Reimagining River Security: The Brahmaputra's Future Between Dams, Diplomacy, and Data

Tejaswini Kaktikar, University College London, Department of Anthropology, London, United Kingdom

Date: *June 2025*

Abstract

The Brahmaputra River Basin (BRB) is one of South Asia's most ecologically rich yet geopolitically fragile freshwater systems. 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.)

In recent years, the BRB has become a site of accelerating environmental risk, strategic tension, and institutional fragmentation. This short report offers an overview of literature published on the BRB, a structured analysis of the challenges facing the Brahmaputra and proposes a coordinated governance strategy rooted in the Underwater Domain Awareness (UDA) framework. Focusing on water security, river management, the China factor and the Indian approach, as well as climate stress, upstream damming, transboundary mistrust, and sediment instability, the report highlights the urgent need for integrated data systems, basin-wide collaboration, and community-driven resilience planning.

Keywords

Brahmaputra River, Underwater Domain Awareness, Flood Risk, Transboundary Governance, Climate Resilience, River Sediment, Water Diplomacy, Majuli Island

Executive Summary

The Brahmaputra River is one of South Asia's most vital and volatile transboundary water systems. Originating in Tibet and flowing through China, India into Bangladesh, the river sustains over 130 million people while navigating a delicate balance of ecological richness and strategic vulnerability. In recent years, this balance has been disrupted by a convergence of stressors.

Upstream, China's hydropower projects, particularly the planned 60 GW dam at the Great Bend, have raised concerns about downstream water availability, sediment flow disruption, and hydro-political asymmetry. India has responded by enhancing inland navigation under frameworks like SAGAR, Sagarmala and development along National Waterway 2. However, these measures often do not take into account the ground realities and floodplain morphology. The most vulnerable downstream country, Bangladesh, still remains largely excluded from bilateral negotiations despite bearing the brunt of upstream decisions. Meanwhile, the river's ecological instability is steadily worsening. Annual floods and rapid erosion, especially around Majuli Island, are displacing communities and undermining traditional livelihoods. Climate change compounds these risks through intensified glacial melt and erratic monsoons, further destabilising river systems already stretched thin.

This report proposes the Underwater Domain Awareness (UDA) framework as a tool for integrative, real-time governance of the Brahmaputra. The report also foregrounds anthropological insights, emphasising the value of indigenous adaptation practices such as elevated housing, rotational farming, and flood memory mapping, as key components of a resilient and just river governance strategy. The findings urge a shift from fragmented, state-centric planning to inclusive, basin-wide coordination.

Table of Contents

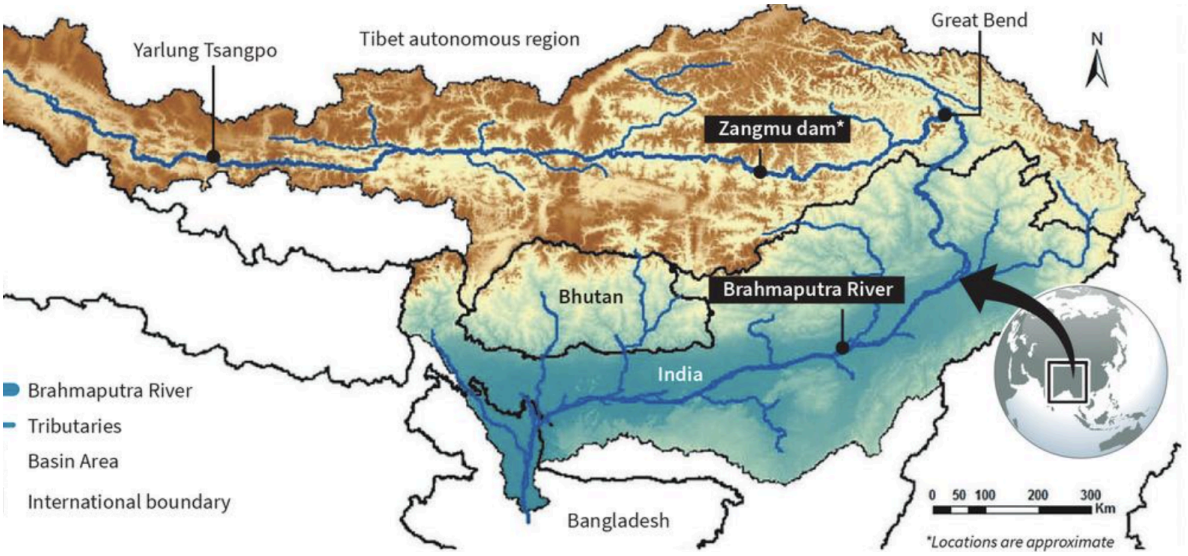
1. Introduction

The Brahmaputra River, known as the Yarlung Tsangpo in Tibet, is one of the most powerful and complex transboundary river systems in South Asia. Originating from the Angsi Glacier in the Tibetan Plateau, it flows through China, India, and Bangladesh and sustains approximately 130 million people. The river supports biodiversity hotspots, agricultural economies, indigenous knowledge systems, and dense cultural landscapes. However, the Brahmaputra is increasingly viewed as not just an ecological lifeline but also as a strategic, contested, and politically sensitive artery.

In recent years, the river has emerged at the crossroads of multiple crises: upstream hydro-infrastructure development, climate change-induced hydrological volatility, sediment management failures, and governance fragmentation. The growing infrastructural footprint in the upper riparian region, primarily China's dam construction without downstream consultation, has amplified strategic anxieties in India. At the same time, India's own inland navigation and development strategies, while ambitious, often fall short of ecological foresight and regional cooperation. Bangladesh, as the lowest riparian, remains the most ecologically vulnerable but is politically sidelined in most bilateral dialogues.

Overlaying this geopolitical tension is a worsening environmental scenario: accelerated erosion of riverbanks, contamination of groundwater by sediment-bound toxins, increasing frequency of floods and droughts, and displacement among river-dependent communities. Climate models predict further glacial melt and monsoon irregularities, placing additional stress on already fragile ecosystems and governance systems. These overlapping risks highlight the urgent need for a basin-wide governance framework that is adaptive, inclusive, and grounded in both scientific and cultural knowledge systems.

This report aims to address these converging concerns through a multi-disciplinary lens, combining hydrological science, geopolitical analysis, and anthropological insights. The Underwater Domain Awareness (UDA) framework is proposed as a strategic and integrative tool to enable real-time monitoring, cooperative governance, and community-based resilience. By investigating the Brahmaputra's strategic, ecological, and cultural dimensions, the report provides a roadmap for transforming the river from a flashpoint of regional insecurity to a model of cooperative resilience. The Brahmaputra River is no longer just a water body but a symbol of growing strategic unease, ecological disruption, and policy inertia. This report investigates the convergence of environmental stressors and political complexities surrounding the Brahmaputra. It aims to (a) assess key challenges from a transdisciplinary perspective, (b) evaluate the effectiveness of national responses, and (c) recommend an integrated governance strategy grounded in the UDA framework that includes anthropological insight into localised resilience and cultural adaptation.



Rahman, M. Z. (2025, January 6). *The implications of China's mega-dam project: Explained*. The Hindu.

2. Literature Review

The Brahmaputra River Basin (BRB) has long been acknowledged as a vital freshwater system that is both ecologically rich and socio-politically and culturally complex. Recent literature increasingly reflects how its transboundary nature makes it not just an environmental or development issue, but a profoundly geopolitical and anthropological one.

Hydro-political tensions have intensified over the last decade, with China's status as an upper riparian granting it significant hydrological control. In December 2024, China announced the construction of a 60 GW hydropower dam at the Great Bend in Medog County, Tibet, the most powerful of its kind (Rajagopalan, 2025) Studies by Baruah et al. (2023), Zeitoun & Mirumachi (2022) and Modak & Ghosh (2025) argue that China's dam-building program, notably the Medog Dam, signals a shift toward hydro-hegemony, where water infrastructure becomes a tool of geopolitical influence rather than mutual benefit. This is reinforced by the lack of transparency and absence of a comprehensive legal framework for transboundary cooperation, leaving downstream states like India and Bangladesh increasingly vulnerable.

From the Indian standpoint, efforts to operationalise inland waterways under the Sagarmala and SAGAR frameworks reflect a strategic reorientation. However, these remain primarily focused on economic connectivity and security rather than ecosystem health (Palash et al., 2023). The Brahmaputra Board, once envisioned as a coordinating body, is often criticised for its fragmented authority and limited enforcement capacity. Moreover, bilateral arrangements such as seasonal hydrological data sharing with China are insufficient for managing year-round sedimentation, glacial melt, and ecological degradation (Giordano & Wahal, 2024).

Environmental literature has drawn urgent attention to sediment instability, flood recurrence, and glacial retreat. Nandi et al. (2023) and Prasujya & Nayan (2021) provide satellite-based evidence of riverbank erosion and braid-bar migration, particularly around Majuli Island. Pradhan et al. (2021) link sediment load to toxic contamination, raising public health alarms. Meanwhile, climate studies warn of increasing glacier melt in Tibet and erratic monsoon behaviour, exacerbating flood risks across the basin (Lyu et al., 2023).

Anthropological contributions have begun highlighting how communities interact with the river in ways deeply embedded in cultural, spiritual, and livelihood practices. Work by Vijayaraghavan (2021) on Assam's Mising tribe reveals adaptation strategies, such as stilt housing (chang ghars), rotational cropping, and participatory wetland management, that are crucial for resilience yet remain marginalised in technocratic discourses. Jain (2023) also underscores how traditional architectural knowledge can mitigate flood impacts more sustainably than conventional embankments.

In addition, caste, gender, and kinship-based governance structures influence who has access to flood relief and how land is inherited or reclaimed post-disaster. These embedded social systems are largely ignored in top-down resilience planning. According to Akther & Evans (2024), such exclusions weaken the effectiveness of climate adaptation frameworks and make policies less equitable.

From a governance standpoint, Barua et al. (2024) argue that the absence of basin-wide institutions and participatory legal instruments severely limits adaptive capacity. The Mekong River Commission and the Senegal River Basin Organisation offer comparative lessons in cooperative modelling, joint monitoring, and early warning systems that the BRB could emulate. Despite calls from multiple scholars and institutions, there remains little political momentum toward establishing a Brahmaputra Basin Organisation that could facilitate these best practices.

In sum, the literature paints a complex but interconnected picture: strategic unilateralism, ecological fragility, and social marginalisation are reinforcing one another. Without a shift toward inclusive, science-based, and culturally aware governance mechanisms, the BRB risks becoming a site of cascading socio-environmental failures rather than a cooperative opportunity.

3. Research Methodology

This report synthesises insights from diverse secondary sources, including peer-reviewed journal articles, institutional reports, government publications, satellite datasets, and ethnographic fieldwork summaries from 2021 to 2025. These sources cover a spectrum of disciplines, including hydrology, political science, development studies, and anthropology, reflecting the multifaceted nature of the Brahmaputra River Basin's challenges.

A qualitative content analysis approach was used to identify and code dominant themes across the literature, clustered into five analytical categories: (1) strategic infrastructure and power asymmetries, (2) environmental stress and river instability, (3) climate vulnerability and social displacement, (4) institutional fragmentation and geopolitical risk, and (5) the application of the Underwater Domain Awareness (UDA) framework.

Special emphasis was placed on materials that offered integrated perspectives, particularly studies referencing basin-wide governance models, community-based flood resilience, and transboundary monitoring frameworks. Anthropological and ethnographic works were deliberately incorporated to reflect the lived realities of river-dependent populations, whose cultural practices, land-use traditions, and adaptive innovations remain underrepresented in mainstream policy design. These human-centric insights were used to deepen the analysis and broaden the applicability of UDA as a socially attuned governance tool.

The findings generated through this approach inform both the thematic structure of the analysis and the recommendations proposed in the latter sections of this report.

4. Analysis

The Brahmaputra River Basin brings together a web of political interests, environmental pressures, and deeply rooted cultural ties. Managing all this through conventional policies is becoming increasingly unworkable. In this section, we explore how the expansion of strategic infrastructure, ecological strain, and fragmented institutions are intertwining in ways that cut across borders and reinforce mutual vulnerabilities.

4.1. Strategic Infrastructure and Power Asymmetries

China's growing infrastructural presence in the Brahmaputra Basin has moved swiftly in recent years, shaped by both geopolitical calculation and its clean energy transition. The announcement of the 60 GW Medog Dam in 2024 is emblematic of this push. Though officially described as a run-of-the-river project, its size and the secrecy surrounding its rollout have raised serious questions, especially about its potential to influence water flow downstream during times of tension (Rajagopalan, 2025; Zhao & Chen, 2023). Some researchers argue this reflects a kind of hydro-hegemony: using water as leverage, especially in disputed areas like Arunachal Pradesh (Zeitoun & Mirumachi, 2022; Wouters et al., 2024). For India, the implications are troubling, as this kind of strategic pressure isn't easily countered through conventional means.

India has started to respond more assertively, though not always coherently. Programmes like SAGAR Vision and Sagarmala aim to revitalise inland water transport and link up regions economically, with National Waterway 2 playing a key role (Chakraborty & Dey, 2022). But these infrastructure plans often sidestep the river's specific traits; its erratic sediment load, tendency to shift course, and the erosion risks that go with it. The

Brahmaputra Board, which was set up to guide integrated management of the basin, lacks the teeth to enforce much of anything (Giordano & Wahal, 2024). Without better coordination and a deeper ecological lens, infrastructure expansion could just as easily deepen India's exposure as reduce it.

4.2. Environmental Stress and River Instability

The Brahmaputra is one of the most morphologically dynamic rivers on Earth. It carries huge amounts of sediment and frequently reshapes its own course. In recent years, these natural tendencies have been made worse by upstream development, particularly dams, which trap sediment and deprive the lower basin of its ecological nutrients. In Assam, this has led to damaged floodplains, poorer soils, and the collapse of riverbanks, especially around Majuli Island, where displacement is a yearly event (Prasujya & Nayan, 2021; Nandi et al., 2023). Layered on top of this is tectonic activity, which makes the river even harder to predict (Mahanta et al., 2024).

Flood control efforts, especially embankments, have frequently backfired. By boxing in the river and preventing its natural spread, these structures can cause water to back up and worsen flooding elsewhere. Even with satellite data and field evidence pointing to the flaws, sediment management is still not a mainstream concern in flood planning. Meanwhile, rising arsenic levels in groundwater, linked to disrupted sediment flow, are becoming a serious health hazard (Pradhan et al., 2021). Altogether, this points to a cycle of environmental stress and reactive planning that’s leaving too many communities in harm’s way.

4.3. Climate Vulnerability and Social Displacement

Climate change is amplifying the Brahmaputra’s natural extremes. Glacial melt from Tibet, paired with increasingly unpredictable monsoons, is creating a pattern of repeated flooding,

sudden landslides, and prolonged dry spells, all in the same basin. Island communities in Assam and Arunachal Pradesh are among the hardest hit, where floods are no longer a seasonal anomaly but a near-certainty. In places like Majuli, erosion has turned from an occasional emergency into a constant threat (Nath, 2023). Many families are relocated repeatedly, often without permanent solutions. Over time, that erodes more than homes—it breaks family networks and disrupts long-standing social structures.

Though several Indian states have drawn up climate adaptation plans, most of them struggle with limited resources, inter-agency confusion, and poor alignment with national water strategies (Khalid et al., 2024). What's particularly concerning is the tendency to ignore local expertise. Indigenous communities like the Mising have developed detailed ways of living with the river, such as building elevated homes (chang ghars), rotating crops to suit shifting soil conditions, and co-managing wetlands (Vijayaraghavan, 2021). These practices reflect a deep, lived understanding of how to adapt, but they're rarely consulted. Sidestepping these local strategies means missing out on practical, proven ways to build resilience.

4.4. Institutional Fragmentation and Geopolitical Risk

One of the most urgent yet unresolved issues in the Brahmaputra Basin is the lack of a formal transboundary governance system. China, India, and Bangladesh all depend on the river in different ways, yet no comprehensive water-sharing treaty exists. Instead, what's in place, like seasonal data exchanges, is ad hoc and non-binding (Wang et al., 2023). The risks of this approach became starkly clear during the 2017 Doklam standoff, when China stopped sharing flood data, showing how easily water cooperation can turn into a bargaining chip (Manhas & Yadav, 2024). Incidents like this strain diplomatic ties and make the basin more fragile.

The institutional gaps aren't just international. Within India, dysfunction runs deep. The Brahmaputra Board has struggled with overlapping mandates and unclear authority. Efforts to form a unified Brahmaputra Basin Organisation have repeatedly broken down over state-level disputes and fears of losing control over water rights (Haby, 2024). Bangladesh, despite being downstream and highly affected by what happens upstream, is often excluded from talks between India and China. This lack of inclusive dialogue makes it harder to address shared risks, let alone build lasting cooperation.

4.5. UDA and the Potential for Integrated Governance

The concept of Underwater Domain Awareness (UDA), originally built for ocean security, might offer an unexpected but timely model for improving governance in the Brahmaputra Basin. UDA combines real-time data collection with multi-level coordination, linking what happens on the ground to what's discussed in policy rooms (Das, 2021). If adapted well, it could help break down silos between countries, sectors, and even scientific and local knowledge systems. Pilots in high-risk zones like Pasighat (India), Nuxia (China), and Bahadurabad (Bangladesh) could demonstrate how this works in practice, offering better flood warnings, more transparent data sharing, and a stronger foundation for trust.

But tech tools alone won't be enough. For UDA to really work, it must integrate lived knowledge, like how communities remember past floods, manage land through kinship, or treat rivers as sacred spaces. These informal ways of knowing aren't just cultural—they hold valuable information that can improve predictive models and planning. UDA, if designed with this in mind, becomes more than just a monitoring system; it becomes a governance approach grounded in justice, legitimacy, and shared responsibility. With the right balance of diplomacy, data, and local insight, the Brahmaputra could shift from being a contested river to a space of shared resilience.

5. Conclusion

The Brahmaputra River is a shared artery of ecological vitality, strategic concern, and cultural heritage. Yet the patterns emerging across the BRB are symptomatic of a broader governance malaise: critical hydrological decisions are being made unilaterally, without real-time data coordination or localised social input. The result is an increasingly fragile basin, both environmentally, institutionally and socially.

China's upstream assertiveness, India's fragmented institutional architecture, and Bangladesh's downstream vulnerability represent a triad of challenges that conventional bilateral diplomacy cannot resolve. Meanwhile, communities on the ground, particularly in Assam and Arunachal Pradesh, remain under-consulted and under-equipped to handle the accelerating pace of ecological change.

However, there is a window of opportunity. The UDA framework, adapted to freshwater contexts, provides a structure through which multisectoral data and decision-making can be harmonised. When combined with the insights of anthropology, respect for local knowledge, cultural memory, and spatial practice, river governance can become both more effective and more just.

Ultimately, the future of the Brahmaputra depends not just on technology or treaties, but on the willingness of all actors to engage with the river as a living system embedded in diverse human experiences. Moving from domination to stewardship, from fragmentation to federation, is not only desirable but is urgently necessary.

The Brahmaputra is at a tipping point. Strategic unilateralism, climate vulnerability, and institutional inertia threaten to transform a shared resource into a flashpoint. However, there is potential for renewal. Integrating technology, diplomacy, and community experience

through frameworks like UDA, supplemented with anthropological understanding, can foster both ecological resilience and regional trust.

6. Recommendations

The Brahmaputra River Basin (BRB) requires a strategic realignment of governance, technology, diplomacy, and community engagement to prevent worsening ecological, political, and humanitarian risks. The Underwater Domain Awareness (UDA) framework provides a critical lens to integrate real-time monitoring, data transparency, and basin-wide cooperation. However, technology alone is not enough. A blended approach must address governance inertia, climate vulnerability, and the exclusion of riverine communities from decision-making processes.

6.1 Institutional and Diplomatic Reform

- Create a Brahmaputra River Commission: Establish a trilateral, multi-stakeholder body involving China, India, and Bangladesh to facilitate data sharing, policy harmonisation, and dispute resolution.
- Adopt Mekong-Inspired Protocols: Introduce real-time hydrological data platforms and joint modelling mechanisms based on successful elements from the Mekong River Commission.
- Bridge Strategic Gaps via SAGAR Diplomacy: Expand India's SAGAR framework to freshwater systems and foster dialogue through ASEAN and BIMSTEC partnerships.
- Legal Recognition of Riverine Rights: Develop formal mechanisms to ensure river-dependent communities have participatory rights in water governance decisions.

6.2 Surveillance and Monitoring Enhancements

- Deploy UDA Pilot Zones: Implement integrated monitoring systems at strategic points such as Nuxia (China), Pasighat (India), and Bahadurabad (Bangladesh), using satellite, acoustic, and sensor-based data.
- Develop a Public UDA Dashboard: Launch a multilingual, open-access platform where stakeholders can access and share real-time data on river dynamics.
- Enhance Satellite-Acoustic Surveillance: Use dual-technology systems to detect morphological changes in erosion-prone areas like Majuli Island.

6.3 Environmentally Responsive Infrastructure

- Eco-Infrastructure Design Mandates: Revise EIA protocols to include sediment flow analysis, intangible cultural heritage impacts, and river morphology.
- Expand Inland Water Infrastructure Responsibly: Align projects under Sagarmala and NW-2 with sediment budgets, biodiversity metrics, and floodplain ecology.
- Climate-Responsive Alternatives: Promote ecosystem-based adaptation models rather than rigid dam infrastructure to accommodate seasonal variability.

6.4 Community-Centric Knowledge and Governance

- Integrate Ethnographic Baselines: Institutionalise pre-project assessments of local knowledge, seasonal movement, and sacred geography to inform design and mitigation strategies.
- Integrate Indigenous Practices into Adaptation Planning: Support state-level frameworks that embed traditional practices like chang ghars, rotational cropping, and wetland fisheries.

- Institutionalise Community-Led Monitoring: Create decentralised networks of trained observers to track erosion, rainfall, and water levels, grounded in lived experience.

6.5 Future Research and Policy Innovation

- Apply UDA in Research: Combine acoustic sensing, remote sensing, and field data to assess dam operations and sediment flows independently.
- Model Discharge and Sediment Scenarios: Use hydrological-sediment coupled models to evaluate China's dam impacts on water availability, flood timing, and soil health.
- Investigate China's Political Economy of Damming: Analyse policy documents, SOE strategies, and carbon neutrality goals to understand upstream motivations.
- Enable Cross-Basin Comparative Studies: Assess China's diplomatic behaviour across the Mekong, Salween, and Irtysh basins to determine applicable negotiation frameworks.
- Legal Leverage Research: Explore intersections with international water law, WTO trade regimes, and BRI environmental principles to identify new pressure points.

Together, these strategies will form a comprehensive roadmap for the Brahmaputra River Basin that will be equitable, climate-resilient, and rooted in cooperative governance in data, diplomacy, and dignity.

7. Limitations

Despite the interdisciplinary scope and integration of both technical and socio-cultural perspectives, this report faces several limitations that should be acknowledged when interpreting its findings and recommendations.

1. The analysis relies exclusively on open-source, English-language material published between 2021 and 2025. This excludes Chinese-language publications, classified hydrological data, and restricted satellite datasets. This gap constrains the ability to fully assess China's internal water management strategies and real-time infrastructure decisions.
2. While the Underwater Domain Awareness (UDA) framework is central to the report's analytical and policy orientation, its practical application in riverine environments remains largely conceptual. No large-scale UDA pilots have yet been implemented in freshwater transboundary basins, limiting the assessment to theoretical extrapolations and proposed designs.
3. This report does not include original empirical fieldwork and primarily draws upon secondary academic work. While these sources are rigorous, the lack of direct engagement restricts the ability to ground-check proposed solutions or measure policy legitimacy at the grassroots level
4. The study does not account for confidential or Track II diplomatic interactions among BRB countries, which may be shaping the contours of informal cooperation or treaty negotiation behind the scenes. Similarly, it does not model long-term climate projections such as glacial retreat, snowpack variability, or downstream flow reduction under different emissions scenarios, factors that are critical to understanding future hydrological risks.

5. The report is limited by the inherent difficulty of integrating complex and evolving geopolitical, ecological, institutional, and cultural dynamics into a single governance framework. The Brahmaputra River Basin is not only a natural system but a deeply political and social one. As such, the insights offered here should be viewed as part of an ongoing, adaptive research agenda that will require further empirical validation, transboundary dialogue, and pilot implementation to realise its full potential.

References

1. FAO. 2011. AQUASTAT Transboundary River Basins – Ganges-Brahmaputra Meghna River Basin. Food and Agriculture Organisation of the United Nations (FAO). Rome, Italy
2. WRIS India. (n.d.). *Brahmaputra Basin Profile*. India-WRIS Wiki. https://indiawris.gov.in/wiki/doku.php?id=brahmaputra
   Rajagopalan, R. (2025). China's mega dam plan: Implications for the region. *The Diplomat*. https://thediplomat.com/2025/01/chinas-dam-on-brahmaputra
3. Baruah, T., Barua, A., & Vij, S. (2023). Hydropolitics intertwined with geopolitics in the Brahmaputra River Basin. WIREs Water, 10(2), e1626. https://doi.org/10.1002/wat2.1626
4. Modak, S., & Ghosh, N. (2025). China–India hydropolitics on the Brahmaputra: why do hard data need to dominate over existing rhetoric? International Journal of Water Resources Development, 1–22. https://doi.org/10.1080/07900627.2024.2449227
5. Zeitoun, M., & Mirumachi, N. (2022). Hydro-hegemony revisited: Frameworks for transboundary power. *Water Alternatives*, 15(3), 1–17. http://www.water-alternatives.org/index.php/alldoc/articles/vol15/v15issue3/669-a15-3-1

6. Palash, W., Bajracharya, S. R., Shrestha, A. B., Wahid, S., Hossain, Md. S., Mogumder, T. K., & Mazumder, L. C. (2023). Climate change impacts on the hydrology of the Brahmaputra River Basin. *Climate*, *11*(1), 18. https://doi.org/10.3390/cli11010018
7. Giordano, M., & Wahal, A. (2024). Hydro-diplomacy on the Brahmaputra: Examining the interplay of water, territorial claims, and infrastructure. *International Journal of Water Resources Development*, 40(6), 1032–1052.
8. Nandi, K. K., Pradhan, C., Dutta, S., & Khatua, K. K. (2023). Identifying the stability trajectory of a large braided Brahmaputra river using reach-scale process-based approach. Journal of Hydrology, 626, 130329
9. Prasujya, G., & Nayan, S. (2021). Spatio-temporal study of morpho-dynamics of the Brahmaputra River along its Majuli Island Reach. *Environmental Challenges*, *5*, 100217. https://doi.org/10.1016/j.envc.2021.100217
10. Pradhan, N. S., Das, P. J., Gupta, N., & Shrestha, A. B. (2021). Sustainable Management Options for Healthy Rivers in South Asia: The Case of Brahmaputra. Sustainability, 13(3), 1087. https://doi.org/10.3390/su13031087
11. Lyu, H., Tian, F., Zhang, K., & Nan, Y. (2023). Water-energy-food nexus in the Yarlung Tsangpo-Brahmaputra River Basin: Impact of mainstream hydropower development. *Journal of Hydrology: Regional Studies*, 44, 101293.
12. Xiao, L., Wang, J., Wang, B., Wang, B., & He, J. (2023). China's Hydropower Resources and Development. Sustainability, 15(5), 3940.
13. Vijayaraghavan, V. (2021, November 19). The Mising Tribe of Assam's Unique Approach to Climate Change Adaptation and Mitigation. *No Momente*. https://www.nomomente.org/post/mising-tribe-of-assam-climate-change-adaptation-and-mitigation

14. Jain, R. (2023, April 12). *Traditional building techniques could mitigate flood damage in Assam*. Dialogue Earth. https://dialogue.earth/en/climate/indigenous-traditions-offer-solutions-flood-damage-assam/
15. Akther, S., & Evans, J. (2024). Emerging attributes of adaptive governance in the global south. *Frontiers in Environmental Science*, 12, 1372157. https://doi.org/10.3389/fenvs.2024.1372157
16. Barua, A., Baruah, T., & Vij, S. (2024). Game theoretical analysis of China-india interactions in the Brahmaputra River Basin. *Journal of Hydrology*, *652*, 132602. https://doi.org/10.1016/j.jhydrol.2024.132602
17. Jyoti Deka, B. (2021). HYDRO-POLITICS BETWEEN INDIA AND CHINA: THE 'BRAHMA-HYPOTHESIS' AND SECURING THE BRAHMAPUTRA. Asian Affairs, 52(2), 327–343. https://doi-org.libproxy.ucl.ac.uk/10.1080/03068374.2021.1914449
18. Chakravarty, A. (2023). Ensuring water security in the Brahmaputra Basin: Shift from conflict to Cooperation. A Research Agenda for Water Law, 33–58. https://doi.org/10.4337/9781802204476.00008
19. Baruah, T., Barua, A., & Vij, S. (2023). Hydropolitics intertwined with geopolitics in the Brahmaputra River Basin. *WIREs Water, 10*(2), e1626. https://doi.org/10.1002/wat2.1626
20. Vegad, U., Pokhrel, Y., & Mishra, V. (2024). Flood risk assessment for Indian sub-continental river basins. *Hydrology and Earth System Sciences*, *28*(5), 1107–1126. https://doi.org/10.5194/hess-28-1107-2024
21. Mahanta, B. N., Kashyap, M. P., Mahapatra, B. M., & Goswami, T. K. (2024). Tectonic anabranching of Brahmaputra River system: Implications on survival of world's largest inhabited River Island Majuli. *Discover Geoscience*, *2*(1). https://doi.org/10.1007/s44288-024-00100-7

22. Wang, J., Wei, J., Shan, W., & Zhao, J. (2023). Modelling the water-energy-food-environment nexus and transboundary cooperation opportunity in the Brahmaputra River Basin. *Journal of Hydrology: Regional Studies*, *49*, 101497. https://doi.org/10.1016/j.ejrh.2023.101497
23. Xue, Q., He, L., Tang, Q., Xu, X., Chen, D., Wright, N. G., Islam, G. M. T., Baniya, B., Islam, A. K. M. S., Chowdhury, A. I. A., & Tang, Y. (2025). Planform Change and Its Delayed Response to Discharge in an Active Braided River Reach: Majuli Island Reach of the Brahmaputra River. https://doi.org/10.3390/rs17060944
24. Gajurel, K. P. (2024). Water Resources and Geopolitical Tensions in the Himalayas: Analysing Nepal's Mediating Role. *Medha: A Multidisciplinary Journal*, 7(1), 93–106. https://doi.org/10.3126/medha.v7i1.73899
25. Das, A. (2021). *Underwater Domain Awareness (UDA) Framework: An Indian Perspective*. Maritime Research Centre, Pune.
26. Xue, Q., He, L., Tang, Q., Xu, X., Chen, D., Wright, N. G., Islam, G. M. T., Baniya, B., Islam, A. K. M. S., Chowdhury, A. I. A., & Tang, Y. (2025). Planform Change and Its Delayed Response to Discharge in an Active Braided River Reach: Majuli Island Reach of the Brahmaputra River. Remote Sensing, 17(6), 944. https://doi.org/10.3390/rs17060944
27. Akamani, K. (2023). The roles of adaptive water governance in enhancing the transition towards ecosystem-based adaptation. *Water*, 15(13), 2341. https://doi.org/10.3390/w15132341
28. Akther, S., & Evans, J. (2024). Emerging attributes of adaptive governance in the global south. *Frontiers in Environmental Science*, 12, 1372157. https://doi.org/10.3389/fenvs.2024.1372157

29. Manhas, N. S., & Yadav, H. G. (2024). Beyond the border: Exploring the complex dynamics of water tensions between India and China. *Discover Global Society*, 2, Article 57. https://doi.org/10.1007/s44282-024-00089-x
30. Wouters, P., Daza-Clark, A. M., & Devlaeminck, D. J. (2024). China's transboundary hydropower development at home and abroad: Exploring the regulatory interface between international water law and international economic law. *Frontiers in Climate*, 5, 1302103. https://doi.org/10.3389/fclim.2023.1302103
31. Wouters, P. K., & Devlaeminck, D. J. (2024). Comparing China and India's transboundary water governance: insights from international law. International Journal of Water Resources Development, 1–20. https://doi.org/10.1080/07900627.2024.2341274
32. Das, A. (2021). *Underwater Domain Awareness (UDA) Framework: An Indian Perspective*. Maritime Research Centre, Pune.
33. Rahman, M. Z. (2025, January 6). *The implications of China's mega-dam project: Explained*. The Hindu. https://www.thehindu.com/news/international/the-implications-of-chinas-mega-dam-project-explained/article69064553.ece