

Beyond Non-Binding Agreements: Legal Vacuums in Transboundary Water Governance between China and India

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Abstract: *This article examines the persistent absence of binding legal frameworks governing transboundary rivers between China and India, arguing that the current reliance on non-binding arrangements has created a significant legal and institutional vacuum. Despite sharing critical river systems originating from the Tibetan Plateau, including the Brahmaputra, Sutlej, and other Indus tributaries, both states have refrained from developing enforceable treaties or comprehensive basin-wide governance mechanisms. Instead, their engagement is limited to memoranda of understanding (MoUs), seasonal hydrological data-sharing agreements, and diplomatic exchanges lacking legal accountability. The article examines this governance gap within broader structural factors, including geopolitical asymmetry, competing doctrines of territorial sovereignty, and China's strategic preference for flexibility in managing upstream resources. It contends that while such informal arrangements have contributed to short-term stability, they inadequately address long-term challenges such as cumulative ecological degradation, disaster risk management, and information asymmetry. The absence of dispute resolution mechanisms further exacerbates downstream vulnerabilities, particularly for India. By critically analyzing the legal, political, and environmental dimensions of this issue, the article highlights how the current framework effectively normalizes unilateralism in transboundary water management. It concludes by exploring potential pathways toward more institutionalized cooperation, including confidence-building measures, incremental legalization, and the possible role of international norms in fostering equitable and sustainable governance of shared water resources.*

Keywords: Transboundary rivers; hydro-hegemony; China–India relations; Brahmaputra; international water law; climate change; basin governance

1. Introduction

1) Water, Power, and Legal Absence

Transboundary rivers sit at the complex intersection of physical geography, sovereign authority, and environmental governance. Unlike territorially confined resources, river systems flow across political borders while sustaining interconnected ecological networks, agricultural economies, urban settlements, and energy infrastructures. This inherent fluidity generates structural interdependence among riparian states, requiring governance arrangements that reconcile sovereign control with collective ecological responsibility. Yet despite significant normative advances in international environmental law, institutional frameworks governing shared rivers remain uneven, fragmented, and frequently non-binding.^[1]

This governance gap is particularly visible in Asia, home to some of the world's largest and most strategically significant river basins. Major systems such as the Ganges, Brahmaputra, Indus, Mekong, and Salween originate largely in the Tibetan Plateau and Himalayan cryosphere, forming the ecological foundation of South and Southeast Asia. These basins collectively support hundreds of millions of people, yet their governance structures have not evolved proportionately to their environmental and geopolitical importance. Cooperation remains partial, episodic, and highly sensitive to broader political tensions.

Within this regional landscape, the India-China water relationship is especially under-institutionalized. Despite sharing key transboundary rivers, there is no comprehensive, legally binding treaty governing water allocation, environmental protection, or basin-wide management. This absence is notable given the deep hydrological interdependence between the two states and the growing

exposure of the region to climate-induced hydrological volatility. In contrast to several other contested basins globally, where adversarial riparian relations have still produced formal governance regimes, the Sino-Indian case remains largely governed by an institutional vacuum.

In place of treaty-based governance, cooperation is limited to non-binding arrangements such as MoUs, seasonal hydrological data-sharing protocols, and periodic diplomatic consultations.^[2] These mechanisms are framed primarily as technical or humanitarian instruments rather than legal commitments. Their primary function is to support monsoon flood forecasting and maintain minimal channels of communication on river-related issues. While they have contributed to short-term stability and reduced immediate crisis risks, their scope and legal force remain limited.

From an international law perspective, these arrangements fall within the category of soft law, normatively influential but legally non-binding. Compliance depends on political goodwill rather than enforceable obligations or adjudicatory mechanisms. Data sharing is discretionary, continuity is contingent on bilateral relations, and institutional durability remains vulnerable to geopolitical tensions. During periods of diplomatic strain, even technical cooperation may be reduced or suspended without legal consequence.

These limitations become more pronounced when viewed against the scale of contemporary hydrological challenges. Transboundary water governance now extends beyond seasonal flow management to include cumulative ecological impacts from hydropower expansion, sediment disruption, glacial retreat, shifting monsoon dynamics, and climate-driven extreme events. In the Brahmaputra basin, upstream infrastructural developments and hydrological modifications can significantly influence downstream flood regimes,

agricultural productivity, and ecosystem stability. These processes require continuous, transparent, and jointly verified data systems, which remain absent.

The result is a structural mismatch between ecological interdependence and legal fragmentation. Long-term systemic risks are managed through short-term political arrangements rather than institutionalized governance, creating persistent uncertainty in one of the world's most climate-sensitive river basins.

This article advances three core arguments. First, the absence of binding legal frameworks is structurally embedded in broader patterns of geopolitical mistrust, sovereignty concerns, and strategic competition. Second, this institutional vacuum reinforces hydro-hegemonic dynamics by amplifying upstream advantages in geography, infrastructure, and information control.^[3] Third, while soft-law arrangements may reduce short-term tensions, they are insufficient for addressing long-term ecological risks and instead produce institutional ambiguity that increases systemic vulnerability. The central challenge is therefore not merely hydrological but fundamentally institutional.

2) International Water Law: Normative Foundations without Enforcement

Modern international water law has developed gradually through a combination of treaty practice, customary international law, judicial decisions, and scholarly interpretation. Unlike domestic legal systems, which rely on centralized authority for enforcement, international water governance operates in a decentralized environment shaped by sovereign equality. This structural condition limits the possibility of compulsory compliance. As a result, international water law functions less as a coercive legal regime and more as a normative framework that guides state behaviour without guaranteeing enforcement.

At its core, contemporary international water law is built upon four widely recognized principles. The first is equitable and reasonable utilization, which requires that shared water resources be used in a fair and balanced manner, taking into account relevant factors such as population dependence, economic needs, hydrological contribution, and existing uses. The second is the obligation not to cause significant harm, which aims to prevent upstream activities from producing substantial adverse effects on downstream states. The third is the principle of prior notification of planned measures, requiring states to inform co-riparians before undertaking projects that may affect shared watercourses. The fourth is the duty to cooperate and exchange information, which underpins transparency, dialogue, and joint management of transboundary systems.^[4]

Together, these principles mark a normative shift away from absolute territorial sovereignty toward a more relational understanding of shared water governance. However, their practical application remains uneven. The principles are intentionally flexible, allowing states interpretive discretion. While this flexibility enhances their political acceptability, it also reduces precision and weakens enforceability.

The most comprehensive global codification of these norms is the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses (1997).^[5] The Convention consolidates customary principles and establishes procedural obligations relating to notification, consultation, and dispute settlement. It affirms both equitable utilization and the no-harm rule as foundational norms. However, its effectiveness is constrained by limited ratification and uneven implementation, particularly among major upstream and downstream powers. This restricts its role as a truly universal legal framework.

Earlier and complementary instruments have also shaped the evolution of international water law. The Helsinki Rules (1966), developed by the International Law Association, provided one of the earliest systematic articulations of equitable utilization as the basis for water allocation. Although non-binding, they significantly influenced subsequent treaty practice. The Berlin Rules (2004) expanded the normative scope further by explicitly integrating environmental protection, ecosystem integrity, and sustainability into water governance principles. Despite their conceptual importance, both remain soft-law instruments without binding force.

International jurisprudence has contributed additional interpretive guidance. The landmark *Gabcikovo–Nagymaros Project* case (Hungary v. Slovakia, ICJ, 1997) emphasized sustainable development, environmental protection, and the need for cooperative management in shared river systems.^[6] However, the impact of such rulings is structurally constrained. International courts operate on consent-based jurisdiction, meaning states must voluntarily accept adjudication and comply with outcomes. In politically sensitive or strategically significant basins, states often avoid judicial settlement altogether.

This reliance on consent reveals a central limitation of international water law: its dependence on voluntary compliance. Even when legal principles are clearly articulated, enforcement depends on political willingness rather than institutional compulsion. In many transboundary basins marked by asymmetry or geopolitical rivalry, states prefer diplomatic or technical arrangements over legally binding adjudication, preserving flexibility and sovereignty.

As a result, international water law operates in a space where normative clarity coexists with institutional weakness. Scholars such as Stephen McCaffrey, Salman M. A. Salman, and Patricia Wouters emphasize that the system should be understood not as a rigid enforcement mechanism but as a guiding framework shaped by principles, expectations, and reputational pressures.^[7]

In practice, this means that principles such as equitable utilization, no significant harm, prior notification, and cooperation are often interpreted differently across states, producing competing legal narratives rather than uniform application. Implementation of procedural obligations like data sharing or prior consultation frequently depends on political relations rather than consistent legal duty.

In sum, international water law provides a sophisticated normative architecture but remains structurally limited by

state sovereignty and the absence of centralized enforcement. It establishes shared principles for cooperation and sustainability, yet its effectiveness ultimately depends on political commitment and institutional design at the basin level. This tension between normative ambition and enforcement limitation is central to understanding contemporary transboundary water governance, particularly in complex and asymmetric basins such as those shared by China and India.

3) Hydro-Hegemony and Structural Asymmetry

Hydro-hegemony theory offers a critical framework for understanding power relations in transboundary river basins where geography is uneven and institutional governance is weak or absent. Unlike conventional conflict-based approaches that focus on overt disputes or militarized competition, hydro-hegemony explains how control over shared water resources can be exercised, maintained, and normalized through a combination of geographic advantage, infrastructural capacity, discursive framing, and institutional asymmetry. Power in river basins is therefore not only material but also procedural and informational.^[8]

A central premise of the theory is that geography constitutes structural power. Upstream states hold an inherent hydrological advantage because they control headwaters and can influence the timing, volume, and quality of downstream flows. This position becomes even more significant when upstream regions are politically insulated or geographically remote. In the Sino-Indian context, China's control over the Tibetan Plateau represents such an advantage. The plateau functions as the source of several major Asian river systems, enabling extensive hydrological intervention with limited external oversight.

Over the past two decades, China has expanded hydropower and water infrastructure across Tibetan river systems through cascade dams, diversion projects, and storage facilities. While these developments are primarily justified in terms of domestic energy security and regional development, they have important transboundary consequences. Even when individual projects are categorized as "run-of-the-river," their cumulative effect can alter seasonal flow variability, sediment transport, and ecological continuity. In large river systems, such incremental changes may not produce immediate disruptions but can gradually reshape hydrological behavior over time.

This structural asymmetry is intensified by the absence of binding legal frameworks governing shared rivers between China and India. In well-developed transboundary water regimes, upstream infrastructure projects are typically subject to procedural requirements such as prior notification, joint environmental impact assessment (EIA), and consultation with downstream stakeholders. These mechanisms do not eliminate sovereignty but introduce transparency and negotiated coordination. In the Sino-Indian case, however, such obligations exist only in limited, non-binding forms, leaving upstream decision-making largely autonomous.

India's downstream position reinforces this imbalance. Its dependence on rivers originating in the Tibetan Plateau creates structural reliance on externally generated

hydrological data. This dependence becomes particularly critical during the monsoon season, when variability in river flows significantly affects flood risk management in states such as Assam and Arunachal Pradesh. Although China shares seasonal hydrological data through MoUs, these arrangements are intermittent, time-bound, and politically contingent rather than legally enforceable.^[9]

This creates a condition of informational dependence without institutional guarantee. Downstream states require continuous and reliable data for irrigation planning, hydropower operations, and disaster preparedness. Yet in the absence of binding commitments, data sharing may be delayed, limited, or suspended during periods of diplomatic tension, increasing strategic uncertainty in hydrological governance.

The interaction between upstream control and downstream dependence produces what scholars describe as "managed vulnerability."^[10] In this condition, neither outright coercion nor complete cooperation exists. Instead, vulnerability is stabilized through institutional gaps that allow uncertainty to persist without escalating into open conflict. This equilibrium reduces immediate instability while embedding long-term asymmetry into the system.

Importantly, hydro-hegemony does not assume deliberate coercion. China's actions are primarily driven by domestic imperatives such as energy generation and water management. However, structural outcomes extend beyond intent. In the absence of shared rules, upstream flexibility translates into downstream exposure, regardless of political motivation.

Ultimately, hydro-hegemony in the Sino-Indian context is shaped not only by geography but by the interaction of geography with legal absence and institutional fragmentation. Power in transboundary river systems is therefore exercised not only through control of water, but also through control over information, institutions, and governance frameworks that regulate that water.

4) Comparative Basin Governance: Lessons from Other Regions

Comparative analysis of transboundary river governance reveals a broad spectrum of institutional arrangements, ranging from highly formalized treaty-based regimes to flexible, technically driven cooperation frameworks. These global experiences are particularly useful for assessing the Sino-Indian water relationship, as they demonstrate that while geography imposes constraints, governance outcomes are largely shaped by institutional design, political incentives, and hydrological power asymmetries. Importantly, effective cooperation does not always depend on harmonious political relations, but it does require structured, predictable, and rule-based engagement.

One of the most frequently cited examples is the Indus Waters Treaty (1960) between India and Pakistan. Despite enduring hostility and multiple wars, the treaty has remained operational for decades.^[11] Its resilience lies in its clear allocation of rivers, well-defined rights and obligations, and the establishment of the Permanent Indus Commission as a standing institutional mechanism for communication and

dispute resolution. This design shows that legally binding frameworks can stabilize water relations even in conflict-prone settings by depoliticizing technical issues. However, its rigidity limits adaptability to emerging challenges such as climate variability and groundwater stress.

In contrast, the Mekong River Commission (MRC) represents a more flexible, cooperation-oriented model involving Cambodia, Laos, Thailand, and Vietnam. It prioritizes technical coordination, data sharing, and joint basin planning rather than strict legal enforcement.^[12] While it has developed robust hydrological monitoring and impact assessment procedures, its effectiveness is constrained by the absence of China, an upstream actor outside its regulatory framework. This exclusion highlights a key limitation: institutional strength diminishes significantly when critical upstream stakeholders are not part of the governance structure.

The Nile Basin Initiative (NBI) illustrates challenges arising from deep asymmetries and competing sovereignty claims.^[13] It functions as a transitional platform to promote cooperation and technical collaboration among riparian states. While it has advanced dialogue and capacity building, it has struggled to achieve consensus on binding water allocation rules. Persistent disagreements among Egypt, Ethiopia, and Sudan underscore how historical entitlements and development ambitions can obstruct the evolution of enforceable basin-wide governance.

The Jordan River system offers a different model where limited but pragmatic cooperation persists despite unresolved political conflict. Water agreements are often embedded within broader peace processes or bilateral arrangements.^[14] Cooperation on desalination, allocation, and wastewater reuse demonstrates that even fragmented governance can yield functional outcomes when water is treated as a shared necessity rather than a zero-sum resource.

Finally, the Rhine River regime, coordinated through the International Commission for the Protection of the Rhine (ICPR), represents one of the most successful cases of environmental recovery and institutional integration. Through binding commitments, coordinated pollution control, and ecosystem-based management, the Rhine has undergone significant ecological restoration.^[15] Its success is grounded in strong institutions, continuous monitoring, enforceable standards, and sustained political commitment.

Collectively, these cases highlight a key insight: the effectiveness of transboundary water governance depends less on formal treaties alone and more on institutional depth, including permanent commissions, scientific cooperation, monitoring systems, and dispute resolution mechanisms. Shallow governance structures, characterized by ad hoc agreements and intermittent data sharing, tend to generate uncertainty and weaken trust.

Applied to the Sino-Indian context, these lessons suggest that the core challenge is not simply the absence of a treaty, but the lack of institutional density across legal, technical, and scientific dimensions. Ultimately, global experience demonstrates that transboundary water governance is best understood as a continuum, where durable cooperation

emerges from sustained institutional development rather than political alignment alone.

5) Hydropower Expansion and Environmental Risk

China's rapid hydropower expansion on the Tibetan Plateau has become a major driver of transformation in Asia's upper river systems. In particular, cascade dam development along tributaries feeding the Brahmaputra basin has raised significant downstream concerns regarding altered flow regimes, sediment retention, and long-term ecological change.^[16] While these projects are framed domestically as part of China's renewable energy transition and development strategy, their transboundary implications extend far beyond national energy planning.

A defining feature of this hydropower strategy is the cascade dam system, where multiple dams are constructed sequentially along river stretches. Although efficient for energy production, cascade systems intensify cumulative hydrological impacts. Together, they can alter seasonal discharge patterns, reduce sediment transport, and modify river temperature and oxygen levels. In the Brahmaputra basin, where sediment-rich flows sustain agriculture and delta stability, such changes have long-term geomorphological consequences.

The ecological sensitivity of the Tibetan Plateau adds further complexity. Glacial melt, permafrost dynamics, and monsoonal interactions already produce highly variable river systems. Large-scale infrastructure development in such an environment introduces additional uncertainty. Even "run-of-the-river" projects, when multiplied across tributaries, can collectively regulate downstream flows, especially during dry seasons when natural discharge is lower.

Downstream concerns focus heavily on flow timing and seasonal variability, not just water quantity. Agricultural cycles, fisheries, and floodplain ecosystems in regions such as Assam depend on predictable monsoon flooding. Any upstream alteration in timing or intensity can disrupt these systems, producing disproportionate socio-economic impacts.

Another major risk is sediment disruption. Himalayan rivers carry among the highest sediment loads globally, crucial for maintaining fertile floodplains and stabilizing deltas. Dams trap sediment, reducing downstream replenishment and potentially accelerating riverbank erosion, delta subsidence, and coastal vulnerability over time.

Although hydropower is often classified as clean energy, its ecological impacts are complex, cumulative, and difficult to measure without basin-wide monitoring. In the absence of shared datasets and coordinated modeling, downstream states must rely on partial information to assess long-term risks.

International best practices reflected in UNECE guidelines and the World Commission on Dams emphasize prior notification, cumulative environmental impact assessment, stakeholder consultation, and continuous monitoring.^[17] These mechanisms aim to reduce uncertainty and improve cooperative management in shared basins.

However, in the Sino-Indian context, these norms remain largely non-binding. Cooperation is limited to seasonal data-sharing agreements under Memoranda of Understanding, without requirements for prior notification or joint environmental assessment. This creates a structural gap between infrastructural development and governance capacity.

As a result, hydropower expansion in the Tibetan Plateau illustrates a broader challenge in transboundary water governance: technologically advanced infrastructure development coexisting with weak institutional frameworks for environmental coordination and risk management.

6) Data Asymmetry, Disaster Risk, and Climate Change

Hydrological data asymmetry is one of the most critical yet under-recognized challenges in transboundary water governance. It refers to unequal control over information on river flows, precipitation, reservoir operations, and cryospheric conditions. In transboundary basins, this asymmetry is not merely technical; it reflects deeper structural power relations shaped by geography and institutional design.

In upstream–downstream systems, upstream states typically control key monitoring stations near headwaters and infrastructure sites. This enables them to determine what data is collected, when it is shared, and in what form. In the absence of binding legal obligations, this control can result in delayed, selective, or incomplete data dissemination.^[18] Downstream states are therefore often required to make decisions on flood management, irrigation planning, and disaster preparedness using partial or time-lagged information.

In the Sino-Indian context, this asymmetry is especially significant given downstream dependence on hydrological systems originating in the Tibetan Plateau. Rivers such as the Brahmaputra are highly sensitive to monsoon variability, glacial melt, and upstream regulation. Even small discrepancies in flow data can significantly affect forecasting accuracy in flood-prone regions like Assam and Arunachal Pradesh, translating directly into socio-economic vulnerability.

The implications extend beyond routine water management into disaster risk governance. Hydrological data underpins early warning systems, reservoir operations, and emergency response planning. When information is delayed or incomplete, downstream states face reduced lead times for responding to extreme events, increasing risks of flood damage, infrastructure loss, and population displacement.

Climate change further intensifies these vulnerabilities. According to the IPCC AR6, the Himalayan cryosphere is undergoing rapid warming, leading to glacier retreat, permafrost degradation, and altered snow dynamics.^[19] These changes increase the likelihood of Glacial Lake Outburst Floods (GLOFs), which are sudden and highly destructive hydrological events.

International organizations such as ICIMOD and the World Meteorological Organization (WMO) emphasize the need for

basin-wide, real-time early warning systems based on shared data, standardized indicators, and interoperable models. However, implementation remains limited in politically sensitive basins.

In the absence of binding frameworks, hydrological data sharing remains seasonal and fragmented. Downstream states must rely on a combination of limited upstream data, domestic monitoring, and satellite-based observations, which cannot fully replace real-time ground measurements.

Ultimately, hydrological data asymmetry undermines disaster preparedness, weakens trust, and increases systemic risk. As climate change accelerates hydrological uncertainty, the need for institutionalized, transparent, and jointly verified data-sharing systems becomes essential for basin-wide resilience and stability.

7) Environmental and Human Security Dimensions

Environmental and human security in transboundary river basins are closely interconnected, especially where ecological systems cross political borders while governance remains fragmented. Unlike traditional national security paradigms focused on military threats, environmental security broadens the scope to include ecological stability, resource sustainability, and the resilience of socio-economic systems dependent on natural resources.^[20] In transboundary basins, environmental degradation rarely remains contained within one state; it propagates downstream through hydrological linkages, producing cumulative impacts on livelihoods and ecosystems.

In the Brahmaputra and wider Himalayan river systems, environmental change is primarily transmitted through alterations in sediment flow, flood regimes, and seasonal variability. Sediment transport is essential for maintaining fertile agricultural plains, stabilizing riverbanks, and sustaining deltaic ecosystems. Upstream interventions such as dam construction, reservoir storage, and river regulation disrupt this natural sediment flow, leading over time to soil nutrient depletion, increased erosion, and weakening of downstream delta systems. These changes are often gradual but structurally transformative.

Flood regimes are equally significant. In the Brahmaputra basin, seasonal flooding supports agriculture, fisheries, and wetland regeneration. However, upstream hydropower operations and climate variability can alter the timing and intensity of these floods. Sudden water releases may intensify flood peaks, while excessive retention can reduce natural flood cycles, both of which undermine traditional flood-dependent livelihoods.

Seasonal flow variability further affects rural communities dependent on predictable monsoon patterns for agriculture, drinking water, and livestock. Disruptions in timing or volume increase vulnerability to both drought and flood conditions, disproportionately affecting subsistence-based populations in downstream regions such as Assam and Bangladesh.

The concept of water security captures these interlinked environmental and human dimensions. As defined by

institutions such as the United Nations and the World Bank, water security refers to ensuring sustainable access to adequate water while managing water-related risks such as floods, droughts, and pollution.^[21] This framework explicitly links ecological stability with economic development and social resilience.

In transboundary contexts, environmental risks are often externalized due to the absence of enforceable governance mechanisms. Upstream states may benefit from hydropower and water regulation, while downstream regions bear disproportionate ecological and disaster-related costs. This structural imbalance deepens socio-economic inequality and limits adaptive capacity.

Environmental degradation also directly translates into human security challenges, including reduced agricultural productivity, food insecurity, displacement, and infrastructure damage. These impacts are amplified by climate change, which increases hydrological variability and reduces predictability.

Overall, environmental and human security in transboundary basins must be understood as a unified challenge, where ecological disruption and socio-economic vulnerability reinforce each other across borders.

8) Climate Change and Systemic Uncertainty

Climate change is fundamentally reshaping global hydrological systems, shifting them from historically stable and predictable regimes to increasingly volatile and non-linear systems characterized by deep uncertainty. Traditional water governance has long relied on the principle of stationarity, the assumption that past hydrological patterns such as rainfall, river discharge, and seasonal variability can reliably predict future conditions. This assumption is now widely regarded as scientifically outdated, particularly in cryosphere-dependent and monsoon-influenced basins.^[22]

In the Himalayan–Tibetan region, these transformations are especially pronounced. Rising temperatures, accelerated glacier retreat, shifting precipitation regimes, and increased frequency of extreme weather events are altering the hydrological behavior of rivers such as the Brahmaputra. Flow regimes are no longer governed solely by monsoonal cycles but increasingly reflect complex interactions between glacial melt, rainfall variability, snow dynamics, and upstream regulation. This produces systemic uncertainty, where both short-term fluctuations and long-term trends become difficult to model or predict reliably.

A key consequence is the declining usefulness of historical flow data for infrastructure planning, irrigation systems, hydropower generation, and flood control. As climatic baselines shift, states must increasingly govern water systems under conditions where past averages no longer represent future realities. This challenges conventional engineering-oriented approaches that assume stability and predictability.

In transboundary basins, climate change interacts with upstream infrastructure to further complicate hydrological interpretation and political assessment. Distinguishing between climate-induced variability and human-induced

regulation becomes increasingly difficult, deepening epistemic uncertainty in water governance.

International organizations, including the United Nations and the World Bank, therefore advocate adaptive governance frameworks that prioritize flexibility, real-time monitoring, and scenario-based planning rather than fixed long-term projections.^[23] Adaptive governance accepts uncertainty as intrinsic, emphasizing resilience over precise prediction.

However, in basins such as the Brahmaputra, effective adaptation is constrained by geopolitical fragmentation and asymmetric access to hydrological data. Without cooperative transboundary institutions, climate responses remain fragmented and reactive rather than coordinated and preventive. Consequently, climate change amplifies existing governance deficits, increasing systemic vulnerability across the basin and reinforcing the need for integrated climate-water governance frameworks.

9) Legal Vacuum and Strategic Implications

The Sino-Indian transboundary water relationship illustrates how a legal vacuum can itself function as a form of structural power in international river basins. While classical international relations theory associates power with material capabilities, military strength, economic capacity, or geographic advantage, hydropolitics reveals an additional dimension: power exercised through the absence of binding rules, weak institutionalization, and non-enforceable obligations. In this sense, legal vacuum is not neutral; it actively structures outcomes by defining what states are not required to do and what constraints do not exist.^[24]

In the absence of a comprehensive treaty framework governing shared rivers, upstream infrastructure development proceeds largely according to domestic priorities. Hydropower projects, cascade dams, and diversion schemes can be implemented without mandatory prior notification, joint environmental assessment, or downstream consent. Consequently, downstream states such as India are placed in a reactive position, responding to hydrological changes only after projects are already underway or completed, rather than participating in decision-making processes.

This generates persistent strategic uncertainty, extending beyond water quantity to include flow timing, sediment transport, seasonal variability, and extreme hydrological risks. In river systems like the Brahmaputra, where monsoon dynamics and glacial melt already produce high variability, even small upstream interventions can have disproportionate downstream consequences for agriculture, hydropower operations, and flood management.

Importantly, this does not necessarily imply intentional coercion. Instead, it reflects a structural condition in which institutional absence shapes strategic outcomes regardless of intent. Upstream states may pursue legitimate domestic development goals, while downstream impacts accumulate as indirect consequences. This disconnect between intention and effect is central to contemporary transboundary water politics.

The Sino-Indian case demonstrates that hydro-hegemony is not solely rooted in geography but is significantly amplified

by legal architecture or its absence. Upstream geographic advantage becomes strategically more powerful when not moderated by binding procedural obligations such as transparency, consultation, and dispute resolution mechanisms. In contrast, robust legal regimes can partially balance asymmetries by constraining unilateral action and improving predictability.

Without such frameworks, upstream actors retain flexibility over timing, scale, and sequencing of water infrastructure, while downstream states rely on incomplete information and reactive adaptation. This produces a structural imbalance in which one side effectively influences hydrological conditions while the other manages uncertainty under informational and procedural constraints.

In practice, existing cooperation mechanisms, primarily MoU and ad hoc data exchanges, lack enforceability and remain vulnerable to political fluctuations. This reinforces volatility in governance and weakens long-term trust.

Ultimately, the Sino-Indian case underscores a key insight in hydro-politics: legal vacuum itself is a form of power, shaping risk distribution, institutional stability, and strategic outcomes. The design or absence of legal frameworks is therefore as consequential as physical control over water resources in determining basin-level power relations.

2. Conclusion: Toward Incremental Basin Governance

The analysis demonstrates that transboundary water governance between China and India is constrained less by physical water scarcity than by institutional fragmentation and the absence of binding legal frameworks. The Brahmaputra and broader Himalayan river systems remain hydrologically significant, but insecurity arises primarily from how these waters are governed across sovereign boundaries without shared, enforceable rules. As a result, water insecurity is fundamentally a governance problem rather than a purely natural or environmental one.

In the absence of a comprehensive legal architecture, governance is marked by asymmetry, uncertainty, and reactive decision-making. Upstream actors retain discretion over hydrological infrastructure and data control, while downstream actors must respond to incomplete information and unpredictable flow regimes. This structural imbalance is not episodic but embedded in the institutional design gap governing the basin.

Importantly, this does not imply inevitable conflict or deliberate exploitation. Rather, it highlights how institutional voids shape strategic outcomes even without hostile intent. Existing cooperation mechanisms, largely limited to non-binding agreements, remain fragile, episodic, and politically contingent, lacking the depth required for long-term basin-wide resilience.

Comparative global experience suggests that such governance deficits are not permanent. River basins worldwide have demonstrated that durable cooperation often evolves through incremental legalization and institutional

layering, where technical cooperation precedes formal treaty-making. This highlights the relevance of an incremental approach for the Sino-Indian context.

Key priorities include: establishing permanent hydrological data-sharing systems, developing joint environmental impact assessments, strengthening basin-wide climate adaptation mechanisms, creating politically insulated scientific commissions, and gradually expanding toward multilateral governance that includes Bangladesh.

Ultimately, sustainable basin governance will depend not on immediate treaty formation but on the gradual construction of trust, transparency, and institutional depth. Without such evolution, uncertainty and asymmetry will persist; with it, even incremental reforms can significantly enhance resilience and stability.

References

- [1] McCaffrey, S. C. (2019). *The law of international watercourses* (3rd ed.). Oxford University Press.
- [2] Government of India. (2002–2023). *Annual reports on transboundary rivers and hydrological cooperation*. Ministry of Jal Shakti, Government of India.
- [3] Mirumachi, N. (2015). *Transboundary water politics in the developing world*. Routledge.
- [4] International Water Law Association. (1966). *Helsinki rules on the uses of the waters of international rivers*. International Law Association.
- [5] International Watercourses Convention. (1997). *United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses*. United Nations.
- [6] International Court of Justice (ICJ). (1997). *Case concerning the Gabčíkovo–Nagymaros Project (Hungary/Slovakia)*, judgment of 25 September 1997. ICJ Reports.
- [7] Salman, S. M. A. (2010). *The United Nations Watercourses Convention ten years later*. World Bank Law Review, 1(2), 1–25.
- [8] Zeitoun, M., & Warner, J. (2006). Hydro-hegemony: A framework for analysis of transboundary water conflicts. *Water Policy*, 8(5), 435–460.
- [9] Ho, S. (2014). *Tibetan water and Chinese development: The political ecology of hydropower*. Routledge.
- [10] Cascao, A. E. (2009). Changing power relations in the Nile River Basin: Unilateralism vs. cooperation? *Water Alternatives*, 2(2), 245–268.
- [11] World Bank. (1960). *The Indus Waters Treaty: Background and implementation framework*. World Bank.
- [12] Mekong River Commission (MRC). (1995–2020). *Annual reports and basin development strategy documents*. MRC Secretariat.
- [13] Nile Basin Initiative (NBI). (2012–2020). *State of the Nile Basin reports*. Nile Basin Initiative Secretariat.
- [14] EcoPeace Middle East. (2021). *Shared waters, shared future: Water security in the Jordan River Basin*. EcoPeace Middle East.
- [15] International Commission for the Protection of the Rhine (ICPR). (2020). *Rhine action programme and river basin management report*. ICPR Secretariat.

- [16] Rosen, D. H., & Szamosszegi, A. (2011). *China's hydropower expansion and strategic implications*. U.S.-China Economic and Security Review Commission.
- [17] World Commission on Dams. (2000). *Dams and development: A new framework for decision-making*. Earthscan.
- [18] World Meteorological Organization (WMO). (2021). *State of the global water resources report*. WMO.
- [19] IPCC. (2023). Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.
- [20] International Centre for Integrated Mountain Development (ICIMOD). (2023). *Himalayan climate and water resources report*. ICIMOD.
- [21] World Bank. (2016). *High and dry: Climate change, water, and the economy*. World Bank Group.
- [22] IPCC (2023).
- [23] United Nations Educational, Scientific and Cultural Organization (UNESCO). (2020). *Water security and sustainable development report*. UNESCO Publishing.
- [24] Conca, K. (2006). *Governing water: Contentious transnational politics and global institution building*. MIT Press.

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