Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Hydro-political asymmetry and security in India–Bangladesh transboundary waters: Farakka and Teesta

Md. Riday Howlader

mriday18.pol@bu.ac.bd

University of Barisal

Md. Obaidullah

University of Southern Mississippi

Research Article

Keywords: Hydro-politics, Water Security, Power Asymmetry, Critical Geopolitics, South Asia

Posted Date: June 19th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-8698454/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Hydro-political asymmetry and security in India–Bangladesh transboundary waters: Farakka and Teesta

Md. Riday Howlader[1] *is affiliated with the Department of Political Science, University of Barishal, Bangladesh.*
Md. Obaidullah[2] *is affiliated with the Department of Political Science, The University of Southern Mississippi, United States.*

Abstract

Hydro-political relations in the Ganges–Brahmaputra Basin are commonly framed through narratives of cooperation and institutional stability. This paper challenges such framings by examining how hydro-political asymmetry functions as a spatially embedded, non-military security-producing mechanism. Drawing on a qualitative spatial–geopolitical approach, the study combines critical document analysis with a geopolitical reading of basin geography to examine how security is produced through routine governance rather than overt conflict. Focusing on the Farakka Barrage and the prolonged Teesta River governance deadlock, the findings demonstrate that hydro-political asymmetry is structurally stabilized through institutional design, infrastructural control, and normalized uncertainty rather than resolved by cooperative treaties. The paper introduces the concept of a cascading or 'chain' of hydro-political securitization and highlights how sub-national politics and material conditions reinforce downstream vulnerability. By conceptualizing the river basin as a geopolitical security space, the study advances hydro-politics and political geography by showing how spatial positioning and institutional silence operate as instruments of power beyond traditional military security frameworks, with broader implications for asymmetrical transboundary river basins globally.

Keywords

Hydro-politics; Water Security; Power Asymmetry; Critical Geopolitics; South Asia

1. Introduction

Transboundary rivers are frequently approached in policy and academic debates as arenas of cooperation, technical management, and shared benefit (Dinar et al., 2007; Obaidullah & Howlader, 2025; Wolf, Aaron T. and Joshua T. Newton, 2008). While such perspectives have

contributed to understanding institutional arrangements, they often obscure the ways in which water functions as a security issue embedded in spatial and geopolitical power relations(Zeitoun & Mirumachi, 2008). In contexts marked by pronounced upstream–downstream inequalities, water governance extends beyond resource allocation to become a mechanism through which security, influence, and control are exercised without recourse to overt military confrontation (Buzan et al., 1998).

The Ganges–Brahmaputra Basin constitutes one of the most geopolitically consequential river systems in South Asia, linking multiple states through complex hydrological and political interdependencies(Obaidullah & Howlader, 2025). The basin's geography characterized by upstream concentration of hydraulic infrastructure and downstream reliance on transboundary flows creates enduring asymmetries that shape regional power relations(Sultana, 2025; Zeitoun et al., 2013). Despite the absence of sustained armed conflict over water, hydro-political interactions within the basin continue to generate downstream insecurity, diplomatic vulnerability, and policy dependence(Sultana, 2025). This highlights the limitations of cooperative framings that fail to account for the security effects produced by spatial control over water.

Existing scholarship on hydro-politics has extensively examined cooperation, conflict, and institutional design in transboundary river basins (Dinar et al., 2007; Milman & Gerlak, 2020; Wolf, Aaron T. and Joshua T. Newton, 2008). However, two critical gaps remain. First, hydro-political asymmetry is often treated as a contextual background rather than as an active force that structures security relations(Barua et al., 2025). Second, the spatial dimensions of power how basin geography itself enables the exercise of security influence remain under-theorized (Ó Tuathail, 1996; Dalby, 2007). As a result, river basins are frequently conceptualized as passive settings rather than as geopolitical spaces through which security and power are constituted(Bréthaut et al., 2022).This paper addresses these gaps by advancing a spatially grounded analysis of hydro-political security in the Ganges–Brahmaputra Basin. It is guided by the following research question:

How does hydro-political asymmetry in the Ganges–Brahmaputra Basin function as a spatial mechanism of security and power?

Understanding these mechanisms is particularly urgent as climate variability, upstream infrastructural expansion, and geopolitical competition intensify existing asymmetries without triggering formal conflict(Lal & You, 2025). This study does not seek to explain water conflict or cooperation outcomes. Instead, it examines how security is produced and stabilized through spatially embedded governance arrangements(Shan, 2026). To answer this question, the paper integrates insights from hydro-political asymmetry, securitization theory, and critical geopolitics to examine how water governance practices, institutional arrangements, and basin geography collectively produce security outcomes(Buzan et al., 1998; Zeitoun et al., 2013). By treating the river basin as an active political space, the study moves beyond cooperation-centered narratives and reframes water as a non-military instrument of geopolitical power. While this study primarily focuses on the India-Bangladesh relationship, it acknowledges that the Ganges–Brahmaputra Basin is part of a broader, multi-layered hierarchy(Sultana, 2025). The role of China as the 'primary upstream' riparian on the Brahmaputra adds a layer of cascading asymmetry(Barua et al., 2025). This complicates the security-producing mechanism, as India simultaneously occupies the role of a dominant upstream actor toward Bangladesh and a vulnerable downstream actor toward China, creating a complex 'chain of securitization' across the basin(Barua et al., 2025; Sultana, 2025).

This paper makes three original contributions to the literature on transboundary water governance. First, it reconceptualizes hydro-political asymmetry not as a contextual background condition, but as an active, spatially embedded mechanism that produces security effects independent of overt coercion or conflict. Second, by integrating securitization theory with critical geopolitics, the study demonstrates how water is securitized through routine governance practices and infrastructural arrangements rather than through explicit political speech acts or emergency framings. Third, by treating the river basin itself as a geopolitical security space, the paper moves beyond cooperation–conflict binaries and reframes transboundary water governance as a domain where security is continuously produced and stabilized through spatial control and institutional design.

2. Literature Review: Reframing Hydro-politics Through Security and Space

Recent hydro-political scholarship has moved beyond deterministic conflict–cooperation binaries, yet transboundary rivers are still predominantly conceptualized as governance and management challenges rather than as security-producing spaces(De Stefano et al., 2017; Döring & Kim,

2025a). Institutional and legal analyses continue to dominate, often interpreting stability and the absence of overt conflict as indicators of successful water governance (Dinar et al., 2007; Swain, 2011). Such approaches, however, tend to overlook how unequal spatial control can generate persistent vulnerability even under formally cooperative arrangements(Donko & Doevenspeck, 2025).

An expanding body of research now recognizes power asymmetry as central to transboundary water relations, particularly in upstream–downstream configurations(Hussein et al., 2023). Studies on hydro-political power demonstrate how control over infrastructure, flow timing, and information enables upstream actors to shape outcomes without direct coercion (Hayat et al., 2022; Zeitoun et al., 2013; Zeitoun & Warner, 2006). While this literature marks a significant departure from cooperation-centered narratives, it often remains outcome-focused, emphasizing allocation or negotiation results rather than examining how asymmetry itself becomes embedded and normalized through everyday governance practices(Boampong & Mouthaan, 2025). As a result, power is frequently treated as episodic rather than as a continuous condition shaping long-term security relations(Hekkala et al., 2022).

Parallel to this, the growing literature on water security has broadened analytical attention to risk, vulnerability, and resilience. Yet water security is commonly framed in technocratic or human-security terms, focusing on scarcity, climate stress, or management failure (Scott et al., 2021). These perspectives often depoliticize insecurity by attributing it to external pressures rather than to institutional design and spatial ordering(Filgueiras et al., 2023). Consequently, the role of governance arrangements in actively producing insecurity especially in transboundary contexts remains underexplored(De Stefano et al., 2017; Ikram & Boudraa, 2025).

Securitization theory offers tools to address this limitation by conceptualizing security as a political process rather than an objective condition (Buzan et al., 1998). However, applications of securitization to water governance have largely emphasized explicit political discourse or crisis narratives. Less attention has been given to how security is enacted through routine administrative practices, treaty structures, and infrastructural control, resulting in limited understanding of non-military and non-discursive forms of securitization(Barquet & Sjölander, 2025).

Critical geopolitics provides a necessary spatial corrective by emphasizing infrastructure, materiality, and territorial practices as central to the production of power (Dalby, 2007; Tuathail & Toal, 1996). Yet hydro-political studies have rarely integrated this spatial perspective systematically, continuing to treat river basins as neutral physical systems rather than as politically produced spaces(Hayat et al., 2022). In South Asia, these dynamics are further intensified by colonial legacies, post-partition sovereignty anxieties, and federal political structures that fragment water governance authority(Chowdhory & Mohanty, 2023; Hayat et al., 2022). As a result, formal cooperation often coexists with deep structural insecurity, making the region particularly suited for examining non-military hydro-political power(Döring & Kim, 2025b).

This study addresses these gaps by reconceptualizing the Ganges–Brahmaputra Basin as a geopolitical security space(Sultana, 2025). By integrating hydro-political asymmetry, securitization theory, and critical geopolitics, it advances a spatially grounded understanding of how water governance produces enduring, non-military security effects even in the absence of overt conflict(Irengbam & Sneddon, 2025; Sultana, 2025). While domestic political dynamics including federal politics, sub-national actors, and internal bargaining processes, mediate transboundary water outcomes in South Asia, this study focuses on basin-scale structural power rather than domestic political negotiation(Obaidullah & Howlader, 2025). This allows the analysis to foreground how spatial positioning and governance arrangements produce security effects independent of short-term political bargaining(Atikcan et al., 2026). This concern has been raised in South Asian hydro-political scholarship, where formal cooperation often coexists with entrenched asymmetries(Mozumder et al., 2025; Sultana, 2025).

3. Historical Perspective of the Ganges–Brahmaputra Basin

Understanding contemporary hydro-political asymmetry in the Ganges–Brahmaputra Basin requires situating present-day governance arrangements within their historical evolution. Control over river flows, institutions, and decision-making authority did not emerge organically but was produced through successive political and administrative transformations, beginning in the colonial period and continuing through post-partition state formation(Baffoe & Roy, 2023; Das, 2024). These historical processes shaped the basin as a spatially unequal system in which power and security outcomes remain unevenly distributed (see Fig. 1).

Fig. 1 here



Fig. 1 Map of the Ganges–Brahmaputra River Basin across India and Bangladesh.

Historically, the rivers of the Ganges–Brahmaputra Basin have functioned as shared ecological systems, supporting agriculture, trade, and mobility across regions(Obaidullah & Howlader, 2025). Early river use emphasized seasonal adaptation rather than centralized control. However, with the expansion of modern state administration, rivers gradually became objects of regulation, measurement, and intervention(Milman & Gerlak, 2020). The introduction of large-scale irrigation, embankments, and flow-control mechanisms transformed rivers from flexible natural systems into strategic infrastructures, embedding control within political authority(Ramesh, 2021).This shift marked the beginning of spatial differentiation within the basin. Control over upstream segments increasingly translated into influence over downstream availability, laying the groundwork for asymmetrical hydro-political relations that persist today(Hayat et al., 2022).

Colonial governance played a decisive role in institutionalizing river control within the basin. British administrative priorities emphasized irrigation expansion, flood control, and revenue generation, leading to the construction of canals and hydraulic structures primarily in upstream territories(Weil, 2006). Rivers were reimagined as technical resources to be managed by centralized authorities rather than as shared socio-ecological systems(Bruns, 2023).Crucially,

colonial river management was organized along administrative boundaries rather than hydrological logic(Bruns, 2023). This fragmented the basin into unequal zones of control and dependence, privileging upstream regulation while marginalizing downstream concerns. The colonial legacy thus embedded spatial hierarchies of access and authority, which later became normalized within postcolonial governance frameworks(van Ryneveld & Islar, 2023).

The partition of South Asia fundamentally altered hydro-political relations in the Ganges–Brahmaputra Basin. Rivers that once flowed within a single political entity were transformed into transboundary systems, introducing sovereignty, national security, and strategic calculation into water governance(Hussein et al., 2023). Newly established borders converted upstream–downstream relations into interstate power relations, intensifying existing asymmetries inherited from the colonial period(Hussein et al., 2023).Post-partition water politics increasingly framed rivers as matters of national interest. Decisions regarding infrastructure development, water allocation, and data sharing became entangled with broader geopolitical considerations(Obaidullah & Howlader, 2025). Rather than dismantling colonial-era inequalities, partition reinscribed them within an interstate security framework, amplifying downstream vulnerability and institutionalizing dependence on upstream decision-making.

Over time, hydro-political asymmetry in the basin became institutionalized through formal agreements, bureaucratic practices, and governance norms(Sultana, 2025). While cooperative mechanisms were introduced, these arrangements often prioritized stability over equity, avoiding enforcement provisions that could challenge existing power differentials(Silvers, 2020). As a result, institutional frameworks functioned less as instruments of redistribution and more as mechanisms for managing asymmetry without resolving it(Leonard et al., 2013).

This process normalized unequal control over river flows and information, transforming hydro-political imbalance into a routine feature of regional governance(Hayat et al., 2022). The basin thus evolved into a geopolitical space where asymmetry is no longer contested but administratively stabilized, reinforcing water's role as a non-military instrument of security and power(Sultana, 2025). These historical processes did not merely shape water governance, but embedded security logics into spatial control over rivers, normalizing asymmetry as an administrative condition rather than a contested political issue(Ponce de León, 2025).

This historical trajectory demonstrates that contemporary hydro-political asymmetry in the Ganges–Brahmaputra Basin is not a policy failure or temporary condition, but the outcome of layered political decisions, spatial restructuring, and institutional consolidation. By tracing these processes, the section establishes how present security dynamics are historically produced rather than geographically inevitable.

4. Theoretical Framework

This study draws on three complementary theoretical pillars: hydro-political asymmetry, securitization theory, and critical geopolitics to conceptualize how transboundary river basins operate as spaces where geography, power, and security intersect (Bréthaut et al., 2022; Buzan et al., 1998; Tuathail & Toal, 1996; Zeitoun & Warner, 2006) . Together, these perspectives allow for an understanding of water not merely as a natural resource or object of cooperation, but as a spatially embedded instrument of geopolitical influence (Dalby, 2007; Döring & Kim, 2025a; Sneddon & Fox, 2012) .

4.1 Hydro-political Asymmetry

Hydro-political asymmetry refers to the unequal distribution of power between actors sharing transboundary water systems, arising primarily from upstream–downstream positioning, control over hydraulic infrastructure, and institutional authority (Azizi, 2025; Ponce de León, 2025; Zeitoun et al., 2013; Zeitoun & Warner, 2006). Rather than viewing asymmetry as a secondary condition, this study treats it as a structuring force that actively shapes political and security outcomes (Kantel, 2016). Upstream positional advantage enables selective regulation of river flows, information, and timing, producing downstream dependence that extends beyond water management into broader domains of political leverage (Allan, 2003).

Importantly, hydro-political asymmetry does not necessarily result in open conflict. Instead, it often manifests through routine governance practices that normalize unequal access and control (Ducrot & Bourblanc, 2017; Zeitoun et al., 2013). By foregrounding asymmetry, this framework moves beyond cooperation–conflict binaries and emphasizes how spatial advantage is translated into sustained influence within river basin politics(Döring & Kim, 2025b).

It is important to distinguish the concept of hydro-political asymmetry advanced in this study from the established framework of hydro-hegemony. While hydro-hegemony emphasizes actor-centered dominance, strategic intent, and the exercise of leadership or coercion by powerful riparians, hydro-political asymmetry is conceptualized here as a structurally embedded spatial condition(Obaidullah & Howlader, 2025; Sultana, 2025). Asymmetry operates regardless of deliberate intent and produces security effects through geography, infrastructure, and governance arrangements that normalize unequal control(Obaidullah & Howlader, 2025). Rather than explaining how dominance is exercised, this study focuses on how security is produced and stabilized through asymmetrical spatial positioning itself (Allen & Barbalau, 2024). In this sense, hydro-political asymmetry precedes and exceeds hegemony, functioning as a condition that enables security effects even in the absence of explicit domination or conflict(Cascão, 2009).

Furthermore, hydro-political asymmetry is not a monolithic state-level strategy but is often mediated by sub-national or federal dynamics(Al-Muqdadi, 2022). In democratic contexts, the 'internal-external' nexus of water governance, in which domestic provincial interests override national diplomatic commitments, functions as a secondary mechanism of power(Vij et al., 2024). This internal friction can create institutional deadlocks that are perceived by downstream actors as deliberate strategic inaction, regardless of the central government's intent.(Ponce de León, 2025) By conceptualizing asymmetry as a spatial condition rather than an actor-driven strategy, this framework shifts analytical focus from intent to effect, allowing security outcomes to be identified even in the absence of deliberate coercion(Mozumder et al., 2025; Ponce de León, 2025).

4.2 Securitization Theory

To explain how water becomes a matter of security, this study draws on securitization theory, particularly the insights of the Copenhagen School(Buzan et al., 1998). Securitization theory highlights how issues are transformed into security concerns through political processes rather than objective threats(Karyotis et al., 2025). While early formulations emphasize speech acts, this study adopts a broader interpretation that includes institutional practices, policy arrangements, and bureaucratic routines as mechanisms of securitization (Balzacq, 2010; Ducrot & Bourblanc, 2017).

Within transboundary river basins, water is securitized not through dramatic declarations but through everyday governance decisions that frame control, uncertainty, and access as matters of strategic concern (Kantel, 2016; Vij et al., 2024). Treaties, data-sharing practices, and infrastructural planning contribute to constructing water as a security-sensitive domain(Zeitoun et al., 2013). This approach allows for an analysis of hydro-political security that operates below the threshold of militarization, aligning with the study's focus on non-military forms of power(Döring & Kim, 2025b). Securitization in this context does not imply deliberate threat construction, but emerges through routine governance practices that generate strategic uncertainty.

4.3 Critical Geopolitics: Space, Power, and Infrastructure

Critical geopolitics provides the spatial lens necessary to understand how rivers function as geopolitical spaces rather than neutral natural features (Dalby, 2007; Tuathail & Toal, 1996). From this perspective, geography is not a passive backdrop but an active medium through which power is exercised and security is produced. River basins are socially and politically constructed through mapping, infrastructure, and governance practices that materialize political authority.

Hydraulic infrastructures such as dams, barrages, and control mechanisms are central to this process. They transform rivers into material expressions of state power, embedding geopolitical influence within physical landscapes(Mills-Novoa et al., 2020; Mitchell & Campbell, 2011). By emphasizing infrastructure and spatial practices, critical geopolitics reveals how security is enacted through control over territory, mobility, and resource flows.

4.4 Conceptual Model: Geography; Power; Security

Bringing these perspectives together, the study advances a conceptual model in which geography enables power, and power produces security outcomes(Dalby, 2007; Zeitoun et al., 2013). Basin geography establishes positional advantages; hydro-political asymmetry translates these advantages into political leverage; and securitization processes transform water governance into a domain of security(Buzan et al., 1998). Critical geopolitics binds these elements by demonstrating how space and infrastructure materialize and stabilize these dynamics (Tuathail & Toal, 1996).

This integrated framework enables the analysis of the Ganges–Brahmaputra Basin as a historically produced and spatially structured security space. It provides the analytical foundation for examining how hydro-political asymmetry functions as a mechanism of non-military security and power, guiding the empirical analysis presented in the subsequent sections (Obaidullah & Howlader, 2025; Vij et al., 2024).While agency remains relevant, this framework prioritizes structural spatial conditions through which security effects persist beyond individual policy decisions.

5. Methodology

This study adopts a qualitative research design grounded in document analysis and spatial–geopolitical interpretation to examine how hydro-political asymmetry functions as a mechanism of security and power in the Ganges–Brahmaputra Basin (Bowen, 2009; Bréthaut et al., 2022; Creswell & Poth, 2017; Gupta, 2026). Given the study's focus on governance practices, institutional arrangements, and spatial configurations, qualitative methods are particularly suited to capturing the non-military and often implicit dynamics through which water is securitized (Balzacq, 2010; Buzan et al., 1998; Ponce de León, 2025; Vij et al., 2024) .

5.1 Qualitative Document Analysis

The core methodological approach is qualitative document analysis, involving the systematic examination of policy documents, official statements, and institutional texts related to transboundary water governance in the Ganges–Brahmaputra Basin (Al-Muqdadi, 2022; Bowen, 2009; Döring & Kim, 2025a; Ducrot & Bourblanc, 2017; Gupta, 2026; Obaidullah & Howlader, 2025; Vij et al., 2024). The document corpus was compiled through a systematic review of official and institutional sources related to transboundary water governance in the Ganges–Brahmaputra Basin. Primary sources include bilateral treaties and agreements between India and Bangladesh, Joint River Commission reports, national policy documents, parliamentary debates, official government statements, and reports produced by international organizations engaged in regional water governance.

Documents were included based on three criteria: (1) direct relevance to transboundary river governance and interstate water relations; (2) substantive engagement with issues of river flow

regulation, infrastructural control, data-sharing practices, or institutional decision-making authority; and (3) applicability to the Ganges–Brahmaputra Basin. Documents that were purely technical or hydrological in nature, media opinion pieces, or local-level materials lacking transboundary significance were excluded to maintain analytical coherence and political focus.

The temporal scope of the analysis spans from the early 1970s to 2024. This period captures the consolidation of post-colonial water governance institutions in South Asia, beginning with the operationalization of the Farakka Barrage, and enables an examination of how hydro-political asymmetry has been institutionalized and reproduced across successive treaty frameworks and governance regimes up to the present.

Rather than treating documents as neutral sources of information, the analysis approaches them as political artifacts that reflect underlying power relations(Bowen, 2009). Attention is paid to language, omissions, and ambiguities particularly regarding enforcement, data sharing, and control which enables the identification of securitizing practices embedded within routine governance (Ducrot & Bourblanc, 2017). The document corpus includes bilateral treaties, joint river commission reports, policy statements, parliamentary debates, and official government communications produced between the early 1970s and 2024. Documents were selected based on their relevance to river flow regulation, data-sharing practices, infrastructural control, and institutional decision-making authority in the Ganges–Brahmaputra Basin.Together, these documents allow for triangulation across legal, administrative, and policy domains, strengthening the analytical validity of the findings.

5.2 Policy and Treaty Texts

A focused analysis of water-related treaties, agreements, and policy frameworks forms a central component of the methodology (Dinar, 2007; Keskinen et al., 2021; Salman & Uprety, 2002). These texts are examined not only for their stated objectives but also for their institutional design, enforcement mechanisms, and spatial implications (Mayka, 2019). The analysis explores how formal cooperation arrangements may simultaneously stabilize asymmetrical power relations by privileging certain forms of control while limiting avenues for contestation.

By situating treaties within their geopolitical context, the study highlights how legal and policy instruments contribute to the institutionalization of hydro-political asymmetry rather than its resolution (Atanasov, 2026).

5.3 Spatial–Geopolitical Reading of the River Basin

In line with critical geopolitics, the study employs a spatial–geopolitical reading of the Ganges–Brahmaputra Basin, interpreting basin geography, upstream–downstream positioning, and hydraulic infrastructure as sources of political power (Dalby, 2007; Tuathail & Toal, 1996). Maps and spatial representations are used conceptually to understand how control over specific river segments and infrastructures translates into strategic advantage (Sneddon & Fox, 2012).

This spatial approach does not rely on technical GIS modeling but instead emphasizes geography as a political condition, consistent with interpretive and critical geographic analysis (Agnew, 2004).

5.4 Secondary Academic Sources

The analysis is further informed by a wide range of secondary academic literature drawn from political geography, international relations, hydro-politics, and security studies (Creswell & Poth, 2017). These sources provide contextual depth and theoretical grounding, enabling the study to situate empirical findings within broader scholarly debates. Priority is given to peer-reviewed journal articles and foundational theoretical works relevant to hydro-political asymmetry and securitization (Al-Muqdadi, 2022; Buzan et al., 1998; Dinar, 2007; Ducrot & Bourblanc, 2017; *Hydropolitics*, 1995; Warner et al., 2017; Zeitoun et al., 2013).

In this study, security is operationalized as an observable condition produced through governance practices rather than as an articulated threat or military posture. Security effects are identified through three interrelated indicators: (1) institutionalized uncertainty, where downstream actors face unpredictability in water availability, data access, or decision-making timelines; (2) policy and planning constraints, where downstream governance is shaped by dependence on upstream-controlled flows and institutional arrangements; and (3) stabilized dependence, where cooperative frameworks normalize unequal control without providing effective mechanisms for redistribution

or enforcement. These indicators allow security to be empirically identified through documentary evidence, treaty design, and governance practices without relying on explicit securitizing discourse.

5.5 Limitations

A notable limitation of this study is its primary focus on political and document-based analysis, which may under-emphasize the role of physical hydrological variables. Specifically, the impacts of high sedimentation (siltation) and climate-induced flow variability are treated as contextual factors rather than primary variables. Future research should integrate GIS-based sedimentation mapping with geopolitical analysis to further quantify the spatial production of insecurity."

6. Case Selection and Justification: Critical and Typical Mechanisms of Hydro-political Power

This study employs a purposeful, theory-driven case selection strategy rather than representative sampling, consistent with qualitative research in political geography and security studies (Flyvbjerg, 2001, 2006; Yin, 2017). The objective is not to generalize statistically across all transboundary rivers, but to identify and demonstrate causal mechanisms through which hydro-political asymmetry functions as a non-military security instrument. The Farakka Barrage and the Teesta River governance deadlock are selected because they represent analytically distinct mechanisms of hydro-political power within the same river basin. Together, they allow for controlled comparison under shared historical, institutional, and geographical conditions, while revealing variation in how security is produced.

6.1 The Farakka Barrage as a *Critical Case* of Infrastructure-Based Power

The Farakka Barrage constitutes a critical case for examining infrastructure-based hydro-political power. A critical case is one where, *if a theoretical proposition holds here, it is likely to hold in less extreme cases as well* (Rahman & Rahaman, 2018). Farakka represents the most explicit and materialized form of upstream control within the Ganges Brahmaputra Basin, where spatial advantage is converted into operational authority over river flows(Rahman & Rahaman, 2018). Operational decisions regarding dry-season releases under the Farakka Barrage, particularly during

low-flow years, have repeatedly introduced uncertainty for downstream planning despite the presence of a formal treaty framework(Islam et al., 2022).

This case is critical for three reasons:

1. Maximum Material Leverage: The barrage enables direct regulation of dry-season flows, making downstream water availability contingent on upstream operational decisions. This creates an observable link between infrastructure and downstream vulnerability(Islam et al., 2022).
2. Formal Cooperative Framework Presence: Despite the existence of the 1996 Ganges Water Sharing Treaty, downstream insecurity persists. This allows the study to test whether cooperation neutralizes power asymmetry, or whether infrastructure continues to function as a security mechanism under cooperative conditions(Obaidullah & Howlader, 2025).
3. Visibility of Non-Military Security Effects: Farakka demonstrates how security pressure operates without militarization, through seasonal uncertainty, salinity intrusion, and planning constraints making it an ideal case for examining *quiet securitization*(Islam et al., 2022).

Because Farakka represents an upper-bound condition of infrastructural control, its inclusion strengthens the argument that hydro-political asymmetry can produce security effects even in the absence of conflict or overt coercion.

6.2 The Teesta River Deadlock as a *Typical Case* of Institutional Power Through Absence

In contrast, the Teesta River governance deadlock functions as a typical case, illustrating how hydro-political asymmetry operates under conditions of institutional absence rather than material intervention(Obaidullah & Howlader, 2025). Unlike Farakka, the Teesta lacks a formal, binding water-sharing agreement, making it representative of numerous transboundary rivers where governance remains unresolved(Obaidullah & Howlader, 2025). Repeated postponement of a formal Teesta water-sharing agreement has normalized uncertainty, leaving downstream actors to adapt policies without predictable institutional commitments(Arman Sohail, 2023).

This case is selected for three key reasons:

1. Power Through Inaction: The absence of a treaty allows the upstream actor to retain full policy autonomy, while the downstream actor faces strategic uncertainty. This demonstrates that inaction itself can function as a securitizing practice(Sultana, 2025).
2. Normalization of Uncertainty: Unlike crisis-driven cases, the Teesta exemplifies how long-term uncertainty becomes normalized within everyday governance, reinforcing downstream vulnerability without triggering diplomatic escalation(Islam et al., 2022).
3. Representativeness Across Basins: The Teesta resembles many transboundary rivers globally where formal cooperation is delayed or stalled, making it a typical illustration of how institutional silence sustains asymmetry(Obaidullah & Howlader, 2025).

The Teesta deadlock specifically demonstrates the power of 'sub-national veto' within hydro-political asymmetry. The impasse is largely driven by the Indian state of West Bengal, which opposes water-sharing based on local agricultural demands and political sovereignty over water resources(Vij et al., 2024). This 'domestic-diplomatic gap' creates a permanent state of uncertainty for Bangladesh. For the downstream riparian, the reason for the deadlock (whether it is federal friction or strategic denial) matters less than the outcome: a normalized state of vulnerability that prevents long-term agricultural and economic planning(Gupta, 2026).

By selecting a typical case, the study demonstrates that hydro-political security production does not require exceptional infrastructure or crisis conditions, but can emerge through routine governance inertia.

6.3 Analytical Leverage Through Paired Case Logic

The paired use of Farakka and Teesta provides analytical leverage by demonstrating that hydro-political asymmetry produces security effects through two distinct but complementary pathways (see Table 1):

Table 1 here

Case	Type	Mechanism	Mode of Power
Farakka Barrage	Critical	Infrastructure control	Power through action
Teesta River	Typical	Institutional absence	Power through inaction

Table 1 Comparative Modes of Hydro-Political Power: Farakka Barrage and the Teesta River.

This paired design strengthens internal validity by showing that security production persists across different institutional configurations with and without treaties, and with and without physical intervention. The cases thus function not as anecdotal examples, but as mechanism-revealing sites that operationalize the study's theoretical framework linking geography, governance, and security.

The purpose of these cases is analytical generalization, not empirical representativeness. By identifying how hydro-political asymmetry functions through both infrastructure and institutional silence, the findings are transferable to other asymmetrical transboundary basins where upstream positional advantage is institutionalized through spatial control rather than military force.

7. Findings

The findings presented below are derived from systematic analysis of treaty texts, policy documents, and institutional records related to the Farakka Barrage and the Teesta River. Rather than treating these cases as illustrative examples, the analysis uses them as mechanism-revealing sites through which hydro-political asymmetry can be empirically observed. In the Farakka case, infrastructural control enables direct regulation of downstream flows under a formal cooperative framework, while in the Teesta case, institutional absence itself functions as a mechanism of power through prolonged uncertainty. Together, these cases demonstrate how hydro-political asymmetry produces security effects through both action and inaction, reinforcing downstream vulnerability without overt confrontation.

7.1 Structural Hydro-political Asymmetry

The analysis demonstrates that hydro-political asymmetry in the Ganges–Brahmaputra Basin is structural, enduring, and spatially embedded, rather than episodic or event-driven. Upstream positional advantage derived from control over river headwaters, flow-regulation capacity, and large-scale hydraulic infrastructure enables upstream actors to exercise sustained influence over downstream water availability across seasonal cycles (Obaidullah & Howlader, 2025; Rahman & Rahaman, 2018; Sultana, 2025; Vij et al., 2024).

Documentary evidence indicates that this asymmetry is reinforced by the basin's physical geography, where upstream control over storage, diversion, and timing of releases allows for discretionary regulation of downstream flows. This spatial configuration produces long-term dependence rather than short-term vulnerability, embedding security imbalance into the routine functioning of the river system (Islam et al., 2022; Mills-Novoa et al., 2020; Molle, 2009; Sultana, 2025).

Policy documents and institutional records further reveal that downstream reliance on upstream-controlled flows has become normalized within governance arrangements, limiting downstream bargaining capacity and constraining policy autonomy. Rather than being contested through open political confrontation, this imbalance persists through accepted institutional practices, thereby reproducing an uneven security landscape without explicit conflict (Atanasov, 2026; Obaidullah & Howlader, 2025; Ponce de León, 2025; Sultana, 2025).

7.2 Securitization Through Governance Practices

The findings show that water is positioned as a strategic concern primarily through governance practices, rather than through explicit securitizing language or formal security declarations. Analysis of policy texts, administrative procedures, and institutional protocols reveals that water management is treated as a sensitive domain through indirect mechanisms, including restricted transparency, conditional data-sharing arrangements, and discretionary decision-making authority(Allouche, 2011; Gupta, 2026; Keskinen et al., 2021; Zeitoun & Mirumachi, 2008).

Institutional silences such as the absence of binding disclosure requirements or predictable information-sharing schedules contribute to an environment of managed ambiguity(Molle, 2009). This ambiguity elevates water from a technical or developmental issue to a strategic one by generating uncertainty regarding flow timing, volume, and future availability. Empirical evidence indicates that such uncertainty disproportionately affects downstream planning capacity, reinforcing vulnerability without overt policy statements framing water as a security threat(Islam et al., 2022).

Notably, securitization emerges through routine bureaucratic processes, where procedural control and informational asymmetry function as instruments of power. These practices signal authority and reinforce downstream insecurity while remaining embedded within ostensibly neutral governance frameworks(Mills-Novoa et al., 2020). Policy documents consistently frame flow variability and data disclosure as technical matters, yet their discretionary implementation reveals an implicit prioritization of strategic flexibility over downstream predictability.

7.3 Treaties as Instruments of Power Stabilization

The study finds that existing water-sharing treaties and institutional frameworks tend to stabilize hydro-political asymmetry rather than mitigate it (Allouche, 2011). Treaty texts consistently emphasize principles of cooperation, dialogue, and joint management; however, empirical analysis shows that they frequently lack enforcement mechanisms capable of addressing unequal control over water flows(Dinar et al., 2015; Kantel, 2016).Provisions related to dispute resolution, compliance monitoring, and adaptive adjustment remain weak or procedurally constrained, limiting their capacity to alter upstream dominance(Ponce de León, 2025). As a result, treaties institutionalize existing power relations while projecting an appearance of cooperation and mutual benefit.

Rather than redistributing authority or reducing dependence, these agreements function as regulatory instruments that manage asymmetry, ensuring continuity of upstream control within formally cooperative arrangements(Scott et al., 2021). The empirical pattern suggests that treaties serve more effectively as mechanisms of stability than as tools of redistribution.

7.4 Non-Military Security Pressure

The findings reveal that hydro-political influence in the basin is exercised predominantly through non-military forms of security pressure(Obaidullah & Howlader, 2025). This includes delayed decision-making, selective regulation of flows, and uncertainty surrounding water release schedules and information dissemination (Cascão, 2009; Warner & Wegerich, 2010).

Such practices generate downstream insecurity without crossing thresholds associated with militarized conflict or overt coercion. Instead, pressure is exerted quietly and incrementally, shaping expectations and limiting adaptive responses(Atanasov, 2026). Documentary evidence indicates that these non-military mechanisms are persistent and cumulative, producing long-term security effects that remain largely invisible within conventional security assessments focused on armed confrontation(Atanasov, 2026; Dinar et al., 2015).This mode of influence allows hydro-political control to operate continuously while avoiding political escalation, thereby maintaining asymmetry under conditions of formal stability.

7.5 The Basin as a Geopolitical Security Space

The analysis identifies the Ganges–Brahmaputra Basin as a geopolitical security space, where rivers function not merely as physical resources but as spatial instruments of power and governance(Panday, 2025). Control over hydraulic infrastructure, flow regimes, and basin-scale decision-making processes transforms the river system into an active site of political influence (Flint, 2016; Masten et al., 2016; Sneddon & Fox, 2012).

Empirical evidence demonstrates that authority, dependence, and security relations are produced through the spatial organization of the basin itself(Döring & Kim, 2025b). Infrastructure placement, institutional jurisdiction, and control over temporal flow patterns collectively shape security outcomes. Consequently, the basin emerges not as a neutral setting for interaction, but as a structured space through which hydro-political power is continuously enacted and maintained (Chayakul et al., 2026) (see Table 2).

Table 2 here

Empirical Dimension	Observed Pattern	Security Effect
Basin geography	Upstream positional dominance	Long-term downstream dependence
Governance practices	Policy ambiguity and institutional silence	Strategic uncertainty
Treaty design	Weak enforcement mechanisms	Stabilization of asymmetry
Power expression	Non-military pressure	Persistent insecurity
Spatial control	Infrastructure-based influence	Basin-level security imbalance

Table 2. Empirical Patterns of Hydro-political Asymmetry and Security Effects (author's synthesis based on document analysis).

Fig. 2 here

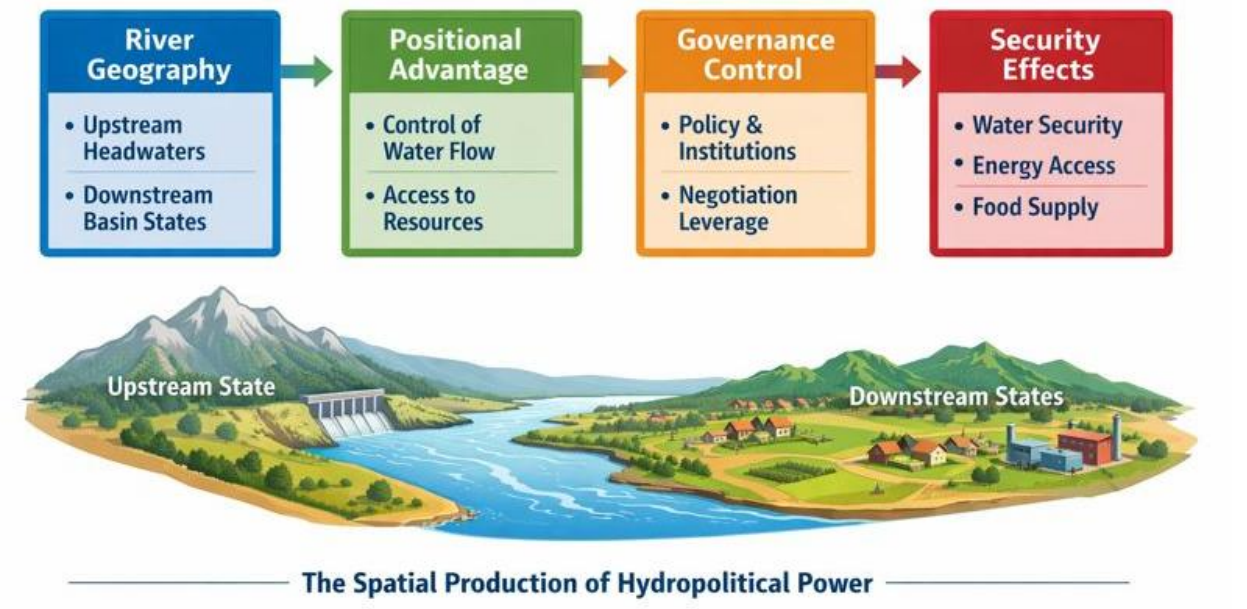


Fig. 2 Hydro-political Asymmetry as a Security Mechanism (Conceptual Diagram).

The diagram visually represents the sequential process through which hydro-political power is produced and exercised within a transboundary river basin. It is structured as a left-to-right causal chain, linking physical geography to political and security outcomes (see Fig. 2).

At the first stage, River Geography, the diagram highlights the asymmetrical spatial structure of the basin. Control over upstream headwaters is contrasted with the dependency of downstream basin states, establishing the foundational geographical condition from which power differentials emerge.

The second stage, Positional Advantage, illustrates how upstream location translates geography into power. Here, control over water flow and privileged access to water resources provide upstream states with a strategic advantage that is embedded in spatial position rather than military capability.

The third stage, Governance Control, shows how positional advantage is institutionalized. Through policies, legal frameworks, infrastructural development (such as dams), and negotiation leverage, upstream states convert spatial control into durable political authority over basin governance. This stage emphasizes that hydro-political power operates primarily through regulatory and institutional mechanisms.

The final stage, Security Effects, depicts the downstream consequences of upstream governance control. These effects manifest as non-military security outcomes, including impacts on water security, energy access, and food supply, underscoring how water governance becomes a critical dimension of human and national security.

The lower visual layer of the diagram reinforces this logic spatially: an upstream state, depicted with mountainous terrain and hydraulic infrastructure, contrasts with downstream states, shown as agrarian and industrial landscapes dependent on river flows. Together, the upper conceptual flowchart and the lower spatial illustration demonstrate how hydro-political power is produced through geography, mediated by governance, and realized as security outcomes, rather than through direct coercion.

Overall, the diagram encapsulates the argument that hydro-political power is structural, spatially embedded, and governance-driven, operating through long-term institutional control rather than overt conflict.

8. Discussion

This section interprets the findings through the theoretical lenses of hydro-political asymmetry, securitization theory, and critical geopolitics, demonstrating how basin geography is translated into power and subsequently into security outcomes. By doing so, the discussion moves beyond descriptive accounts of water governance to explain why and how hydro-political relations in the Ganges–Brahmaputra Basin generate persistent security effects rather than episodic conflict (Allouche, 2011; Dalby, 2007; Islam et al., 2022; Rahman & Rahaman, 2018; Sultana, 2025; Zeitoun & Warner, 2006).

The findings demonstrate that hydro-political asymmetry operates as more than an unequal distribution of water resources; it functions as a security-producing condition embedded within basin geography. Interpreted through hydro-political asymmetry, upstream positional advantage is not merely technical but fundamentally political, enabling sustained influence over downstream security without recourse to coercive force(Cascão, 2009; Islam et al., 2022; Obaidullah & Howlader, 2025; Sultana, 2025; Zeitoun et al., 2013; Zeitoun & Warner, 2006) .

This confirms and extends existing hydro-politics scholarship by showing that asymmetry is not a background variable but an active mechanism through which power is exercised. The spatial configuration of the basin enables long-term control to be normalized through governance arrangements, reinforcing downstream security dependence as a structural outcome rather than a situational crisis(Chayakul et al., 2026; Döring & Kim, 2025b; Kantel, 2016; Ponce de León, 2025).

Securitization theory helps explain how water becomes a security issue in the absence of explicit threat articulation. The findings suggest that securitization in the Ganges–Brahmaputra Basin occurs primarily through governance practices policy ambiguity, selective data sharing, and institutional silence rather than overt political speech acts(Buzan, 1991; Buzan et al., 1998; Chayakul et al., 2026; Gupta, 2026).This supports a practice-oriented reading of securitization,

where security is enacted through routine administrative decisions and institutionalized governance rather than emergency declarations (Balzacq, 2010; Bengtsson & Rhinard, 2019; Das, 2024; Ponce de León, 2025). Water governance thus becomes a domain of quiet securitization, operating below the threshold of militarization while still producing tangible security effects. The case demonstrates that securitization can be spatially and institutionally embedded, reinforcing security hierarchies without formal declarations of threat(Döring & Kim, 2025b; Huysmans, 2006; Islam et al., 2022; Kantel, 2016).

Critical geopolitics provides the spatial framework necessary to interpret the basin as an active geopolitical space rather than a neutral hydrological unit. The findings show that rivers, infrastructure, and basin-scale governance are material expressions of political power, embedded in spatial strategies of control and regulation (Agnew, 2004; Dalby, 2007; Islam et al., 2022; Obaidullah & Howlader, 2025).

Through infrastructural control and spatial management, geography itself becomes a medium of governance and security production. This perspective shifts attention from state intentions to spatial practices, revealing how security is produced through control over physical landscapes and material flows (Elden, 2013; Tuathail & Toal, 1996). The Ganges–Brahmaputra Basin thus emerges as a geopolitically constructed security space, where authority, dependence, and vulnerability are continuously reproduced through everyday governance(Islam et al., 2022).The dominance of cooperation-centered narratives in transboundary water literature obscures the security effects revealed by this study. While cooperative frameworks formally exist, the findings show that they often function to stabilize asymmetry rather than transform it (Dinar, 2007; Dinar et al., 2015; Kantel, 2016).

From a theoretical standpoint, cooperation does not negate power; instead, it can institutionalize unequal control when enforcement mechanisms and power-balancing institutions are absent(Zeitoun & Warner, 2006). By foregrounding security and spatial power, this study demonstrates that cooperation alone cannot explain persistent downstream vulnerability. Hydro-political relations must therefore be understood as simultaneously cooperative and coercive, where institutional stability coexists with structural insecurity(Chayakul et al., 2026; Islam et al., 2022; Menga, 2017; Mills-Novoa et al., 2020).

This study makes four key contributions to hydro-politics and political geography. First, it reframes hydro-political asymmetry as a security mechanism, rather than merely a distributional imbalance(Zeitoun & Warner, 2006). Second, it advances securitization theory by demonstrating how security is produced through spatial governance practices rather than explicit discourse(Balzacq, 2010; Huysmans, 2006). Third, it enriches critical geopolitics by conceptualizing river basins as geopolitical security spaces shaped through material and institutional control (Dalby, 2007; Elden, 2013). Finally, it bridges international relations and political geography by showing how non-military power is exercised through spatial control of natural systems.

Together, these contributions challenge prevailing assumptions in transboundary water studies and offer a theoretically integrated framework for understanding water, power, and security beyond conflict cooperation binaries.

9. Conclusion

This study has challenged the traditional narratives of water cooperation by demonstrating that hydro-political asymmetry in the Ganges–Brahmaputra Basin is not merely a background condition but an active, non-military mechanism of security and power. By integrating critical geopolitics with securitization theory, the analysis reveals that security in transboundary basins is frequently produced through routine governance, infrastructural control, and the normalization of uncertainty rather than through overt military confrontation.

The comparative analysis of the Farakka Barrage and the Teesta River deadlock highlights two distinct modes of power. While Farakka demonstrates how material infrastructure enables power through action (the ability to regulate flows), the Teesta deadlock exemplifies power through inaction. In the latter case, the absence of a formal treaty serves as a securitizing tool that sustains downstream vulnerability(Islam et al., 2022). Furthermore, the study finds that these asymmetries are deeply exacerbated by sub-national federalism where the domestic interests of regional actors, such as the West Bengal state government, override national diplomatic agendas and the cascading asymmetry introduced by China’s upstream position on the Brahmaputra.

Addressing these entrenched security effects requires a fundamental reorientation of hydro-political governance in South Asia. The findings suggest that continued reliance on bilateral treaties often stabilizes rather than resolves asymmetrical power relations, underscoring the need for a basin-wide multilateral governance framework. A comprehensive Ganges–Brahmaputra–Meghna (GBM) basin arrangement involving China, India, Nepal, Bhutan, and Bangladesh would enable the river system to be managed as an integrated ecological and political unit, rather than as fragmented bilateral segments. At the same time, future transboundary negotiations must more explicitly incorporate domestic political realities by formally engaging sub-national stakeholders. Recognizing and addressing state-level political interests within international frameworks can help prevent internal governance conflicts from translating into persistent diplomatic deadlocks.

The study also highlights the necessity of moving beyond narrow, volumetric approaches to water sharing that focus primarily on flow quantities. Effective hydro-political governance must instead engage with the material realities of river systems, including sedimentation dynamics, infrastructural vulnerability, and climate-induced variability. As climate change increasingly disrupts hydrological patterns, static treaty arrangements are likely to become progressively inadequate, making adaptive and flexible governance mechanisms essential.

Ultimately, reframing the river basin as a geopolitical security space allows for a more realistic understanding of why institutional stability does not always equate to equity. True water security in South Asia will require de-securitizing these transboundary flows by addressing the structural inequalities of geography, infrastructure, and domestic politics that currently define the region's hydro-political landscape.

Statements and Declarations

Competing Interests: The author declares no competing financial or non-financial interests.

Funding: No funding was received for conducting this study.

Ethical Approval: Not applicable.
Consent to Participate: Not applicable.

10. References:

Agnew, J. (2004). *Geopolitics: Re-Visioning World Politics* (2nd ed.). Routledge. https://doi.org/10.4324/9780203413739

Allan, J. A. (2003). Virtual Water—The Water, Food, and Trade Nexus. Useful Concept or Misleading Metaphor? *Water International*, *28*(1), 106–113. https://doi.org/10.1080/02508060.2003.9724812

Allen, F., & Barbalau, A. (2024). Security design: A review. *Journal of Financial Intermediation*, *60*, 101113. https://doi.org/10.1016/j.jfi.2024.101113

Allouche, J. (2011). The sustainability and resilience of global water and food systems: Political analysis of the interplay between security, resource scarcity, political systems and global trade. *Food Policy, The Challenge of Global Food Sustainability*, *36*, S3–S8. https://doi.org/10.1016/j.foodpol.2010.11.013

Al-Muqdadi, S. W. H. (2022). The Spiral of Escalating Water Conflict: The Theory of Hydro-Politics. *Water*, *14*(21), 3466. https://doi.org/10.3390/w14213466

Arman Sohail, E. (2023, April 13). Can't India Resolve Teesta Issue By Following Obiter Dicta Of UN Charter For Sake Of Good Relations With Bangladesh? – OpEd. *Eurasia Review*. https://www.eurasiareview.com/13042023-cant-india-resolve-teesta-issue-by-following-obiter-dicta-of-un-charter-for-sake-of-good-relations-with-bangladesh-oped/

Atanasov, A. (2026). The economics of water conflict: Transaction costs, bargaining failure, and sustainable cooperation in the Nile dispute. *Social Sciences & Humanities Open*, *13*, 102074. https://doi.org/10.1016/j.ssaho.2025.102074

Atikcan, E. Ö., Hurrelmann, A., & Siles-Brügge, G. (2026). Spatial Imaginaries and the Geopolitics of Trade: A Constructivist Perspective. *Geopolitics*, *31*(1), 1–24. https://doi.org/10.1080/14650045.2025.2578629

Azizi, S. (2025). China's Belt and Road Initiative (BRI): A strategic framework for ASEAN engagement. *Discover Global Society*, *3*(1), 119. https://doi.org/10.1007/s44282-025-00240-2

Baffoe, G., & Roy, S. (2023). Colonial legacies and contemporary urban planning practices in Dhaka, Bangladesh. *Planning Perspectives*, *38*(1), 173–196. https://doi.org/10.1080/02665433.2022.2041468

Balzacq, T. (Ed.). (2010). *Securitization Theory: How Security Problems Emerge and Dissolve*. Routledge. https://doi.org/10.4324/9780203868508

Barquet, K., & Sjölander, F. (2025). Quiet power: How security interests shape offshore wind and marine spatial planning in Sweden. *Energy Research & Social Science*, *130*, 104451. https://doi.org/10.1016/j.erss.2025.104451

Barua, A., Baruah, T., & Vij, S. (2025). 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

Bengtsson, L., & Rhinard, M. (2019). Securitisation across borders: The case of 'health security' cooperation in the European Union. *West European Politics*, *42*(2), 346–368. https://doi.org/10.1080/01402382.2018.1510198

Boampong, M., & Mouthaan, M. (2025). Confronting mainstream migration narratives in Ghana: Everyday youth aspirations as part of a decentring agenda. *Journal of Ethnic and Migration Studies*, *51*(18), 4760–4779. https://doi.org/10.1080/1369183X.2025.2544090

Bowen, G. A. (2009). Document Analysis as a Qualitative Research Method. *Qualitative Research Journal*, *9*(2), 27–40. https://doi.org/10.3316/QRJ0902027

Bréthaut, C., Ezbakhe, F., McCracken, M., Wolf, A., & Dalton, J. (2022). Exploring discursive hydropolitics: A conceptual framework and research agenda. *International Journal of Water Resources Development*, *38*(3), 464–479. https://doi.org/10.1080/07900627.2021.1944845

Bruns, B. (2023). Water User Associations and Collective Action in Irrigation and Drainage. In *Oxford Research Encyclopedia of Environmental Science*.

https://oxfordre.com/environmentalscience/display/10.1093/acrefore/9780199389414.001.0001/acrefore-9780199389414-e-791

Buzan, B. (1991). New Patterns of Global Security in the Twenty-First Century. *International Affairs (Royal Institute of International Affairs 1944-)*, *67*(3), 431–451. https://doi.org/10.2307/2621945

Buzan, B., Wæver, O., & Wilde, J. de. (1998). *Security: A New Framework for Analysis*. Lynne Rienner Publishers.

Cascão, A. E. (2009). Changing Power Relations in the Nile River Basin: Unilateralism vs. Cooperation? *Water Alternatives*, *2*(2), 245-268.

Chayakul, J., Veldwisch, G. J., Bruins, B., & Boelens, R. (2026). Contested waters: Hydrosocial territories and power dynamics in the landscape of peri-urban Chiang Mai, Thailand. *Geoforum*, *169*, 104457. https://doi.org/10.1016/j.geoforum.2025.104457

Chowdhory, N., & Mohanty, B. (2023). Dispossession, Border and Exception in South Asia: An Introduction. *Journal of Borderlands Studies*, *38*(4), 537–547. https://doi.org/10.1080/08865655.2023.2226404

Creswell, J. W., & Poth, C. N. (2017). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. SAGE Publications.

Dalby, S. (2007). Ecology, Security, and Change in the Anthropocene. *The Brown Journal of World Affairs*, *13*(2), 155–164.

Das, M. (2024). Post-colonial Water Governance: Shifting Paradigms. *History and Sociology of South Asia*, *18*(1), 124–133. https://doi.org/10.1177/22308075231204929

De Stefano, L., Petersen-Perlman, J. D., Sproles, E. A., Eynard, J., & Wolf, A. T. (2017). Assessment of transboundary river basins for potential hydro-political tensions. *Global Environmental Change*, *45*, 35–46. https://doi.org/10.1016/j.gloenvcha.2017.04.008

Dinar, A., Dinar, S., McCaffrey, S., & McKinney, D. (2007). Bridges Over Water: Understanding Transboundary Water Conflict, Negotiation And Cooperation. *McGeorge School of Law Scholarly Books*, 1–458.

Dinar, S. (2007). *International water treaties: Negotiation and cooperation along transboundary rivers*. Routledge. https://www.taylorfrancis.com/books/mono/10.4324/9780203934456/international-water-treaties-shlomi-dinar

Dinar, S., Katz, D., De Stefano, L., & Blankespoor, B. (2015). Climate change, conflict, and cooperation: Global analysis of the effectiveness of international river treaties in addressing water variability. *Political Geography*, *45*, 55–66. https://doi.org/10.1016/j.polgeo.2014.08.003

Donko, K., & Doevenspeck, M. (2025). Violence in the Borderlands of Burkina Faso, Niger, and Benin: Regional Integration Without ECOWAS. *Society*. https://doi.org/10.1007/s12115-025-01153-1

Döring, S., & Kim, K. (2025a). Streams of contestation, streams of cooperation: Toward a research agenda on water and peace. *Environment and Security*, *3*(4), 405–425. https://doi.org/10.1177/27538796251390045

Döring, S., & Kim, K. (2025b). Streams of contestation, streams of cooperation: Toward a research agenda on water and peace. *Environment and Security*, *3*(4), 405–425. https://doi.org/10.1177/27538796251390045

Ducrot, R., & Bourblanc, M. (2017). Promoting equity in water access: The limits of fairness of a rural water programme in semi-arid Mozambique. *Natural Resources Forum*, *41*(3), 131–144. https://doi.org/10.1111/1477-8947.12128

Elden, S. (2013). Secure the volume: Vertical geopolitics and the depth of power. *Political Geography*, *34*, 35–51. https://doi.org/10.1016/j.polgeo.2012.12.009

Filgueiras, F., Palotti, P., & Testa, G. G. (2023). Complexing Governance Styles: Connecting Politics and Policy in Governance Theories. *Sage Open*, *13*(1), 21582440231158521. https://doi.org/10.1177/21582440231158521

Flint, C. (2016). *Introduction to Geopolitics* (3rd ed.). Routledge. https://doi.org/10.4324/9781315640044

Flyvbjerg, B. (2001). *Making social science matter: Why social inquiry fails and how it can succeed again* (pp. x, 204). Cambridge University Press. https://doi.org/10.1017/CBO9780511810503

Flyvbjerg, B. (2006). Five Misunderstandings About Case-Study Research. *Qualitative Inquiry*, *12*(2), 219–245. https://doi.org/10.1177/1077800405284363

Gupta, K. (2026). Rethinking the Teesta River Dispute: A Social Constructivist Approach to Transboundary Water Cooperation. *World Water Policy*, *12*(1), e70046. https://doi.org/10.1002/wwp2.70046

Hayat, S., Gupta, J., Vegelin, C., & Jamali, H. (2022). A review of hydro-hegemony and transboundary water governance. *Water Policy*, *24*(11), 1723–1740. https://doi.org/10.2166/wp.2022.256

Hekkala, R., Stein, M.-K., & Sarker, S. (2022). Power and conflict in inter-organisational information systems development. *Information Systems Journal*, *32*(2), 440–468. https://doi.org/10.1111/isj.12335

Hussein, H., Poplawsky, M., & Mohapatra, T. (2023). The political context of change in transboundary freshwater agreements. *Environmental Science & Policy*, *149*, 103572. https://doi.org/10.1016/j.envsci.2023.103572

Huysmans, J. (2006). *The Politics of Insecurity: Fear, Migration and Asylum in the EU*. https://doi.org/10.4324/9780203008690

Hydropolitics: Conflicts over water as a development constraint. (1995). Dhaka : University Press ; London ; Atlantic Highlands, N.J. : Zed Books. http://archive.org/details/hydropoliticscon0000unse

Ikram, M., & Boudraa, C. (2025). The role of quality governance in achieving sustainable development goals in North Africa: An integrated decision-support system. *Sustainable Operations and Computers*, *6*, 198–216. https://doi.org/10.1016/j.susoc.2025.07.005

Irengbam, M., & Sneddon, C. (2025). The making of a hydrofrontier: Geopolitics, securitization and 'green' energy imaginaries in India's eastern borderlands. *Political Geography*, *121*, 103378. https://doi.org/10.1016/j.polgeo.2025.103378

Islam, A. R. M. T., Talukdar, S., Akhter, S., Eibek, K. U., Rahman, M. M., Pal, S., Naikoo, M. W., Rahman, A., & Mosavi, A. (2022). Assessing the Impact of the Farakka Barrage on Hydrological

Alteration in the Padma River with Future Insight. *Sustainability*, *14*(9), 5233. https://doi.org/10.3390/su14095233

Kantel, A. J. (2016). Mirumachi, Naho. 2015. Transboundary Water Politics in the Developing World. Abingdon, UK: Routledge. *Global Environmental Politics*, *16*(4), 139–141. https://doi.org/10.1162/GLEP_r_00383

Karyotis, G., Paterson, I., & Judge, A. (2025). Understanding Securitization Success: A New Analytical Framework. *International Studies Review*, *27*(1), viaf006. https://doi.org/10.1093/isr/viaf006

Keskinen, M., Salminen, E., & Haapala, J. (2021). Water diplomacy paths – An approach to recognise water diplomacy actions in shared waters. *Journal of Hydrology*, *602*, 126737. https://doi.org/10.1016/j.jhydrol.2021.126737

Lal, A., & You, F. (2025). Advances and challenges in energy and climate alignment of AI infrastructure expansion. *Advances in Applied Energy*, *20*, 100243. https://doi.org/10.1016/j.adapen.2025.100243

Leonard, D. K., Bloom, G., Hanson, K., O'Farrell, J., & Spicer, N. (2013). Institutional Solutions to the Asymmetric Information Problem in Health and Development Services for the Poor. *World Development*, *48*, 71–87. https://doi.org/10.1016/j.worlddev.2013.04.003

Masten, S. J., Davies, S. H., & Mcelmurry, S. P. (2016). Flint Water Crisis: What Happened and Why? *Journal - American Water Works Association*, *108*(12), 22–34. https://doi.org/10.5942/jawwa.2016.108.0195

Mayka, L. (2019). The Origins of Strong Institutional Design: Policy Reform and Participatory Institutions in Brazil's Health Sector. *Comparative Politics*, *51*(2), 275–294.

Menga, F. (2017). *Hydropolis*: Reinterpreting the *polis* in water politics. *Political Geography*, *60*, 100–109. https://doi.org/10.1016/j.polgeo.2017.05.002

Mills-Novoa, M., Boelens, R., Hoogesteger, J., & Vos, J. (2020). Governmentalities, hydrosocial territories & recognition politics: The making of objects and subjects for climate change adaptation in Ecuador. *Geoforum*, *115*, 90–101. https://doi.org/10.1016/j.geoforum.2020.06.024

Milman, A., & Gerlak, A. K. (2020). International river basin organizations, science, and hydrodiplomacy. *Environmental Science & Policy*, *107*, 137–149. https://doi.org/10.1016/j.envsci.2020.02.023

Mitchell, G., & Campbell, L. (2011). The social economy of excluded families. *Child & Family Social Work*, *16*(4), 422–433. https://doi.org/10.1111/j.1365-2206.2011.00757.x

Molle, F. (2009). Water, politics and river basin governance: Repoliticizing approaches to river basin management. *Water International*, *34*(1), 62–70. https://doi.org/10.1080/02508060802677846

Mozumder, M. M. H., Schneider, P., & Deb, D. (2025). Integrating waters, bridging boundaries: A comprehensive review of Transboundary Mega-Basin Management for sustainable and equitable water governance. *Water International*, *50*(7), 730–745. https://doi.org/10.1080/02508060.2025.2535928

Obaidullah, Md., & Howlader, Md. R. (2025). Assessing geopolitical and socio-economic consequences of India-Bangladesh water disputes. *Discover Global Society*, *3*(1), 1. https://doi.org/10.1007/s44282-025-00137-0

Panday, P. K. (2025). The Role of Union Parishads in Attaining SDG 16.6 in Bangladesh: From Policy to Practice. *Bangladesh Journal of Administration Management*. https://doi.org/10.56379/bjam.V37i2.94

Ponce de León, A. (2025). The politics of restless motion: Water governance and state formation in Colombia's upper Cauca basin, 1910–1940. *Tapuya: Latin American Science, Technology and Society*, *8*(1), 2513196. https://doi.org/10.1080/25729861.2025.2513196

Rahman, Md. M., & Rahaman, M. M. (2018). Impacts of Farakka barrage on hydrological flow of Ganges river and environment in Bangladesh. *Sustainable Water Resources Management*, *4*(4), 767–780. https://doi.org/10.1007/s40899-017-0163-y

Ramesh, A. (2021). INDIAN RIVERS, 'PRODUCTIVE WORKS', AND THE EMERGENCE OF LARGE DAMS IN NINETEENTH-CENTURY MADRAS. *The Historical Journal*, *64*(2), 281–309. https://doi.org/10.1017/S0018246X20000163

Salman, S. M. A., & Uprety, K. (2002). *Conflict and Cooperation on South Asia's International Rivers: A Legal Perspective*. World Bank Publications.

Scott, C. A., Zilio, M. I., Harmon, T., Zuniga-Teran, A., Díaz-Caravantes, R., Hoyos, N., Perillo, G. M. E., Meza, F., Varady, R. G., Neto, A. R., Velez, M. I., Martín, F., Escobar, J., Piccolo, M. C., Mussetta, P., Montenegro, S., Rusak, J. A., & Pineda, N. (2021). Do ecosystem insecurity and social vulnerability lead to failure of water security? *Environmental Development, Bridging Science and Policy through Collaborative, Interdisciplinary Global Change Research in the Americas*, *38*, 100606. https://doi.org/10.1016/j.envdev.2020.100606

Shan, Y. (2026). Digital platforms and the transformation of crime governance. *The Journal of Chinese Sociology*, *13*(1), 1. https://doi.org/10.1186/s40711-025-00252-0

Silvers, R. (2020). Cross-border cooperation between securities regulators. *Journal of Accounting and Economics*, *69*(2), 101301. https://doi.org/10.1016/j.jacceco.2020.101301

Sneddon, C., & Fox, C. (2012). Inland Capture Fisheries and Large River Systems: A Political Economy of Mekong Fisheries. *Journal of Agrarian Change*, *12*(2–3), 279–299. https://doi.org/10.1111/j.1471-0366.2011.00350.x

Sultana, F. (2025). From hydro-hegemony to hydro-coercion: Politics of precarity in India–Bangladesh transboundary water conflicts. *Human Geography*, 19427786251400314. https://doi.org/10.1177/19427786251400314

Swain, A. (2011). Challenges for water sharing in the Nile basin: Changing geo-politics and changing climate. *Hydrological Sciences Journal*, *56*(4), 687–702. https://doi.org/10.1080/02626667.2011.577037

Tuathail, G. Ó., & Toal, G. (1996). *Critical Geopolitics: The Politics of Writing Global Space*. University of Minnesota Press. https://books.google.com.bd/books/about/Critical_Geopolitics.html?id=q4z31O4RWg0C&redir_esc=y

van Ryneveld, T. N., & Islar, M. (2023). Coloniality as a Barrier to Climate Action: Hierarchies of Power in a Coal-Based Economy. *Antipode*, *55*(3), 958–981. https://doi.org/10.1111/anti.12907

Vij, S., Warner, J. F., Sanjeev Mehta, A., & Barua, A. (2024). Status quo in transboundary waters: Unpacking non-decision making and non-action. *Global Environmental Change*, *85*, 102821. https://doi.org/10.1016/j.gloenvcha.2024.102821

Warner, J., Mirumachi, N., Farnum, R. L., Grandi, M., Menga, F., & Zeitoun, M. (2017). Transboundary 'hydro-hegemony': 10 years later. *WIREs Water*, *4*(6), e1242. https://doi.org/10.1002/wat2.1242

Warner, J., & Wegerich, K. (2010). *Is water politics?: Towards international water relations*. https://hdl.handle.net/10568/37301

Weil, B. (2006). The Rivers Come: Colonial Flood Control and Knowledge Systems in the Indus Basin, 1840s-1930s. *Environment and History*, *12*(1), 3–29. https://doi.org/10.3197/096734006776026818

Wolf, Aaron T. and Joshua T. Newton. (2008). Water Conflict Resolution | Program in Water Conflict Management and Transformation. *Cambridge University Press.* https://transboundarywaters.ceoas.oregonstate.edu/case-studies-water-conflict-resolution

Yin, R. K. (2017). *Case Study Research and Applications: Design and Methods*. SAGE Publications.

Zeitoun, M., Eid-Sabbagh, K., Talhami, M., & Dajani, M. (2013). *Hydro-Hegemony in the Upper Jordan Waterscape: Control and Use of the Flows*. *6*(1). https://www.water-alternatives.org/index.php/volume6/v6issue1/200-a6-1-5/file

Zeitoun, M., & Mirumachi, N. (2008). Transboundary water interaction I: Reconsidering conflict and cooperation. *International Environmental Agreements: Politics, Law and Economics*, *8*(4), 297–316. https://doi.org/10.1007/s10784-008-9083-5

Zeitoun, M., & Warner, J. (2006). Hydro-hegemony – a framework for analysis of trans-boundary water conflicts. *Water Policy*, *8*(5), 435–460. https://doi.org/10.2166/wp.2006.054