

Hydro-politics of the Indus and Yarlung Tsangpo: Conduits of Conflict between India, China and Pakistan

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Abstract

The Indus and Yarlung Tsangpo/Brahmaputra River basins are important for India, China and Pakistan's economic development, water security, and geopolitical stability. These rivers are transboundary with shared resources that require practical diplomatic cooperation, especially considering the growing risks associated with climate change. However, they are also potential hotspots for conflict due to issues like upstream dam construction, opaque data sharing, and ingrained historical grievances. The primary causes of these river conflicts have the potential paths toward cooperation and settlement in these contested basins. For instance, the Indus Waters Treaty (IWT) is essential to bilateralism, it is threatened by hydrological changes brought on by climate change, severe trust issues, and crises like the Pahalgam escalation, which was followed by the Indian government's decision to put the treaty in abeyance. At the same time, the Yarlung Tsangpo/Brahmaputra Basin, which does not have a formal water-sharing treaty, is experiencing increased hydro-political tensions due to China's ambitious hydropower projects. According to the study, current regional political problems pertaining to water are made worse by climate change, which calls for quick and cooperative policy solutions. Policy implications highlight the necessity of strategic move away from unilateral measures and toward collaborative, basin-wide strategies that put an emphasis on open data sharing, scientific cooperation, multi-stakeholder engagement, and the depoliticisation of water issues to promote resilient regional relations.

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Keywords: Indus, IWT, China, Yarlung Tsangpo, Brahmaputra, India, Pakistan, Hydro, Himalaya, Tibet.

Introduction

Often referred to as the "blue gold" of the 21st century, water is a vital resource for ecological balance, economic growth, and human survival.¹ The demand for freshwater is rising as economies and populations around the world expand, putting tremendous strain on limited supplies. About 60% of the freshwater on earth comes from rivers that cross international borders.² Nearly 40% of the world's population depends on these transboundary rivers, which number over 263 worldwide and sustain livelihoods, agriculture, industry, and energy production across several riparian states.³ Since these hydrological systems are shared, upstream activities will always influence downstream communities, resulting in intricate interdependencies that can lead to both significant geopolitical tension and collaboration. An effective transboundary water governance has emerged as a critical issue for international relations. Sustainable development has become increasingly vital in an era marked by growing water stress caused by pollution, unsustainable consumption, and climate change.⁴

Transboundary water diplomacy is an essential component of modern statecraft since the inability to manage these shared resources sustainably and fairly can lead to disputes, threaten regional stability, and even spark wars. Before opening discussion on Himalayan waters, it is necessary to mention the difference between Hydro-hegemon and Hydro-politics. Hydro-politics refers to a broad field examining the political aspects of

¹ Sandra Postel, *Pillar of Sand: Can the Green Revolution Endure?* (New York: W. W. Norton & Company, 1999).

² Aaron T. Wolf, Shira B. Yoffe, and Mark Giordano, "International Waters: Identifying Basins at Risk," *Water Policy* 7, no. 1 (2005): 29–47.

³ UN-Water, *Transboundary Waters: Sharing a Common Future* (Bonn: UN-Water Decade Programme on Capacity Development, 2008).

⁴ Asit K. Biswas, "Integrated Water Resources Management: A Global Challenge," *Water Resources Development* 20, no. 4 (2004): 433–443.

water, and encompasses all interactions from cooperation to conflict. The involvement in the dynamics of unequal power is hydro-hegemony. It explains how a dominant/upper riparian state or actor can control a shared water resource through institutional, ideological, and economic means in addition to using force. Not all hydro-political interactions involve hydro-hegemony, even though all instances of hydro-hegemony are a type of hydro-politics. In the upcoming discussion, the focus will be on hydro-politics to help understand strands of politics involved in the plans and strategies of all parties involved.

The Himalayan Water Tower and its Geopolitical Nexus

Ten of Asia's largest rivers are fed by the vast glaciers and snow reserves of the Himalayan Mountain range, which is known as the "Third Pole" or the "Water Tower of Asia."⁵ More than two billion people live in South, Southeast, and East Asia along these rivers, which include the Indus, Brahmaputra (Yarlung Tsangpo), Ganges, Mekong, and Yangtze. As a result, the region is heavily reliant on Himalayan meltwater and monsoon-fed flows.⁶ The presence of three nuclear-armed neighbours—China, India, and Pakistan—who each have substantial strategic interests and a history of complicated, frequently tense relations, makes this crucial hydrological nexus a geopolitical hotspot. A volatile hydro-political environment occurs due to the inherent power imbalance between upstream and downstream riparian states, unresolved territorial disputes, and the dearth of comprehensive multilateral water-sharing agreements.⁷ The interaction of hydrology and geopolitics becomes more pertinent when the countries involved increasingly procure the water resources and hydropower potential of the Himalayan Rivers for energy to support their rapid

⁵ Walter W. Immerzeel, Ludovicus P. H. van Beek, and Marc F. P. Bierkens, "Climate Change Will Affect the Asian Water Towers," *Science* 328, no. 5985 (2010): 1382–1385.

⁶ Jianchu Xu et al., "The Melting Himalayas: Geo-Ecological, Socio-Economic and Geopolitical Implications," *Environmental Science & Policy* 12, no. 4 (2009): 371–384.

⁷ Brahma Chellaney, *Water: Asia's New Battleground* (Washington, DC: Georgetown University Press, 2011).

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economic growth. This interaction shapes resource security and regional stability for a large population.

Figure: I Indus River System and its Tributaries



Source: <https://lotusarise.com/indus-river-system-upsc/>

This study aims to delve deeper into the context of contemporary shifting hydrological realities and changing geopolitical dynamics especially in the Post-Pahalgam scenario.

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In the Indus and Yarlung Tsangpo basins involving India, China and Pakistan, there are major causes of conflict, historical grievances, national security concerns, and developmental aspirations. At the same time, there are possible opportunities and motivators for cooperation too. For instance, shared needs for climate change adaptation and economic interdependence. It is significant to understand how the current hydro-political tensions get worse due to the accelerating effects of climate change, particularly changes in precipitation patterns, glacial melt, and extreme weather events. These vital questions also have a significant impact on the calculation of cooperation or conflict between China, India and Pakistan on these crucial river basins.

Hydro politics offers a thorough and sophisticated analytical framework as compared to hydro-hegemony perspective. Hydro-hegemony emphasises the dominance of one state such as China's upstream position, or India's leverage over Pakistan. This geo-strategic positioning could be useful in understanding the conflict. It, however, is vulnerable to oversimplifying the intricacies of the relationships and ignoring cooperative elements. Hence, hydro-politics allows looking at both the cooperative and competitive dynamics at the same time. The long-standing IWT between India and Pakistan, for example, is an evidence of the possibility of collaboration and conflict settlement even in the face of a tense relationship. Similarly, India and China have limited data-sharing agreements, despite concerns about hydro-hegemony raised due to China's massive dam projects on the Yarlung Tsangpo-Brahmaputra River system. This research offers a more accurate and comprehensive picture of the complex relationships between India, Pakistan and China by examining the full range of hydro-political interactions—including legal frameworks, diplomatic negotiations, and technical cooperation, in addition to power imbalances. This goes beyond a simple conflict narrative to identify potential avenues for future stability and cooperation.

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Water Scarcity and Conflict Nexus

The relationship between conflict and water scarcity is frequently divided between "hydro-optimists" (also known as cornucopias) and "hydro-pessimists" (also known as neo-Malthusians).⁸ According to hydro-pessimists, growing water scarcity brought on by population growth and climate change will inevitably result in more competition and violent conflict, especially in areas where geopolitical tensions are already present.⁹ They bolster this opinion with historical examples and the strategic significance of water.

On the other hand, hydro-optimists argue that although a lack of water can augment tensions, there is no evidence of interstate conflict. They instead contend that shared water resources are more often catalysts for collaboration, encouraging riparian states to create joint commissions, negotiate treaties, and create shared management mechanisms to secure reciprocal benefits.¹⁰

Since the Pahalgam incident, the hydro-political environment between India, Pakistan and China has entered a new and more antagonistic phase. Considered as the deadliest terrorist attack in Jammu and Kashmir in 2025, it provided provoked an excuse to India to react unilaterally by putting the IWT in abeyance. While adding new dimensions to sharing waters, this act adds new aspects of water scarcity to the securitisation and weaponisation of Transboundary Rivers.

⁸ Aaron T. Wolf, *Water Conflict Chronology* (Corvallis, OR: Oregon State University, 2007), https://www.transboundarywaters.orst.edu/database/conflict_chronology.html.

⁹ Thomas F. Homer-Dixon, "Environmental Scarcity and Violent Conflict: The Case of Rwanda," *Environmental Change and Security Project Report 5* (Summer 1994): 2–30.

¹⁰ Aaron T. Wolf, Shira B. Yoffe, and Mark Giordano, "International Waters: Identifying Basins at Risk," *Water Policy* 7, no. 1 (2005): 29–47.

Upstream-Downstream Dynamics

Upstream-Downstream Dynamics have historically played a vital role in the resource diplomacy of the nations since World War-II. Power imbalances between upstream and downstream riparian states are a natural feature of transboundary river basins.¹¹ They have a control over the river's flow source. The upstream states like China on the Yarlung Tsangpo and India on the Indus, have a major hydrological advantage. They can unilaterally carry out projects like massive dams for hydropower or irrigation diversion schemes due to their positional power, which can drastically change the amount and quality of water that riparian downstream receives.¹² Downstream states, like Bangladesh and India due to Brahmaputra and Pakistan with regard to the Indus, are inherently vulnerable to upstream actions. Their ecological balance, agricultural productivity, and water security can all be significantly impacted by upstream withdrawals, pollution, or flow regulations.¹³ While upstream states may oppose such restrictions to preserve their sovereignty and development flexibility, downstream states are often compelled to search for legally binding agreements and international frameworks to protect their water rights.¹⁴ The power and authority relationship is vividly changing, and much depends on a number of factors, including diplomatic influence, military might, economic strength, and the presence or absence of international institutions and norms.

The Pahalgam incident has altered this dynamic as well since the water-related discourse is a national security issue. In the case of India and

¹¹ Mark Zeitoun and Jeroen Warner, “Hydro-Hegemony — A Framework for Analysis of Trans-Boundary Water Conflicts,” *Water Policy* 8, no. 5 (2006): 435–460.

¹² Dennis Wichelns and Aaron T. Wolf, “Water and Agriculture Revisited: The Issue of Virtual Water,” *Water Policy* 12, no. 4 (2010): 553–569.

¹³ Salman M. A. Salman and Kishor Upadhyay, *Conflict and Cooperation on Transboundary Water Resources* (Cambridge: Cambridge University Press, 2022).

¹⁴ Jerome Delli Priscoli, “Water and Peace: The New Security Paradigm,” *Water International* 34, no. 1 (2009): 123–134.

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Pakistan, the water issues have become a matter of national sovereignty and survival rather than some mutual economic and environmental concern. It has demonstrated convincingly how, otherwise, a non-water-related incident can turn into a specific water-specific conflict. A new narrative is generated reflecting the interpretation/management by the security and defense authorities of water politics rather than the ministries.¹⁵ Consequently making the diplomatic and technical solutions of water-related issues irrelevant for all the parties concerned.

The Indus River Basin: A Case Study of Enduring Bilateralism

The Indus River Basin (IRB) continues to cause geopolitical tensions between India and Pakistan. It presents sustenance for millions of people throughout South Asia, which is a unique example of durable bilateralism. The post-partition realities of 1947 forced the newly independent nations into an abrupt political crisis over water resources.¹⁶ Yet, the IWT is a historic pact that has endured numerous wars and crises before Pahalgam casualty. The IWT is a legally binding agreement that carefully and systematically divides the six rivers of the Indus. India was allowed a few “non-consumptive” uses, such as run-of-the-river hydropower generation and a few small-scale agricultural uses.¹⁷ Permanent Indus Commission, provisions for impartial experts, and a Court of Arbitration are frequently cited as strong dispute resolution procedures that secured this Treaty's

¹⁵ Chaganti Singh, S., Das, K. N., Ahmed, A., Greenfield, C. & Shahid, A. (2025), Exclusive: India weighs plan to slash Pakistan water supply with new Indus River project. *Reuters*, 16 May. Available at: [https://www.reuters.com/world/asia-pacific/india-weighsplan-slash-pakistan-water-supply-with-new-indus-river-project-2025-05-16/](https://www.reuters.com/world/asia-pacific/india-weighs-plan-slash-pakistan-water-supply-with-new-indus-river-project-2025-05-16/), accessed August 30, 2025.

¹⁶ Muhammad M. Khan et al., “Water Dispute between India and Pakistan,” *Journal of Asian Development Studies* 11, no. 1 (2022): 11–18,

¹⁷ World Bank, *Fact Sheet: The Indus Waters Treaty 1960 and the Role of the World Bank*, June 11, 2018, <https://www.worldbank.org/en/region/sar/brief/fact-sheet-the-indus-waters-treaty-1960-and-the-world-bank>; and Ministry of External Affairs (India), *Indus Waters Treaty*, n.d., <https://www.meaindia.gov.in/bilateral-documents.htm?dtl/6439/Indus>.

tenacity.¹⁸ The political maneuvers have been useful in resolving controversial issues such as the Kishenganga and Ratle Hydropower Projects.¹⁹

Despite the IWT's significance, Pakistan still faces severe water security issues, mostly because of its acute over-reliance on the Indus system for its agricultural economy and means of survival.²⁰ Islamabad's concerns are aggravated by alleged threats from Indian upstream projects, especially regarding the disparity between permissible run-of-the-river schemes and potential large-scale storage projects.²¹ On the other hand, India believes that the treaty permits it to pursue its upstream development needs, and most probably, its substantial hydropower potential on the Western Rivers.²² This resolve is reflected vividly in their leadership statements during the Pahalgam crisis. Despite the occasional appearance of aggressive rhetoric such as “blood and water cannot flow together,” especially in the backdrop of Pahalgam, India's position is based on arguments regarding the “full utilisation” of its Treaty rights.²³

¹⁸ Vajiram & Ravi, *Indus Water Treaty 1960, Map, Key Features, Timeline, Pahalgam Attack*, May 1, 2025, <https://vajiramandravi.com/upsc-exam/indus-water-treaty/>.

¹⁹ *Deccan Herald*, “Indus Waters Dispute: India Rejects Hague Court Ruling on Kishenganga, Ratle Projects,” June 27, 2025, <https://www.deccanherald.com/india/india-rejects-court-of-arbitration-s-ruling-on-kishenganga-ratle-hydroelectric-projects-3606277>

²⁰ “Agriculture: Shackling the Mighty Indus,” *Dawn*, March 31, 2025, <https://www.dawn.com/news/1901166>.

²¹ Ayesha Nawaz et al., “Water Management in Pakistan: Challenges and Way Forward,” *ResearchGate*, 2024, https://www.researchgate.net/publication/378546331_Water_Management_in_Pakistan_Challenges_and_Way_Forward.

²² “Navigating the Indus Waters Treaty: India's Water Rights and Strategic Considerations,” *Deccan Herald*, May 4, 2025, <https://www.deccanherald.com/opinion/navigating-the-indus-waters-treaty-3524466>.

²³ “Waters of Geopolitics: Why Is the Indus River System So Violently Contested?” *Foreign Policy in Focus (FPIF)*, June 6, 2025, <https://fpif.org/waters-of-geopolitics-why-is-the-indus-river-system-so-violently-contested/>.

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China's influential presence as an upper riparian state to the Indus and its tributaries is complicating the current water dynamic between India and Pakistan.²⁴ There is an absence of a comprehensive transboundary water-sharing agreement between China and India for these rivers. India is concerned about the development of hydropower projects in Pakistan-administered Kashmir and Gilgit-Baltistan under the China-Pakistan Economic Corridor (CPEC).²⁵ With possible ramifications for future India-Pakistan water relations, this new “third party” involvement adds another factor to the complex hydro-political landscape of the Indus Basin.²⁶

The Yarlung Tsangpo/Brahmaputra Basin: Emerging Hydro-Political Fault-line

Yarlung Tsangpo/Brahmaputra River Basin (YTBRB) is a Transboundary River system which runs through Bangladesh, India, and China. It is rapidly emerging as one of Asia's salient hydro-political fault-lines. The river Yarlung Tsangpo originates from Tibet (China). It is known as the Siang in Arunachal Pradesh, the Brahmaputra in Assam, and Jamuna in Bangladesh, where it joins the Ganges and empties into the Bay of Bengal.²⁷ Millions of people live in the downstream of this powerful river system, especially in Bangladesh and the northeastern states of India, and its ecological balance,

²⁴ “India-China Relations in Water Management: From Conflict to Cooperation,” *NatStrat*, March 17, 2025, <https://www.natstrat.org/articledetail/publications/india-china-relations-in-water-management-from-conflict-to-cooperation-187.html>.

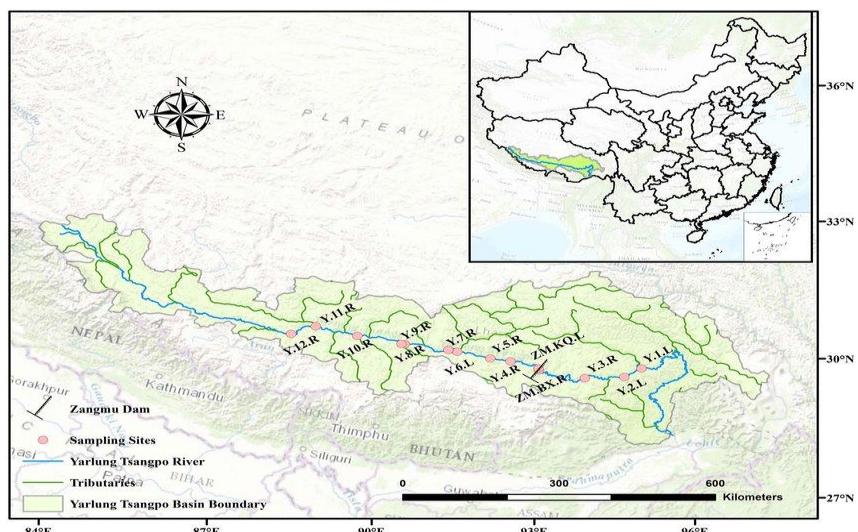
²⁵ Abid Hussain, “Can India Stop Pakistan's River Water—and Will It Spark a New War?” *Al Jazeera*, July 9, 2025, <https://www.aljazeera.com/features/2025/7/9/can-india-stop-pakistans-river-water-and-will-it-spark-a-new>

²⁶ “China's Insertion into India-Pakistan Waters Dispute Adds a Further Ripple in South Asia,” *Renewable Energy World*, July 21, 2025, <https://www.renewableenergyworld.com/hydro-power/chinas-insertion-into-india-pakistan-waters-dispute-adds-a-further-ripple-in-south-asia/>

²⁷ “Brahmaputra Dam Debate: Key Questions and Answers,” *China Dialogue*, April 16, 2024, <https://chinadialogue.net/en/nature/brahmaputra-dam-debate-key-questions-and-answers/>; and “Indus Waters Treaty Must Be Re-evaluated: Indian Government Panel,” *The Economic Times*, March 4, 2025, <https://economictimes.indiatimes.com/news/india/indus-waters-treaty-must-be-re-evaluated-indian-govt-panel/articleshow/108234123.cms>.

agricultural productivity, and energy security depends on it. China's ambitious upstream hydropower projects on the Yarlung Tsangpo are at the center of the growing tensions. Beijing has begun building mega-dams, such as the controversial Medog Dam and the operational Zam Hydropower Station, motivated by the strategic imperatives of energy security, regional developments in Tibet, and the possibility of inter-basin water transfers.²⁸ Both India and Bangladesh are extremely concerned about the size and quantity of these projects, as well as China's absence of a comprehensive, legally-binding water-sharing agreement with its downstream neighbours.²⁹

Figure: II: Overview and detailed map of the Yarlung Tsangpo Basin with sampling sites



²⁸ “Water Scarcity and Chinese Hydropower Development on the Yarlung Tsangpo,” *Future Directions International*, March 29, 2017.; and “India’s Water Diplomacy and the China Factor,” *The Times of India*, April 4, 2025, <https://timesofindia.indiatimes.com/india/indias-water-diplomacy-and-the-china-factor/articleshow/108891234.cms>.

²⁹ "The Brahmaputra: The Challenges of Governing a Transboundary River," Stimson Center, September 12, 2017, <https://www.stimson.org/2017/brahmaputra-challenges-governing-transboundary-river/>.

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SOURCE: https://www.researchgate.net/figure/Overview-and-detailed-map-of-the-Yarlung-Tsangpo-Basin-with-sampling-sites-Red-circles_fig1_320171241

India has deep and varied concerns as decreased dry-season flows could destroy ecological systems, and agricultural livelihoods in its northeastern states. If water releases are not appropriately coordinated, there will be a greater chance of flooding during the monsoon season.³⁰ These worries are exacerbated by environmental impact issues, such as possible seismicity in a seismically active area and wider ecological disturbance.³¹ As a result, India has continuously demanded that China share more transparent, real-time data and establish a bilateral water-sharing mechanism.³² In an effort to meet its energy needs, India is concurrently pursuing its own plans for the development of hydropower on the tributaries of the Brahmaputra, a move that may make regional water management more difficult.³³

Bangladesh is the most vulnerable riparian farther downstream. Any unilateral upstream actions by China or even India could worsen the region's current flood and drought problems, endangering food security and livelihoods due to its extreme reliance on the Brahmaputra's flows, especially for agriculture and groundwater recharge.³⁴ Being a lower-lower riparian, it greatly reduces Bangladesh's bargaining power in bilateral talks.

³⁰ “The Brahmaputra and China's Hydropower Projects,” *Observer Research Foundation*, December 13, 2023, <https://www.orfonline.org/expert-speak/the-brahmaputra-and-chinas-hydropower-projects>

³¹ “Is India Losing the Race to Harness Brahmaputra's Hydropower Potential?” *Livemint*, June 3, 2024, <https://www.livemint.com/economy/is-india-losing-the-race-to-harness-brahmaputras-hydropower-potential-11717412705001.html>

³² *India, China in Talks over Brahmaputra River Data Sharing, Says MEA*, *WION*, May 29, 2024, <https://www.wionews.com/india/india-china-in-talks-over-brahmaputra-river-data-sharing-says-me-a-723521>.

³³ “Why India Needs a Water Treaty with China on the Brahmaputra,” *Livemint*, May 17, 2024, <https://www.livemint.com/news/india/why-india-needs-a-water-treaty-with-china-on-the-brahmaputra-11715915234839.html>

³⁴ Environmental and Socio-Economic Impacts of Proposed Hydroelectric Power Projects along the Brahmaputra River in India, n.d., *SpringerLink*, https://link.springer.com/chapter/10.1007/978-3-030-22165-4_17.

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The possibility of a framework of trilateral cooperation between China, India, and Bangladesh is a more just and long-term solution.³⁵

One crucial gap is lack of a formal, legally-binding water-sharing agreement between all the three countries. Many believe that the current systems for exchanging hydrological data during the flood season, like the Expert Level Mechanism (ELM) and Memoranda of Understanding (MoUs), are inadequate and inconsistent.³⁶ Effective cooperative management and the development of trust between the basin states are hampered by restrictions on the amount of data that can be shared, delays in its delivery, and lack of transparency.³⁷ The Yarlung Tsangpo/Brahmaputra Basin's geological and hydrological significance, along with China's upstream aspirations and strategic justification, India's concerns and reactions, Bangladesh's extreme vulnerability, and shortcomings of the current data-sharing mechanisms, are in the absence of a comprehensive treaty.

Recent developments by the Chinese authorities on the Yarlung Tsangpo basin are making the hydro-politics debate between the two sides more crucial. China is constructing a mega dam officially named as, "Yarlung Tsangpo Lower Reaches Hydropower Project," which is expected to have three times more capacity than the Three Gorges Dam. Geographically, the Indian Territory is only 30km from the location of this mega project. Secondly, it is being constructed in an extremely sensitive and seismically active area. Its enormous scale and strategic location have sparked serious concerns on the Indian side, despite its stated main goal of producing clean

³⁵ *The Brahmaputra River Basin: An Introduction to Its Geopolitics*, n.d., Water Diplomacy, <https://waterdiplomacy.org/brahmaputra-river-basin-introduction-geopolitics/>.

³⁶ "India-China Water Talks on Brahmaputra: A Test of Transparency and Trust," *The Print*, July 18, 2024, <https://theprint.in/opinion/india-china-water-talks-on-brahmaputra-a-test-of-transparency-and-trust/2123996/>.

³⁷ "The Brahmaputra and China's Hydropower Projects," *Observer Research Foundation*, December 13, 2023, <https://www.orfonline.org/expert-speak/the-brahmaputra-and-chinas-hydropower-projects>

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energy to support China's development objectives. The location of the project near Great Bend has diverted the issue of water sharing from a technical matter of water sharing to a strategic rivalry between the two sides.³⁸

Climate Change: An Overarching Driver of Hydro-Political Dynamics

Beside the debate of hydro-political contours of two controversial river basins, there is an overarching debate of climatic ramifications of basin-tempering which is gaining impetus in global water politics. Climate change has certainly become a prevailing force influencing hydro-political dynamics, particularly in Asia's trans-boundary river basins. Its acute and mounting effects on river flows and Himalayan glaciers are fundamentally transforming the hydrological realities of the area and escalating pre-existing water-related clashes and posing fresh challenges for international relations.³⁹ The quick melting of the Himalayan glaciers have significantly increased the amount of the available water, which may worsen glacial lake outburst floods.⁴⁰ However, the considerable melting of the glaciers may transform these issues into a long-term reduction in water quantity, jeopardising the perennial nature of rivers that are essential to the sustainability of populations located downstream.⁴¹

³⁸ Khandu, P., "Arunachal CM calls China's dam a ticking 'water bomb'", *PTI*, July 23, 2025.

³⁹ Intergovernmental Panel on Climate Change (IPCC), *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*, eds. Hans-Otto Pörtner et al. (Geneva: IPCC, 2019).; and Mandira B. Shrestha, S. R. Bajracharya, and N. Sherpa, "Changing Climate, Changing Water: Hydropower Development in the Hindu Kush Himalaya," in *The Himalaya at a Crossroad*, ed. Aditi Mukherji et al. (Cham: Springer, 2022), 241–262

⁴⁰ S. R. Bajracharya, B. Shrestha, and M. S. Shrestha, "Glaciers and Glacial Lakes in the Nepal Himalayas: Status, Trends, and Implications," in *The Hindu Kush Himalaya Assessment*, ed. Philippus Wester et al. (Cham: Springer, 2018), 127–148.

⁴¹ Walter W. Immerzeel, Hester Biemans, Scott P. Brumby, and Marc F. P. Bierkens, "High-Resolution Glacier Mass Balance and Runoff Projections for the Himalayas," *Nature Climate Change* 10, no. 2 (2020): 118–123.

At the same time, monsoon patterns have been drastically transformed by climate change which has resulted in more severe and unpredictable rainfalls. This climate shift may increase the frequency and intensity of natural calamities such as devastating floods and protracted droughts,⁴² imbalanced aquatic biodiversity, sediment load, and compromised water quality throughout these vital river systems.⁴³

These hydrologically driven changes are detrimental to the escalation of tensions between riparian states. As a direct consequence of climate change, competition for limited or unpredictable water resources is growing, that places heavy strain on already tense bilateral and multilateral relationships.⁴⁴ Increased uncertainty related to water availability (whether brought on by lower flows or more unpredictable flood cycles) harms bilateral relationships between upstream and downstream countries, which makes cooperative water management more complicated and may result in the initiation of unilateral actions.⁴⁵ Additionally, water scarcity or extreme weather events may cause internal displacement and migration, and can emerge as major sources of volatility, fueling political strife and pressures across borders.⁴⁶

⁴² Yukiko Hijioka et al., “Asia,” in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects*, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, eds. V. R. Barros et al. (Cambridge: Cambridge University Press, 2014), 1327–1370.

⁴³ Anil Mishra and Thomas Wengel, “Climate Change Impacts on the Water Resources of the Brahmaputra River Basin: A Review,” *Climate and Development* 12, no. 7 (2020): 603–617

⁴⁴ Shlomi Dinar, Ariel Dinabir, and Amy Kurki, *The International Law of Transboundary Aquifers* (London: Routledge, 2015).

⁴⁵ Wimmer, A. De Roo, P. Burek, and S. Duerksen, *Assessment of Climate Change Impacts on Water Resources and Flood Hazards in the Transboundary Ganges-Brahmaputra-Meghna River Basin*, EUR 30739 EN (Luxembourg: Publications Office of the European Union, 2021).

⁴⁶ United Nations University, *Global Trends in Forced Migration* (2018), <https://unu.edu/publications/articles/global-trends-forced-migration.html>.

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Nevertheless, climate change also offers a unique opportunity for improved regional collaboration and may act as a driving force for positive ‘hydro-diplomacy.’ It is necessary to collaborate in terms of adaptation and devising mitigation strategies due to our shared vulnerability to climate change devastating effects.⁴⁷ Unfortunately, the bilateral tensions are further fading the chances of hydro-diplomacy. There is a vicious cycle of environmental degradation and water scarcity that disproportionately affects a region already highly vulnerable to climatic shifts. India and Pakistan in the post-Pahalgam scenario are experiencing the push for unilateral dam projects to secure adequate water supplies. This can negatively impact biodiversity, increase water contamination from industrial and agricultural runoff, and lead to soil salinization in downstream areas.⁴⁸ As it is a collective threat to the sustainability of all stakeholders, riparian states may need to consider cooperative climate resilience rather than conventional zero-sum approaches to water management, which may facilitate in alleviating current hydro-political divisions.⁴⁹

As far as climatic effects of Yarlung Sangpo river conflict between India and China are concerned, primarily this issue is regarded as a unilateral manipulation of the hydrological regime of the river which is further

⁴⁷ Naho Mirumachi, “Transboundary Water Cooperation and Climate Change: Examining Water Diplomacy in the Ganges-Brahmaputra-Meghna Basin,” *Water International* 40, no. 2 (2015): 241–255.

⁴⁸ S. Mukherjee, D. Lal, and R. B. Singh, “Transboundary Water Governance in South Asia: Towards a Climate Resilient Approach,” in *Climate Change and Water Resources in South Asia*, eds. R. B. Singh, D. Lal, and S. K. Ghosh (Cham: Springer, 2018), 201–218.; and Hari Upadhyay, “Climate Change and Water Conflict in the Himalayas,” *Journal of South Asian Studies* 2, no. 1 (2017): 59–74. -Parry, J. E., Osman, H., Terton, A., Asad, S. A. & Ahmed, T. (2025). *The vulnerability of Pakistan's water sector to the impacts of climate change*. International Institute for Sustainable Development. Available at: <https://www.iisd.org/publications/report/vulnerability-pakistans-water-sector-impacts-climate-change-identification-gaps>, accessed August 30, 2025.

⁴⁹ Mark Zeitoun, Jeroen Warner, and Naho Mirumachi, “Transboundary Water Interaction: Revisiting the Cooperation-Conflict Nexus,” *Water International* 35, no. 5 (2010): 639–652.

exacerbated by climatic changes. China's massive dam projects, especially the one at the Great Bend of the Yarlung Tsangpo, have the potential to change the river's natural flow because they are upstream riparian. For downstream India and Bangladesh, this can result in climate-related threats: decreased flow during dry seasons, exacerbated droughts that affect agriculture, and the possibility of devastating flash floods brought on by abrupt, regulated water releases during the monsoon season. In addition, the dam's position in a seismically active and geologically unstable area increases the risk of dam failure, which would release a destructive wall of water and debris. This risk is exacerbated by increased glacial melt and climate change-related extreme weather events.

The pure climatic studies over the basins under discussion suggest serious hydro-politics with an intention to mitigate risk factors for the greater welfare of the entire region. It is expected that climate change may be a catalyst for collaboration and 'hydro-diplomacy' in transboundary river basins conflicts.

Pathways for Cooperation and Conflict Mitigation

The shared waters of the Indus and Yarlung Tsangpo/Brahmaputra basins define South Asia's complex hydro-political landscape and require a proactive shift towards collaboration and conflict resolution. Effective and cooperative water governance is now a strategic inevitability for regional stability and prosperity.⁵⁰ In addition to preserving the IWT, it is required to actively ensure its complete and transparent implementation. There should also be opportunities for periodic review, and its terms must be revised to take into consideration emerging realities, such as climate variability.⁵¹ The mutual Indus management has seriously suffered after the

⁵⁰ Shafqat Islam and Thomas Winkelmann, "Climate Change and Water Conflicts in South Asia," *Water* 14, no. 10 (2022): 1599. - Modak, S., 2025. 'China's Mega Dam on Brahmaputra: Implications for India-China Relations', *Vision IAS*, July 21, 2022.

⁵¹ World Bank, *Fact Sheet: The Indus Waters Treaty 1960 and the Role of the World Bank*, June 11, 2018, <https://www.worldbank.org/en/region/sar/brief/fact-sheet-the-indus-waters-treaty-1960-and-the-world-bank>.

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Pahalgam crisis. Climatic catastrophe is making the entire situation more vulnerable. The table below shows the comparative scenarios of bilateral management of the Indus River by India and Pakistan.

Table 1: Comparative Analysis of Bilateral Water Management

Feature	Pre-Pahalgam Crisis (PIC Operational)	Post-Pahalgam Crisis (PIC in Abeyance)
Legal Status of PIC	Functioning bilateral body with a clear mandate under the IWT.	Unilaterally suspended by India; its legal standing is being debated at international forums.
Data Sharing	Formal, institutionalised exchange of hydrological data, especially during the flood season.	Ad-hoc and informal data sharing via diplomatic channels, not the PIC.
Flood Management	Systematic flood forecasting and early warning system via the commission.	Reactive and less effective flood mitigation; reliance on limited, unilateral warnings.
Trust and Diplomacy	A consistent forum for dialogue and dispute resolution, surviving wars and conflicts.	Breakdown of trust; water issues are increasingly politicised and securitised.

Source: *Table by Author*

The ongoing flood management hazards are further validating the climatic disaster debate of trans-border water management crisis between India and Pakistan. As far as the Yarlung Tsangpo/Brahmaputra case, a comprehensive treaty is markedly lacking. The target should be to strengthen the present Expert Level Mechanism (ELM) into a permanent joint commission. In order to promote dependable communication, ascertain trust, and ultimately open the door for a more thorough water-sharing agreement that considers the concerns of all riparians, this

institutionalisation is essential.⁵² The implementation of thorough, real-time data sharing protocols is essential to any cooperative framework's success. Building trust and lowering fears resulting from uncertainty and perceived unilateral actions, require the transparent and regular exchange of hydrological information, such as river flows, dam operations, and climate projections.⁵³ Verifiable data sharing can turn mistrust into mutual understanding, facilitating better decision-making and cooperative planning for flood and water scarcity management.⁵⁴

Way Forward

No matter how long the geo-economic and climatic realities are ignored, the emerging humanitarian crisis seriously calls for collaborative research and capacity building which can forge a common epistemic community that cuts across political boundaries.⁵⁵ In accordance with the requirement of upcoming weather patterns in the region, a shared understanding of basin-wide challenges requires collaborative scientific studies on critical issues like accelerated glacier melting, changing water availability patterns, advanced flood forecasting, and environmental impacts.⁵⁶ Additionally, developing cooperative flood and drought mitigation, trans-boundary strategies, encouraging effective irrigation methods, and exchanging best practices in water management can all improve regional resilience and

⁵² *The Brahmaputra: The Challenges of Governing a Transboundary River*, Stimson Center, September 12, 2017, <https://www.stimson.org/2017/brahmaputra-challenges-governing-transboundary-river/>.

⁵³ United Nations Economic Commission for Europe (UNECE), *Good Practices and Lessons Learned in Data-Sharing in Transboundary Basins*, n.d., https://unece.org/sites/default/files/2024-11/2413395_E_web%20%281%29.pdf.

⁵⁴ Water Alternatives, *Trust in Transboundary Waters: Identifying Trust-Building in Water Diplomacy Literature*, n.d., <https://www.water-alternatives.org/index.php/alldoc/articles/vol16/v16issue3/727-a16-3-11/file>.

⁵⁵ *The Impact of Global Warming on the Glaciers of the Himalaya*, n.d., ICIMOD, <https://lib.icimod.org/records/p49jj-wst33/files/863.pdf>

⁵⁶ Garima Matta, Anil Kumar, Dinesh Singh Tomar, and Ramesh Kumar, "Climate Change in the Himalayan Region: Susceptible Impacts on Environment and Human Settlements," *Frontiers in Environmental Science* 13 (2025): 1550843.

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create a sense of reciprocal benefit. Multi-stakeholder engagements are essential because it is acknowledged that state actors are not the only ones involved in water issues. Diverse viewpoints, unofficial networks, and creative solutions can be brought to water discussions by involving regional bodies, academic institutions, and civil society organisations.⁵⁷ Beyond official diplomatic channels, programmes like Track-II diplomacy and people-to-people connections can be extremely important in fostering a sense of community, lowering misconceptions, and constructing bridges.⁵⁸ Important guidelines for directing transboundary water cooperation are provided by the framework of International Law and institutions. A normative foundation for future agreements can be established by discussing the UN Watercourses Convention (1997) and its principles of “equitable and reasonable utilisation” and “obligation not to cause significant harm.”⁵⁹ Furthermore, the World Bank’s involvement in the IWT demonstrates that international organisations or third-party mediation can help foster trust, offering technical assistance and defusing tense situations.⁶⁰ Lastly, looking beyond water, a strong avenue for collaboration is provided by connecting hydropower to larger regional integration projects. Water can be transformed from a potential source of conflict into a driver of economic interdependence and shared objectives of prosperity by investigating the possibilities for energy trade and cross-border grid

⁵⁷ Stockholm International Water Institute (SIWI), *Water Diplomacy: Facilitating Dialogues*, July 2019, <https://siwi.org/wp-content/uploads/2019/07/hlpf-policy-brief-3-july-web.pdf>.

⁵⁸ “Track II as a Method to Break Barriers: Pakistan-India Relations Since 1980,” *Business Review*, Institute of Business Administration (IBA), January 7, 2014, <https://ir.iba.edu.pk/cgi/viewcontent.cgi?article=1268&context=businessreview>; and *South Asia Watch on Trade, Economics and Environment (SAWTEE)*, “Track II Diplomacy in South Asia,” n.d., <https://www.sawtee.org/publications/Briefing-Paper-18.pdf>.

⁵⁹ “UN Watercourses Convention Is Good for South Asia,” *Dialogue Earth*, August 18, 2014, <https://dialogue.earth/en/water/un-watercourses-south-asia/>

⁶⁰ “Indus Water Treaty and Water Scarcity in India: Implications for Pakistan,” n.d., *Research Gate*, https://www.researchgate.net/publication/372503516_Indus_Water_Treaty_and_Water_Scarcity_in_India_Implications_for_Pakistan

connectivity.⁶¹ By foregrounding tangible reciprocal advantages, this ‘hydro-diplomacy’ can operate as a springboard for more wide-ranging political and economic collaboration, promoting a more stable and well-integrated South Asia.⁶² Turning hydro-political fault-lines into opportunities requires a systematic, comprehensive strategy. This strategy includes institutional strengthening, data transparency, collaborative knowledge generation, multi-stakeholder engagement, adherence to international legal principles, and purposefully connecting water to broader regional integration.

Conclusion

The Yarlung Tsangpo, Brahmaputra and Indus River basins illustrate the intricate and divergent dynamics of global hydro-politics, highlighting both the possibilities for collaboration and the ongoing threat of conflict. The IWT has effectively governed bilateral water relations between India and Pakistan for decades. In stark contrast, the Yarlung Tsangpo/Brahmaputra basin represents a growing hydro-political fault-line. Absence of a comprehensive water-sharing agreement and significant downstream vulnerabilities in Bangladesh and India have led to escalating tensions and a lack of transparency. Both basins are critical for agriculture and ecology, yet they are also potential flashpoints where water security and national sovereignty are at risk.

The growing effects of climate change are adding to these geopolitical complications. Melting glaciers and shifting monsoon patterns pose a threat to both increasing extreme weather events and causing long-term water scarcity. Because the IWT was not created to withstand such extraordinary strains, these climate-induced changes in hydrology exacerbate already-

⁶¹ “Hydropower in South Asia: Challenges, Resilience, and Sustainable Development in the Face of Climate Change and Socio-Political,” *Scirp.org*, May 28, 2025, https://www.scirp.org/pdf/ajcc_2361571.pdf

⁶² “Collective Deliberation or Just the State (In) action: How Do We Change the Hydrodiplomacy Landscape in South Asia?”, *WUR eDepot*, April 28, 2023, <https://edepot.wur.nl/587651>.

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existing tensions and increase regional instability. A fundamental change from unilateral stances to cooperative and basin-wide management is needed to address these issues.

Some policy recommendations are. First, it is critical for the Indus to restore the IWT and set up procedures for its recurring evaluation and adjustment to the realities of climate. To help the Yarlung Tsangpo reach a comprehensive water-sharing agreement, a permanent joint commission ought to be set up.

Secondly, trust must be established by encouraging transparency through the sharing of real-time data on dam operations and climate projections. Moreover, a common understanding of basin-specific vulnerabilities depends on cooperative scientific research and capacity-building initiatives. Informal networks can be developed and water issues depoliticised through multi-stakeholder engagements and Track-II diplomacy.

Lastly, equitable water use can be guided by third-party mediation and a normative framework based on the UN Watercourses Convention of 1997. It is an effective hydro-diplomacy that can serve as a launching pad for more extensive political and economic collaboration, promoting stability and regional integration. ■

