Research Note

Water Security in the Brahmaputra River Basin: A Review of Literature from 2021 to 2025

Tejaswini Kaktikar

Abstract

The Brahmaputra River Basin (BRB) is a critical transboundary water system shared by China, India, Bangladesh, and Bhutan. Between 2021 and 2025, significant research has emerged addressing the multifaceted challenges of water security within the BRB. This review synthesises key findings from recent literature, focusing on geopolitical dynamics, infrastructural developments, climate change impacts, and sustainable management strategies. The analysis highlights the complex interplay between upstream and downstream stakeholders, the implications of large-scale hydropower projects, the vulnerabilities of riverine communities to climate-induced flooding, and the necessity for cooperative governance frameworks. It underscores the importance of data-driven hydropolitical engagements and integrated management approaches to ensure the sustainable utilisation of the Brahmaputra's resources.

Keywords: Brahmaputra River Basin; water security; hydropolitics; climate change; sustainable management; transboundary governance

1. Introduction

Originating from the Angsi Glacier in the Tibetan Plateau, the Brahmaputra River spans approximately 2,900 kilometres, traversing China (as the Yarlung Tsangpo), India, and Bangladesh before merging with the Ganges and emptying into the Bay of Bengal. The river sustains an estimated 130 million people across its basin, providing water for agriculture, energy generation, drinking, and livelihoods while also supporting rich ecological diversity (FAO, 2011; WRIS, n.d.).

However, the BRB faces increasing pressures on water security from climate change, large-scale infrastructure development, and intensifying geopolitical contestation. The United Nations (UN) Taskforce for Water Security defines water security as "the capacity of a population to safeguard sustainable access to adequate quantities of and acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development... in a climate of peace and political stability" (UN-Water, 2013). This review surveys literature from 2021 to 2025 to assess the state of water security in the BRB, with emphasis on hydropolitical relations, infrastructure expansion, climate vulnerabilities, and pathways toward sustainable management.

2. Geopolitical Dynamics and Hydropolitics

The transboundary nature of the Brahmaputra River fosters intricate hydropolitical dynamics among riparian countries. Deka (2021) introduces the "Brahma hypothesis," which critiques China's hydro-hegemonic stance and its perceived strategic advantage over India. The paper urges the formation of multilateral diplomatic frameworks to manage shared water resources more equitably.

Baruah et al.(2023) similarly explore the nexus between hydropolitics and regional geopolitics, noting that power asymmetries and lack of transparency have securitised water issues, turning them into extensions of national strategic agendas. Giordano and Wahal (2024) argue that although the risk of outright conflict remains low, water infrastructure—especially dams—serves as a means for territorial and symbolic control. Rather than fostering cooperation, the river is increasingly instrumentalised as a geopolitical tool. Challenging alarmist narratives, Modak and Ghosh (2025) advocate for data-driven dialogue between China and India. Their study cautions against overestimating the negative downstream impacts of Chinese hydropower projects and calls for an evidence-based approach to transboundary water governance.

3. Infrastructure Developments and Environmental Concerns

China's announcement of a major hydropower dam in the Tibet Autonomous Region, near the Great Bend of the Yarlung Tsangpo, has reignited concerns in downstream states. Schipani et al. (2025) document how such mega-projects could disrupt sediment transport, aquatic ecosystems, and water availability in northeast India and Bangladesh.

India has officially expressed apprehensions, urging China to provide assurances that the dam will not adversely impact downstream flow regimes (Dayal et al., 2025). The strategic location of the proposed dam, close to disputed border areas, further compounds geopolitical sensitivities. These developments point to the urgency of formalised transboundary water-sharing arrangements and environmental impact transparency.

4. Climate Change and Community Vulnerability

Communities along the Brahmaputra face increasing exposure to climate-driven hazards. Nath (2023) underscores how erratic rainfall patterns and glacier melt contribute to recurring floods and riverbank erosion, displacing thousands annually. The socio-economic vulnerabilities of these populations are exacerbated by limited adaptive infrastructure and weak institutional response mechanisms.

In Assam, for instance, residents on riverine islands are frequently uprooted by floods, and many lack access to adequate disaster relief or rehabilitation services (Nath, 2023). While the state has developed a climate action plan, its implementation has stalled due to funding and institutional delays (Nath, 2023; Khalid et al., 2024). These challenges reflect broader governance deficits in climate resilience planning across the basin.

5. Sustainable Management Strategies

To address the BRB's ecological and governance challenges, Pradhan et al. (2021) propose an integrated basin management framework. Their model emphasises cross-border cooperation, benefit-sharing, disaster preparedness, and ecosystem conservation as key pillars of sustainability.

The literature repeatedly stresses the value of participatory governance, involving local communities, civil society actors, and scientific institutions in decision-making. Collaborative management not only builds regional trust but also ensures that interventions are socially equitable and ecologically sound.

6. Limitations

Despite growing scholarly attention, significant limitations persist in BRB research and governance. There are enduring gaps in hydrological data, particularly from upstream regions where monitoring access is restricted. This hampers predictive modelling and coordinated flood response.

Moreover, the absence of a legally binding multilateral treaty among basin countries impedes trust-building and data sharing. The dynamic and interlinked nature of infrastructure, climate, and politics in the BRB demands continuous, adaptive research to inform evolving policy needs.

7. Way Forward

Future research and governance must prioritise transparent, empirical data collection and sharing, particularly between upstream and downstream stakeholders. Regional dialogues—facilitated by neutral platforms—can help depoliticise water discussions and foster cooperative mechanisms.

Integrating Indigenous knowledge and local community experiences into policy frameworks is also essential for context-sensitive planning. Strengthening institutional capacity and securing climate finance for adaptation will be crucial for ensuring long-term resilience in the Brahmaputra River Basin.

8. Conclusion

The 2021–2025 period has seen significant academic engagement with the multidimensional challenges facing the Brahmaputra River Basin. Geopolitical tension, infrastructural expansion, climate volatility, and community vulnerability converge to make the BRB a critical case for transboundary water governance.

Importantly, renewed urgency and international attention have followed China's announcement in late December 2024 of its intent to build a large dam on the Brahmaputra in Tibet. This development has intensified concerns in India and Bangladesh over water flow disruptions, ecological stability, and regional security. As such, the need for transparent dialogue, basin-wide hydrological data sharing, and inclusive governance has become even more pressing.

Going forward, interdisciplinary research, regional cooperation, and community-led adaptation strategies will be essential to protect the ecological integrity of the Brahmaputra and the millions who depend on its waters.

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