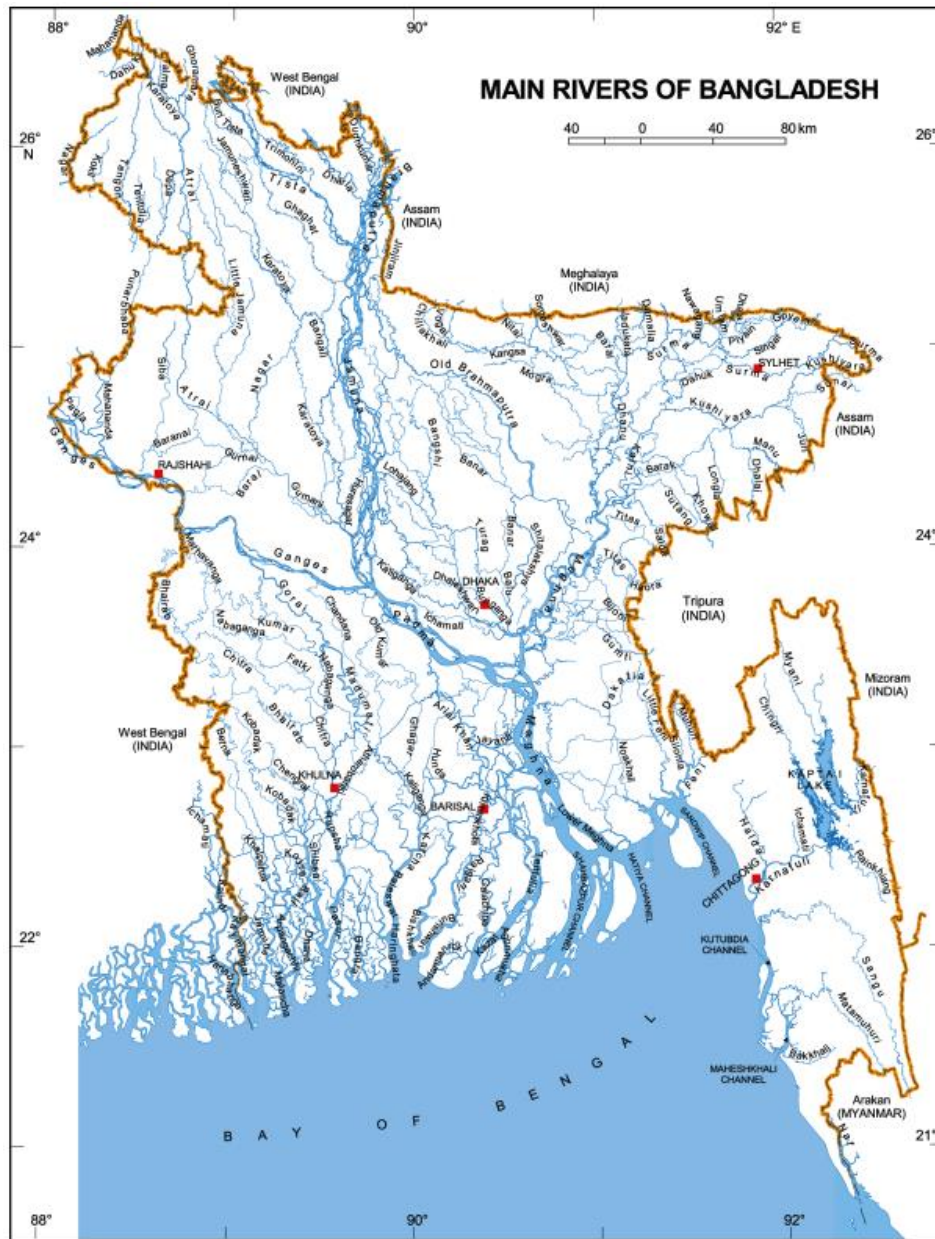


Figure 2 Main Rivers of Bangladesh

(Source: Prime Minister's Office Library, Dhaka)

Bangladesh is located in the heart of the largest deltas of the world as for the three major rivers system the Ganges, the Brahmaputra, and the Meghna River [10]. The principal sources of water for Bangladesh are surface and groundwater. The bodies of water are both salty and clean enough to drink. An estimated 1,160 billion m³ of surface water is regenerated each year, and nearly 93% of that water is imported [3]. The major sources are rainfall, transboundary flows, and rivers where 54 with India and 3 with Myanmar, standing water bodies such as reservoirs, rivers, lakes and ponds, seasonal wetlands, Stream water storage.

With a diverse and intricate river and drainage system, the Bengal delta stands out among the largest deltas of the world. Numerous large and tiny canals crisscross the entire delta; some are active, some are dying, and some are just being drained by the tides. The invasion of saline water into the surface water and groundwater environments is also significantly influenced by this drainage pattern. The constant course changes of the delta-rivers are another noteworthy characteristic. While some of the eastern rivers exhibit a pronounced south-westerly inclination, the majority of the rivers in the western region of the delta follow a fairly south-easterly course [16]. Long maintaining a southeasterly course, the Ganges-Padma main channel. The straight paths of a few significant streams, on the other hand, suggest that they are tectonically regulated channels. The Ganges delta's southwest region,

which is home to the Sundarbans, the biggest mangrove forest in the world, is totally covered in tidal creeks and channels. These distributaries, which connect these tidal channels and estuary creeks, convey a significant volume of water.

In Bangladesh, there are a number of authorities responsible for managing water bodies and resources, from the water development authority. The scenario of water governance practice in Bangladesh is illustrated by the short preview of the activities of the mainstream authorities. They are as follows –

- Bangladesh Water Development Board (BWDB)
- Water Resources Planning Organization (WARPO)
- National Water Resources Database (NWRD)
- Ministry of Water Resources
- River Research Institute (RRI)
- Joint Rivers Commission (JRC)
- Bangladesh Haor and Wetland Development Board
- Institute of Water Modelling
- Dhaka Water and Sewerage Authority

A. Bangladesh Water Development Board (BWDB)

BWDB was launched in 1972 as the responsible authority of water sectors in Bangladesh and currently, it is run by the Bangladesh Water Development Board Act 2000. Its mission is to improve socioeconomic conditions by ensuring food security through irrigation development, while also integrating sustainable development of Bangladesh's water resources through participatory water management, protecting lives and property through the management of water-related disasters, and improving people's socioeconomic standing. The objectives of BWDB are - addressing the negative effects of climate change in accordance with flood control, drainage and irrigation development, river erosion control, land reclamation, salinity mitigation, and integrated coastal zone management as per the strategic plan, to ensure food security, alleviate poverty, and manage water-related disasters, and to improve public participation by actively participating in integrated water resource management.

B. Water Resources Planning Organization (WARPO)

The National Water Resources Council (NWRC) has been granted the legal authority to ensure the implementation of the National Water Resources Plan (NWRP), which replaces the National Water Resources Plan (NWMP), by the Bangladesh Water Act 2013 (BWA), which also established WARPO as the secretariat to the EC of the NWRC. WARPO works with the mission to achieve sustainable water resource development in Bangladesh by pursuing Integrated Water Resources Management (IWRM). The visions of WARPO are –

- Macro-level planning
- A center of excellence for the management and integrated development of water resources
- Acting as a main coordinating body for all relevant activities in the water sector
- The custodian of National and Regional Water Resources Databases and Information systems.

C. National Water Resources Database (NWRD)

The NWRD contains geographic, temporal, and attribute data on water resources, making it the largest geospatial database in the nation. The information in NWRD was gathered from a variety of organizations and sources, including satellite imagery, aerial photos, and paper maps. More than 400 data layers, including 125 levels of spatial data, are stored in NWRD. Base data, surface water, groundwater, soil and agriculture, fisheries, forests, socio-economic, meteorological, environmental, and image data are some of the major divisions into which data in the NWRD is divided. Its main objectives are -

- Support water resources planning including the National Water Management Plan (NWMP)
- Organize the data collected from different agencies, organizations, or projects
- Check the quality of existing data, and establish a data quality-checking procedure and guidelines
- Develop GIS-based tools and other application tools and a meta database.

D. Ministry of Water Resources

The Ministry of Water Resources of the People's Republic of Bangladesh is home to the National River Research Institute (RRI), a statutory public entity. The Director General serves as the Institute's chief executive and is in charge of carrying out decisions. It is divided into three directorates: administration and finance, geotechnical research, and hydraulic research. The main objectives are as follows -

- Regulation and development of rivers and river valleys
- General policy and technical assistance in the field of irrigation, flood control, anti-water-logging, drainage, and anti-erosions
- All matters relating to irrigation, flood forecasting, warning, flood control, flood control works, floods and damage caused by floods to irrigation projects, embankments, etc
- International commissions and conferences relating to irrigation, flood control, and water resource management
- Soil conservation, drainage, embankment and barrages, and water-logging
- Land reclamation, estuary control, Anti-salinity measures, and anti-desertification
- Secretariat administration including financial matters
- Liaison with International Organizations and matters relating to treaties and agreements with other countries and world bodies relating to subjects allotted to this Ministry.

E. River Research Institute (RRI)

RRI was founded with the goal of creating strategies and plans for the sustainable development of water resources. RRI has been conducting multidisciplinary and problem-oriented tests, studies, and research in the fields of river hydraulics,

hydraulics of structures and irrigation, coastal hydraulics, soil mechanics, material testing & quality control, sediment technology, hydrochemistry & geochemistry, and instrumentation since its founding. It focuses on the following goals:

- to conduct research in river engineering, sediment management, estuary, and tidal impacts
- to conduct mathematical model studies on the flow of rivers and regional flow networks, hydrology
- to examine and assess the quality of the construction works thereto, as well as to conduct tests on building materials necessary for river training, riverbank protection, flood control, and irrigation.

F. Joint Rivers Commission (JRC)

If a river crosses an international boundary or in other words a river shared by more than one country is called a Transboundary River. In Bangladesh, there are 57 Transboundary Rivers. Among these, 54 rivers enter Bangladesh from India and the rest 3 rivers enter from Myanmar. The objective of JRC is equitable sharing and joint management of transboundary water resources for sustainable water security.

It does the following significant tasks:

- Dialogue with India on sharing of waters, joint management, the transmission of flood-related data

- to control flows, embankments & riverbank protection works
- monitoring and sharing of the Ganges Waters at Farakka, India, and monitoring at Hardinge Bridge
- dialogue with Nepal for jointly harnessing water resources, mitigating floods and flood damages

G. Bangladesh Haor and Wetland Development Board

The objective of BHWDB is to develop the conditions of the people of the haor area sustainably. It focuses conservation of the biodiversity of haor and wetlands, flood management, infrastructure development, and livelihood development of the people of haor.

H. Institute of Water Modelling (IWM)

IWM performs water modeling, computational hydraulics, and interdisciplinary field to improve integrated water resources management in the areas of flood control, flood forecasting, irrigation and drainage, river morphology, salinity and sediment transport, coastal hydraulics, port, coast, and estuary management, environmental impact assessment, bridge hydraulics, and related infrastructure. It forms plans and enabling policies through adaptation and mitigation techniques for climate finance and climate change politics.



Figure 3 Transboundary Rivers of Bangladesh (Source: Joint Rivers Commission, Bangladesh)

I. Integrated Coastal Resources Database

For strengthening the institutional environment, section 5.5.2 of the Coastal Zone Policy proposed setting up an Integrated Coastal Resources Database (ICRD). Presently 421 data layers have been collected and generated for ICRD. It provides data for Administration and Institutions (ADM), Economics and Finance (ECO), Funds and Interventions (FUN), Human beings and Social Conditions (HUM), Assets, Infrastructure and Services (INF), and Natural Resources and Environment (NRE).

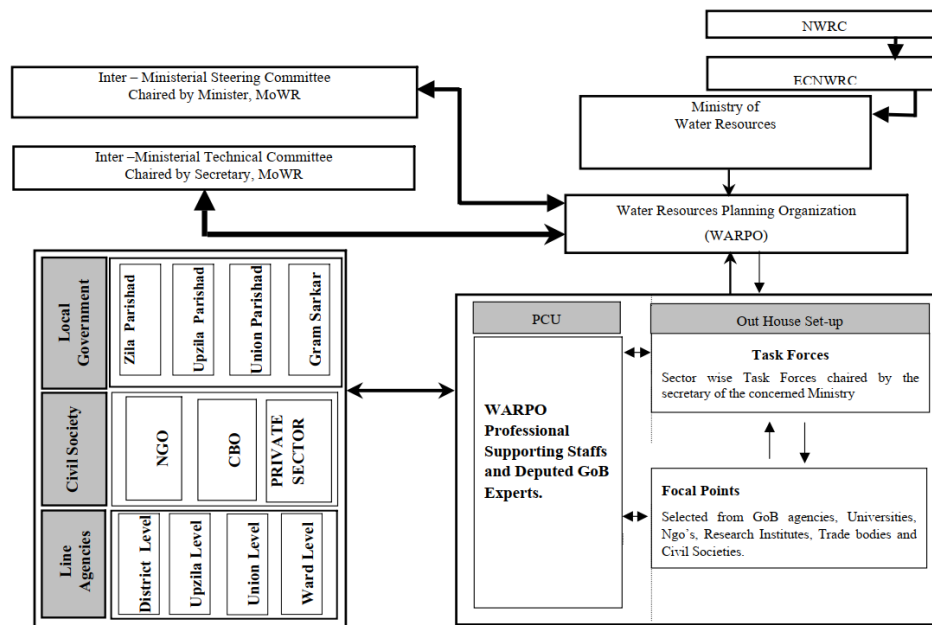


Figure 4 Institutional set-up for the institutionalization and operationalization of Integrated Coastal Zone Management Approaches

J. National River Conservation Commission

Under the Ministry of Shipping the NRCC work with the mission is to ensure the multi-dimensional use of rivers for socio-economic development by preventing encroachment and river contamination. The main inspection objectives are to determine the status of the river, and observations about the river's navigability and pollution. It seeks endangered situation and erosion, and provide recommendations to the government.

K. Dhaka Water and Sewerage Authority

Dhaka Water Supply & Sewerage Authority (DWASA) was established in 1963 as an independent organization with the mandate of Water Supply and Sewage disposal to the city dwellers of Dhaka. Its vision is to supply the best water in the public sector.

L. Major Steps in Water Governance

- Water Resources Planning Act, 1992, and establishment of WARPO
- National Water Policy, 1999
- Guidelines for Participatory Water Management, 2000
- National Water Management Plan, 2004
- Bangladesh Water Act, 2013

a. Bangladesh Water Act 2013

Bangladesh Water Act 2013 (BWA) is a framework Law to integrate and coordinate the water resources management in the country. The BWA-2013, passed in the parliament in August 2013, will ensure: the best use of water resources, integration of the acts of different organizations and legitimize water rights of poor and disadvantaged people.

b. Key Measures of the Water Act

- Right to water
- Adoption of National Water Policy and National Water Resources Plan
- Clearance Certificates
- Water Stressed Areas and Safe Yield
- Restricting abstraction, Protection Orders, and Compliance Order
- Water resource protection
- Pollution control and water quality standards.

c. Adoption of National Water Policy and National Water Resources Plan

The water price will be based on the following:

- Purpose and sector of water use
- Ability of water users
- Actual cost of water delivery
- Financial capability irrespective of service receivers and their classes
- Demand and supply of water (scarcity)

- Any other issues as considered by the government
- The extraction, distribution, use, development, protection, and conservation of water resources as well as the construction of any structures that obstruct the free flow of rivers and streams will all require prior approval from the relevant authorities.

d. Restricting abstraction, protection orders, and compliance orders

- Any individual or organization cannot stop or change or attempt to change the direction of the flow of water by constructing structures or developing land or extracting sand or mud in any water bodies
- No one would be allowed to live on the embankment, plant trees, or use the embankment for road without permission from the appropriate authority.
- Haor, baor, or any other water bodies to be protected to ensure a safe place, movement and sanctuary for birds. No one can preserve the natural or artificial flowing water without the permission of the competent authority.

e. Water resource pollution control and water quality standards.

This section outlines provisions for punishment and monetary fines for failing to comply with the Act, including failure to follow government policy and ordinances, refusal to cooperate with officials, failure to provide required documentation, giving false information, association with offenders, and failure to take protective measures for managing water resources.

f. Compilation of review of challenges of BWA enforcement

The most recent and significant piece of water legislation in Bangladesh for water governance is the Bangladesh Water Act 2013. The Bangladesh Water Act 2013 is a comprehensively robust piece of law for carrying out the National Water Policy.

g. National water policy and national water resources plan

National Water Resources Council (NWRC), the apex body to provide policy guidance to the implementation of water resources National Water Policy, National Water Resource Plan and the Bangladesh Water Act. The committee is comprised of 34 members (including 12 Ministers, 13 Secretaries among others) to be chaired by Prime Minister. Secretary/Senior Secretary, Ministry of Water Resources acts as Member secretary [12]. The Water Act allows the Government to update Water Policy after public hearing from time to time. There is an Executive Committee of the National Water Resources Council (NWRC) for the efficient performance of its functions. . The Executive Committee is comprised of 24 members chaired by the Ministry of Water Resources. Without prior permission issued by the Executive Committee, no individuals or organizations will be allowed to extract, distribute, use, develop, protect, and conserve water resources, nor they will be allowed to build any structure that impedes the natural flow of rivers and creeks.

M. SWOT analysis



Figure 5 Water governance SWOT analysis

N. Challenges of Water Governance in Bangladesh

Interaction between institutions is one of the biggest challenges for implementing good water governance. The Executive committee of NWRC as the executive platform need to incorporate the representation of all the stakeholder in crucial issues like industrial pollution and land grabbing. It is a high-level forum that can only regularly sit after every 6 months. But during the last 20 years only 10 meetings were held, it means 2 years per meeting. The Ministry of Land needs to be coordinated well to enforce the encroachment of water bodies as the majority of water pollution occurred by industrial discharge. Also, the land covering water bodies and rivers belongs to the Ministry of Land. There are complications in the enforcement of the Laws of water Act when laws for land are considered. The flood flow areas and water bodies that need to be protected for safe disposal of floods and retention of excess rainfall runoff need to be identified across the country through the agreed methods to be prepared by WARPO following guidance from Water Act. Currently, the Department of Environment does not have the capacity or knowledge on water resources impact and assessment which can be shared through good collaboration with WARPO holding NWRD. There are substantial challenges around monitoring on the ground and major opportunities for improved monitoring of groundwater extraction and ETP functionality. Monitoring of all groundwater extractions is not monitored by DWASA properly. Decentralized monitoring or delegation of monitoring to local public representatives to improve implementation may be an option. Industrial bodies should be incorporated into water governance mechanisms and government support options explored for ETP and CETP investment. According to BWA, there are several provisions

of enforcement such as compliance orders, protection orders, removal orders, imprisonment, compensation, etc. However, there is a lack of information on how these can be enforced. Due to the weak cooperation and proper measures in responsible institutions, the country has to face floods from artificial embankments at the transboundary rivers.

O. Water Rights

The clearest definition of the human right to water was issued by the United Nations Committee on Economic, Social and Cultural Rights, which stated: "The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses." In Bangladesh prior to 1988, there were no clearly established water rights.

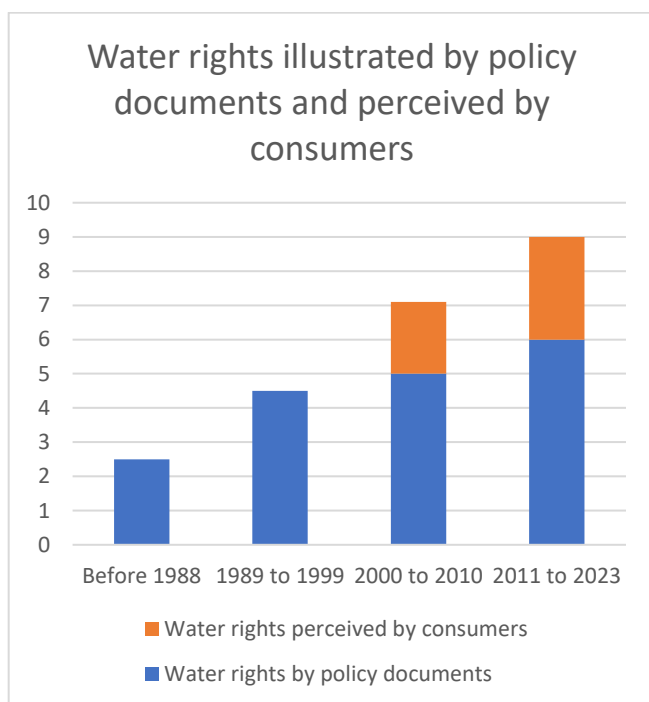


Figure 6 Water rights changing over time by policy documents and perceived by consumers

Another key component to take into account when considering proper water governance is the regime of water rights. Even though water is listed as a human right in Bangladesh's constitution, this right cannot be guaranteed on its own. This calls for the efficient management of the nation's water resources, which includes everyone's responsibility to prevent water waste, clean up pollution, and prevent river encroachment. According to article 18(A) of Bangladesh's constitution, the state shall endeavor to protect and improve the environment and to preserve and safeguard the natural resources, biodiversity, wetlands, forests, and wildlife for the present and future citizens. On the other hand, article 14 covers the protection of our workers, and article 16 covers rural development issues. The provisions of our basic necessities are discussed in Article 15.

The Government Jalmahal Management Policy, 2009 does not have a proper definition for fisher which is very significant in terms of the rural scenario of Bangladesh. It stated that whoever owned fishnets was a fisher. However, during the monsoon, 90 percent of families in a rural setting have fishnets. They cannot all be fishers. The second issue with policy is that, even though we are trying to give fishers the responsibility for Jalmahal management, the process is not inclusive. Poor fishers cannot afford the eight to 12 lakh taka of leasing money that is required. There are also yearly management costs of around 50 to 80 lakh BDT. These payments must be made up front. This is not at all feasible for fish farmers in Bangladesh.

VI. Recommendations

Recently water quality has been one of the most emerging environmental problems in developing countries and Bangladesh is facing a critical water pollution problem. The overgrowth rate of population, industrialization, rapid urbanization, improper sanitation, and use of agrochemicals might have deteriorated the water quality of Bangladesh [15]. The rivers have a significant impact on the nation's economic development. The majority of agriculture's water needs are met by the rivers. Fish are provided by rivers, and fish is a key component of the nation's economic expansion. Since extracting groundwater across the entire nation is a huge undertaking. Decentralized monitoring or delegation of monitoring to local public representatives may be an option in this situation to enhance implementation. Agriculture's consequences on water need more stringent regulation and education. The best way to balance the interests of individuals who depend on the aquatic environment for their wealth and quality of life with those who want to maintain and improve it is to harmonize. Prioritizing adaptation policies and initiatives that will be integrated into development planning requires the formulation and implementation of vulnerability and adaptation assessments. Indeed, it is necessary to integrate the existing laws governing water and water-related issues, as well as the laws establishing multiple bodies involved in water-related issues.

VII. Conclusions

For Bangladesh, it is crucial to examine how water governance has evolved through time. The strategy employed in this article uses main principles and administrative performance to show the qualitative status of water governance in Bangladesh. Indeed, all ideals of governance considerably progressed over time. It has been demonstrated that there is a growing difference between the formal policies for water governance and their actual implementation. To communicate a comprehensive picture of Bangladesh's governance environment and to serve as a solid foundation for bigger, more representative surveys, this study offers a method for describing effective water governance in an organized and reliable manner.

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Conflict of Interest

There are no conflicts of interest.

Author Contributions

Faisal Ahmed and Abdul Kadir Ibne Kamal developed the initial idea of the research and designed the whole article. Faisal Ahmed and Mohammad Hossain Bin Idrish undertook the data collection, statistical analyses, and geospatial analysis.

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