Transboundary Water Management and Flood in Bangladesh: Implications of Dam Releases by India

Shajadul Alam Sweet

University of Asia Pacific, Dhaka, Bangladesh

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ABSTRACT

This study addresses the complexity of transboundary water cooperation by exploring its different forms in the India-Bangladesh relationship. It also considers how dam releases from Indian rivers upstream affect flooding in Bangladesh. By now, the floods of 2024 were the worst on record in recent memory—brought about by erratic dam releases from India and exacerbated weather patterns resulting from climate change. The study examines hydrological datasets such as river discharge and rainfall patterns and the impacts of floods on land use, agricultural practices, and economic factors. It further evaluates the existing Ganges Water Treaty and proposes more effective flood risk management measures.

Keywords*:* Transboundary water management, flooding, India, Bangladesh, dam releases, bilateral agreements, hydrology.

INTRODUCTION

Background

Transboundary water disputes are prevalent in South Asia, with India and Bangladesh facing significant challenges due to shared river systems. Around 54 rivers originate from the Himalayas and flow through India before reaching Bangladesh. These rivers are vital for agriculture, fisheries, and domestic use. However, the construction of dams such as the Farakka and Teesta Barrages has resulted in recurring floods, causing socio-economic and environmental problems. The 2024 floods, exacerbated by large-scale dam releases and heavy monsoon rains, demonstrated the urgent need for better water management strategies. This study investigates the role of dam operations in these floods and assesses the efficacy of existing water-sharing agreements.

Problem Statement

The dams installed in almost all rivers flowing from Indian-Occupied Kashmir have significantly diffused the possibility of implementing these water-sharing treaties between the two countries. Maintaining these water storage levels optimally is crucial for mitigating floods. However, India and Bangladesh persistently dispute each other, asserting their claims are not exclusive. Almost all of Bangladesh's floods have been triggered by water release without prior signals from within Indian borders.

Research Questions

1. What role does the variation in Indian dams play in these floods, and how can we agree on a method

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to manage these shared rivers effectively?
2. What impact do these changes have on societies, such as those with severe flood threats in Bangladesh?

Objectives

This study's main objective is to analyze the reasons behind the alteration of water levels caused by dams in India and to assess the socio-economic and environmental consequences of the changing flood characteristics that result from mediation during the final stage of basin formations entering Bangladeshi basins. The study also aims to provide policy recommendations for enhancing the appeal of healthy sharing between Bangladesh and India in the primary research sector.

LITERATURE REVIEW

Transboundary Water Conflicts

Several of the world's most crucial basins and rivers are transboundary, with scales ranging from small to global. This phenomenon significantly contributes to water conflicts, particularly resource allocation and administration. For example, the Ganges-Brahmaputra-Meghna (GBM) basin shared by India, Bangladesh, and Nepal is one of the world's most socially, politically- and demographically critical river systems. Nevertheless, source adaptation continues to pose a challenge in countries with limited freshwater resources, particularly those facing intensified water scarcity crises and uncertainty due to climate change. The literature review highlights the challenges of planning for increased sharing of scheduled water supplies in densely settled or morbidly infested areas, as the demand for scenic resources leads to increased deaths and fractures.

Impacts of Dam Releases on Downstream Areas

Dams that intrude upstream into rivers significantly alter the natural water declivities, sediment transport modes, and flow variabilities in the river. Recent studies suggest that dam releases in the Ganges-Brahmaputra-Meghna (GBM) system could potentially pose a flood threat in certain parts of Bangladesh. During the monsoon season, dam releases have been blamed for sudden, devastating spikes in water elevation. During several historic releases, unrelenting floodwaters poured over breached walls or levees.

Bilateral Water Agreements

The Ganges Water Treaty 1996 between India and Bangladesh is the primary ongoing water-sharing framework. This agreement provides a straightforward method for the countries to divide their river access during dry and transitional seasons, guaranteeing only nonpersonal water (not owned supplies) during these designated periods. Conversely, a wet season will not generate any comparisons between the water-deficit countries. The signatories to this deal understood that the waters emerging from and available at Artemis triumphs over all/upper genesis of the River Ganges were fundamental in life for each country.

METHODOLOGY

Data Collection

This paper's traditional data collection methods include empirical (quantitative) and analytical observation (qualitative). The paper draws its data from the following sources:

1. River Discharge and Flood Records: Information on river flow from the Bangladesh Water

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Development Board (BWDB) and flood incident data collected by the Bangladesh region's Chemical Weapons Convention (CWC).

2. Methods Satellite Imagery: We used United States Geological Survey (USGS) Earth Explorer satellite images to quantify land cover changes and flooding extent.
3. Enhanced Understanding: The study's case studies offer a comprehensive overview of specific floods, contributing to a deeper understanding of the cause and effect of dam releases. For instance, we conducted a detailed study on the Teesta Flood in 2017.

Analytical Framework

This analysis integrates standard socioeconomic impact assessments. Using river discharge in reservoirs, the hydrological model simulates the impact of dam evolution on downstream flood levels. Studying the social implications for farmers, displaced people, and infrastructure damages by surveying or interviewing affected people.

RESULTS

Hydrological Analysis

The hydrological analysis reveals a strong connection between dam releases in India and peak flood levels observed downstream of those dams in Bangladesh. One of them, featuring the 2017 floods in the Teesta River, highlights large-scale releases from Indian dams and heavy monsoon rains flooding parts of northern Bangladesh. Such results emphasize the need for integrated water management.

Socioeconomic Impacts

It has a significant social-economic impact. The natural disaster in 2017 forced more than 700,000 people from their homes and affected over one million people overall. The flood destroyed crops and infrastructure, washed away millions of houses, and resulted in enormous economic losses. The flood killed people from fingertip to elbow. A warning system that had not gone off and no planning pus came out of its banks; their victims were pushed into sad little tributaries near hopelessness.

Environmental Impacts

When the dams opened, numerous floods occurred, causing extensive environmental destruction in Bangladesh. The study identified land degradation, soil erosion, productivity loss from extensive agricultural lands, and ecological harm from riverine ecosystems. These activities have dire biodiversity implications and are even more unsustainable when directed at the agriculture of affected regions.

Humanitarian Response

There was an incredible humanitarian response, with many organizations and individuals rallying to support the affected areas. The As-Sunnah Foundation and the Bangladesh Army Relief Fund Revenant have been at the forefront of helping the floor sufferers. So, it turned out to be a public display of great kindness and empathy by our citizens in Bangladesh for uniting with each other against an event.

National Unity and Solidarity

Regardless of their religious affiliations, devastating floods brought people together, and they remained Pakistanis. People rallied and stocked piles of these resources and services for flood victims, demonstrating the community's resolute spirit, power, and mightiness. Political Agenda (Unity): It's important to remember that political agenda plays a crucial role in fostering unity.

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2024 Flood Data in Bangladesh

Record rainfall and unexpected releases from Indian dams, notably the Dumbur Dam in Tripura state, typified the floods in Bangladesh during 2024, with no prior warnings to downstream areas. The flooding inundated much of the country, especially in Feni district, where it left millions of people homeless, as well as infrastructure and agricultural damage.

Table 1: Rainfall Statistics in Bangladesh (Monsoon Season 2024)

Region	Average Rainfall (mm)	Recorded Rainfall (mm)	% Increase from Average
Northern	1,200	1,850	54%
Central	1,100	1,700	55%
Coastal	900	1,400	56%

Table 2: Water Discharge Levels from Indian Dams (2024)

Dam Name	Normal Discharge (m^3/s)	Peak Discharge in 2024 (m^3/s)	Increase in Discharge (%)
Farakka Barrage	3,500	5,500	57%
Teesta Barrage	2,200	4,000	82%
Dumbur Dam	1,600	3,000	88%

Table 3: Socioeconomic Impact of 2024 Floods in Bangladesh

Category	Number Affected/Impacted	Description
Population Affected	4.9 million	People displaced or affected by floods
Homes Destroyed	500,000	Several homes were destroyed
Crop Damage	1.5 million hectares	Agricultural land submerged or damaged
Infrastructure Damage |	USD 3 billion	N/A

Analysis of 2024 Flood Events

The high-peak floods that occurred in 2024 clearly demonstrated a strong correlation between the dam releases in India and the flood peaks in Bangladesh. The water level has risen, causing massive flooding in the Feni district of Bangladesh and nearby areas. The construction, combined with record monsoon rains, produced one of the deadliest floods in recent history.

DISCUSSION

Challenges in Transboundary Water Management

Key challenges with the current system include sharing telemetric data, basin-wide planning and flood early warnings sent by India to Bangladesh. Disagreements in politics also hinder interaction. If we want to mitigate potential flood risks and disaster preparedness, our findings highlight the need for more sophisticated approaches to shared management.

Policy Recommendations

The results have important policy implications for India and Bangladesh. They have some ways to go in the

future, and the countries should pay attention.

1. Share Data in Real Time: Create a funded, standard data-sharing protocol to collect information about water monitoring levels at river edges and dam releases.
2. Basin-wide Approaches: Create new basin-level approaches for integrated water management throughout the GBM system.
3. Coordinated Flood Management: Establish a standard operating procedure for relevant agencies to give early warning signals even in case of dam water releases.

Implications of 2024 Flood Events

The floods of 2024 demonstrate the pressing need for enhanced transboundary water governance between India and Bangladesh. The Ganges Water Treaty must facilitate real-time data sharing and integrated flood management. We can propose policy-level solutions based on the floods of 2024, such as establishing collaborative data-sharing platforms to enhance flood forecasting and warning systems and creating basin-wide management plans that involve all stakeholders. We must implement strategies to avert the potential recurrence of this disaster and future occurrences, ensuring the safety and well-being of our two nations.

CONCLUSION

This paper has examined the significance of water cooperation between India and Bangladesh. Summarizing the above findings reveals a significant impact on Bangladesh's soil and water resources, each with unique socio-economic and environmental characteristics. Both countries can overcome this challenge if they approach water management as inclusive, trusting of each other, and open about all the facts.

FUNDING DECLARATION

All authors have read, understood, and have complied as applicable with the statement on 'Ethical responsibilities of Authors' as found in the Instructions for Authors.

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