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CHINA'S STRATEGIC INFRASTRUCTURE ON THE YARLUNG TSANGPO (BRAHMAPUTRA): ANALYZING ITS IMPACT ON SOUTH ASIAN HYDRO-POLITICS AND PAKISTAN'S WATER SECURITY

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ABSTRACT

This study investigates the strategic infrastructural developments undertaken by China on the Yarlung Tsangpo (Brahmaputra) River and critically analyzes their implications for South Asian hydro-politics, with a particular focus on Pakistan's emerging water security concerns. Utilizing a qualitative research design grounded in secondary data sources including expert interviews, policy reports, media content, and academic literature the study employs theoretical lenses such as hydro-hegemony, realism, and environmental security. The research reveals that China's unilateral dam-building practices are not only reshaping regional ecological systems but also recalibrating geopolitical dynamics, especially with downstream nations such as India and Bangladesh. While these countries directly experience the ecological and political consequences of upstream interventions, Pakistan though geographically disconnected from the Brahmaputra is indirectly vulnerable due to shared Himalayan climate systems, glacial dynamics, and strategic water interdependence with China. The study concludes that South Asia lacks an effective multilateral governance mechanism for managing trans boundary rivers, which increases the risk of water-related conflict. The research recommends enhanced regional water diplomacy, bilateral engagement between Pakistan and China, and the establishment of cooperative data-sharing mechanisms to ensure equitable and sustainable management of shared water resources.

Keywords: China, Yarlung Tsangpo, Brahmaputra River, hydro-politics, water security, South Asia, Pakistan, transboundary rivers, hydro-hegemony, environmental security, regional diplomacy.

Introduction

In recent decades, trans boundary water politics has emerged as one of the most critical issues in international relations, especially in regions where river systems cross multiple political boundaries. The Yarlung Tsangpo River, which originates in the Tibetan Plateau and flows into India as the Brahmaputra before reaching Bangladesh, holds immense geopolitical significance. It traverses through one of the most water-stressed and politically volatile regions in the world South Asia. China, as the upper riparian country and the controller of the river's source, has undertaken several infrastructural projects, including the construction of dams, hydropower stations, and proposed water diversion schemes. These developments have triggered a complex hydro-political scenario, raising apprehensions about regional water security, particularly for downstream nations like India and Bangladesh, and indirectly for Pakistan (Hanasz, 2020; Ahmed et al., 2023).

The strategic positioning of the Yarlung Tsangpo provides China with a significant advantage over its downstream neighbors. Its infrastructural activitiesincluding the Zangmu Dam (completed in 2015), the ongoing construction of the Jiacha and Dagu Dams, and proposals for a mega hydropower project near the Great Bend have

escalated concerns about China's intentions in using water as a geopolitical tool (Shah & Garg, 2022). China’s refusal to enter into binding water-sharing treaties and its tendency to maintain opacity in disclosing data on river flow and dam operations have further deepened mistrust among regional stakeholders (Chaturvedi & Sharma, 2021).

Pakistan is not a direct riparian to the Brahmaputra River, it is deeply embedded in the regional hydro-political framework. Pakistan's dependence on the Indus River Basin heavily influenced by monsoon patterns and Himalayan snowmelt makes it indirectly vulnerable to upstream interventions by China, especially when these activities affect weather cycles, regional cooperation, and diplomatic equations. As China continues to invest in water infrastructure along with the broader China-Pakistan Economic Corridor (CPEC), there is a growing urgency for Pakistan to understand how upstream developments on the Brahmaputra could pose indirect but significant challenges to its water security and regional strategy.

This study seeks to analyze the multidimensional implications of China's infrastructural expansion on the Yarlung Tsangpo, particularly in the context of emerging hydro-politics in South Asia and its implications for Pakistan. Through a critical analysis of infrastructure, treaties, political alignments, and environmental impacts, the research aims to provide a comprehensive picture of the shifting dynamics in regional water governance.

Statement of the Problem

The rapid and unilateral development of China’s strategic infrastructure on the Yarlung Tsangpo presents an imminent challenge to the regional hydro-political balance in South Asia. As the upper riparian, China holds disproportionate control over water flows that impact the lives and livelihoods of millions in India, Bangladesh, and to an extent, Pakistan. The construction of multiple dams and water diversion mechanisms without comprehensive transboundary cooperation or shared data protocols has created a power asymmetry that exacerbates tensions between these nations. Pakistan, though not directly connected to the Brahmaputra Basin, is increasingly entangled in the geopolitical consequences of these developments. China's growing influence in regional water diplomacy, coupled with India's concerns over upstream water manipulation, has the potential to alter the South Asian strategic landscape. Moreover, climatic interlinkages such as changes in precipitation patterns and Himalayan glacier dynamics due to upstream interventions can indirectly impact the flow regimes of the Indus River system, upon which Pakistan heavily relies. The core problem, therefore, lies in the potential destabilization of regional hydro-politics and the emergence of water as a strategic tool for political maneuvering.

Rationale of the Study

The rationale behind this research stems from the urgent need to address the growing complexities surrounding transboundary water management in South Asia, particularly in the context of China's upstream infrastructural expansion. While scholarly attention has been given to India-China water relations, relatively less focus has been directed toward understanding how these developments affect Pakistan, both directly and indirectly. This study fills that gap by examining the broader implications of China's activities on the Yarlung Tsangpo in shaping South Asian hydro-politics and analyzing how Pakistan's water security and diplomatic stance may be influenced. The research is also significant for regional climate studies, as environmental changes in one basin can have ripple effects across interconnected systems. By bridging the fields of geopolitics, environmental science, and water diplomacy, the study offers timely insights into the future of regional cooperation, water governance, and conflict mitigation.

Significance of the Study

This research holds theoretical, empirical, and policy relevance. Its primary significance includes the following dimensions: The study was help policymakers understand China's strategic motivations behind water infrastructure development and the resulting power dynamics in South Asia. By identifying the gaps in current transboundary water governance, it encourages dialogue among South Asian nations for cooperative frameworks, transparency, and data-sharing mechanisms. It provides a much-needed perspective on how seemingly unrelated upstream projects can have indirect yet profound consequences for Pakistan's long-term water availability and strategic interests. This study contributes to the growing body of interdisciplinary research on environmental security, resource geopolitics, and hydro-diplomacy.

Research Objectives

1. To examine the scope and strategic intent of China's infrastructural development on the Yarlung Tsangpo (Brahmaputra) River, including dam construction and water diversion plans.
2. To analyze the impact of China's water projects on the hydro-political relationships between China, India, and Bangladesh.
3. To explore the indirect implications of China's upstream activities on Pakistan's water security and strategic regional posture.

Research Questions

1. What are the key infrastructural developments initiated by China on the Yarlung Tsangpo, and what strategic objectives underpin these projects?
2. In what ways have these infrastructural interventions influenced the hydro-political relations among South Asian countries, particularly China, India, and Bangladesh?
3. How do China's developments on the Yarlung Tsangpo

indirectly impact Pakistan’s water security, environmental stability, and regional strategy?

Limitations of the Study

Researcher access to verified and recent data from Chinese sources is limited due to state secrecy policies, which may affect the depth of infrastructural analysis. Since Pakistan is not a direct riparian of the Brahmaputra, the study relies on secondary linkages and inferential analyses, which may limit the precision of some conclusions. Given the sensitive nature of China-India-Pakistan relations, political bias in source material and academic reports may affect the neutrality of interpretations.

Literature Review

Water has increasingly been recognized as a strategic resource not just for economic development and environmental sustainability, but also as a central axis in regional geopolitics (Zeitoun & Warner, 2006). In South Asia, the Yarlung Tsangpo/Brahmaputra River, with its origins in China-controlled Tibet, constitutes one of the most important and politically sensitive trans boundaryrivers. With China constructing large-scale infrastructure projects, including hydropower dams and potential diversion schemes, the hydro-political dynamics in the region are experiencing profound shifts. Research on water politics, river basin management, and trans boundary water conflict has gained traction, particularly from the lenses of environmental security, political ecology, and strategic studies.

Trans boundary Water Politics and China's Upstream Dominance

Extensive research has been conducted on China's rise as a hydro-hegemon in Asia, primarily due to its control over the headwaters of most major Asian rivers. Scholars like Wolf (1999), Hanasz (2020), and Hsu et al. (2022) have examined China's strategic behavior in leveraging its upstream position, particularly in the absence of formal trans boundary water treaties with countries such as India and Bangladesh. This literature indicates that China's water diplomacy is largely unilateral and opaque, which raises concerns about downstream water insecurity and political imbalance. Hanasz (2020) argues that China’s hydro-hegemonic behavior is rooted in a realist understanding of international relations—where control over water becomes a means of regional influence. This resonates with similar studies by Crow and Singh (2009), who explored how the lack of basin-wide institutions in South Asia increases vulnerability to unilateralism and regional instability.

China's Dam Projects on the Yarlung Tsangpo

Multiple studies have detailed the strategic nature of Chinese infrastructure on the Yarlung Tsangpo. The construction of the Zangmu Dam, followed by the Jiacha and Dagu dams, has been extensively documented (Shah & Garg, 2022; Hsu et al., 2022). These projects, although officially aimed at hydropower generation, are perceived by scholars as instruments for geo-strategic leverage. The proposed mega-dam near the “Great Bend” of the Yarlung Tsangpo

has raised alarms due to its potential to disrupt downstream hydrology and geopolitical balance. However, much of the literature remains focused on Sino-Indian tensions, with less emphasis on broader regional implications, particularly for Pakistan.

India and Bangladesh's Water Security Concerns

A substantial body of literature addresses India's and Bangladesh's anxieties over China's upstream water control (Biba, 2018; Chaturvedi & Sharma, 2021). India, which is both a mid-riparian and a regional power, has expressed concern over lack of transparency, data sharing, and the absence of a legally binding agreement with China. Bangladesh, being the lowest riparian, faces severe consequences from any reduction or diversion in water flow.But again, Pakistan remains underrepresented in this regional hydrological narrative despite being a country heavily reliant on Himalayan-fed rivers and embedded within the same climate system.

Gaps in the Literature

Previous literature provides a rich body of knowledge on China's water strategy and South Asian hydro-politics, significant gaps remain: Lack of research on the indirect impact on Pakistan, especially from a climate-diplomatic and strategic security perspective. Limited cross-disciplinary integration that combines hydrology, climate science, and political strategy in one analytical framework. Insufficient exploration of China's water diplomacy under CPEC and BRI, and its implications for Pakistan's regional alignment and water security. Scarcity of work on hydro-climatic interlinkages between the Brahmaputra and Indus River systems through atmospheric and monsoonal patterns. The present study aims to address these lacunae by offering a cross-disciplinary and regionally interconnected analysis.

The present research builds upon existing geopolitical and hydrological literature while expanding the focus to include Pakistan's position in the unfolding hydro-political context. While India's and Bangladesh's concerns have been substantially researched, Pakistan's strategic vulnerability, climate exposure, and geo-political interests in light of China's upstream activities on the Yarlung Tsangpo are underexplored. This study proposes to fill the gap by assessing how China's damming and potential water diversions affect broader regional hydro-stability, with a particular emphasis on Pakistan's national security, Indus Basin vulnerability, and climate dependency.

Theoretical Framework

This study is grounded in Hydro-Hegemony Theory, which provides a robust lens to understand how control over trans boundary water is used to exert power asymmetries. This framework helps explain how China's upstream dominance creates structural, bargaining, and discursive power in hydro-diplomacy. According to Zeitoun and Warner (2006), hydro-hegemony is established not only through geographical advantage but also through economic, political, and discursive control. China exemplifies a hydro-hegemon that uses its

strategic location and infrastructural projects to influence regional water politics. The theory will guide the analysis of China's use of water as a strategic tool, and how it impacts downstream cooperation, especially between India, Bangladesh, and Pakistan. Realism suggests that states act in their own self-interest to maximize power. This theory supports the interpretation of China's dam construction as a strategic maneuver to gain leverage in regional geopolitics (Morgenthau, 1948). It also explains why there is limited cooperation and transparency in trans boundary water sharing. The political ecology framework (Bryant & Bailey, 1997) is also employed to analyze the intersection of environmental change, water infrastructure, and power dynamics. It is useful for exploring how state policies and development narratives justify control over natural resources, often at the expense of environmental justice and equity.

Key Concepts and Terms

Concept	Explanation
Hydro-hegemony	Dominance of one state in a river basin through upstream control, military power, and negotiation advantage.
Water diplomacy	Strategic negotiations and cooperation between states over shared water resources.
Strategic infrastructure	Large-scale water-related projects (e.g., dams) used not only for development but also for political leverage.
Environmental security	The linkage between environmental change and national/regional security concerns.
Riparian relations	The interactions between countries sharing a river basin (upstream, midstream, downstream).

In summary, while there is substantial literature on China's upstream behavior and its implications for India and Bangladesh, Pakistan remains a missing dimension in this discourse. This study aims to critically assess the regional impacts of China's strategic water infrastructure especially on Pakistan's hydrological vulnerability, diplomatic positioning, and security outlook. It does so by integrating hydro-political theory, climate implications, and strategic analysis, thereby offering a unique and necessary contribution to the growing body of trans boundary water politics literature.

Research Methodology

Research Design

This research employed a qualitative exploratory research design, grounded in the interpretivist paradigm. The aim was to understand the strategic, political, environmental, and diplomatic dimensions of China's infrastructure development on the Yarlung Tsangpo River and to assess how this development impacts the broader hydro-political dynamics in South Asia, especially with reference to Pakistan's water security. Given the geopolitical sensitivity of the topic and the limited access to empirical hydrological data from China or on-the-ground stakeholders, a secondary qualitative approach was selected. This allowed the researcher to synthesize and interpret existing expert analyses, media coverage, scholarly commentaries, and policy documents to construct a comprehensive and multidimensional picture of the issue. Qualitative methodology was chosen because it is particularly suited for exploratory inquiries that involve interpreting discourses, geopolitical narratives, and power structures (Creswell & Poth, 2018). This approach enabled the researcher to engage with rich textual data and offer critical insights into the political undercurrents driving water disputes in South Asia.

Data Sources and Sampling Strategy

This study did not involve the collection of primary data through interviews or surveys. Instead, a media-based qualitative content sampling strategy was used, with data drawn from a wide range of publicly available and credible sources. This form of non-reactive secondary data collection is widely accepted in political and social research, particularly where sensitive or elite-driven processes like state strategies or diplomatic actions are being examined (Bryman, 2016).

Categories of Data Sources

The selected sources spanned across five major categories:

a. Televised News Panels and Expert Interviews: High-level geopolitical discussions and expert panels from international and regional TV networks were analyzed. These included:

a) CGTN (China Global Television Network) for China's official narrative and expert commentary
b) NDTV, Times Now, and India Today for India's policy reactions and water security concerns
c) Dawn News, Geo News, and PTV World for Pakistani perspectives on regional water politics
d) Al Jazeera English and BBC World News for neutral, international framing

These broadcasts included opinions from retired diplomats, water policy experts, military strategists, and hydrologists, providing layered perspectives on the issue.

b. YouTube Expert Panels and Academic Webinars: A curated sample of 8 full-length webinars and interviews (ranging from 30 to 90 minutes) hosted by reputable think tanks and universities was included. These were sourced from: Observer Research Foundation

(ORF), Brookings India, Geopolitics & Empire Channel, South Asia Channel, CSIS (Center for Strategic and International Studies)
These platforms featured regional scholars, engineers, and policy advisors speaking on the implications of China's hydropower expansion and its geopolitical impact.

c. News Articles and Op-Eds: Twelve articles from leading international and South Asian newspapers were included, with a focus on investigative reporting and analytical op-eds. Sources included (*The Diplomat*, *South China Morning Post*, *The Hindu*, *The Express Tribune*, *Reuters*, *BBC News*, *Pakistan Observer*). These sources offered up-to-date, factual reports as well as interpretations of unfolding events concerning the Yarlung Tsangpo river and regional water diplomacy.

d. Policy Reports and White Papers: Reports from institutions such as, International Rivers, World Bank, United Nations ESCAP, ICIMOD (International Centre for Integrated Mountain Development). These documents provided technical insights on dam construction, trans boundary basin impacts, and hydrological modeling.

e. Strategic Studies and Academic Literature: Key peer-reviewed articles and book chapters from databases like JSTOR, Google Scholar, and SAGE formed the academic backbone of the analysis. These studies discussed hydro-hegemony, strategic infrastructure, trans boundary water law, and the emerging concept of water weaponization.

Sampling Criteria

A purposive sampling technique was used to select the most relevant, recent, and credible media materials from 2020 to 2025. Sampling criteria included: Content directly referring to China’s infrastructure projects on the Yarlung Tsangpo/Brahmaputra, Commentaries or panels where recognized experts were featured (e.g., authors, diplomats, former water ministers)., Discussions that connected China’s water strategy to regional political implications, especially India-Pakistan-China dynamics, Preference for video/audio content with transcripts or subtitles for accurate coding and analysis. A total of 30 high-value data sources were finalized: 10 televised interviews and panel discussions, 8 YouTube-based academic webinars, 12 news articles and op-eds. This sample was considered sufficient for thematic saturation.

Data Analysis Method

Thematic analysis was applied to all selected content using the six-phase method proposed by Braun and Clarke (2006):

1. **Familiarization:** All transcripts and articles were read or watched thoroughly. Initial observations were noted.
2. **Coding:** Key phrases, arguments, and recurring patterns (e.g., “China’s hydro-hegemony”, “water weapon”, “Indo-China rivalry”) were coded.
3. **Theme Development:** Codes were grouped into categories such as "Strategic Infrastructure," "Transboundary Threats," "Water Politics," and "Indirect Impacts on Pakistan."

4. **Reviewing Themes:** Themes were validated across sources for consistency and relevance.
5. **Defining Themes:** Each theme was refined with sub-categories.
6. **Report Writing:** The thematic findings were used to build the discussion and results sections.

To ensure reliability, **manual coding** was supported by **NVivo 12** software to cross-validate the coding matrix.

Ethical Considerations

All materials used in the research were publicly available and openly accessible. Copyright policies of media channels and publications were respected. Proper attribution and referencing were provided in accordance with APA 7th edition standards.

Data Analysis and Findings

This section presents a detailed analysis of the data gathered from diverse secondary sources including televised interviews, expert panels, YouTube webinars, news articles, and policy reports in alignment with the qualitative methodology adopted for this study. The goal of this analysis is to critically interpret the narratives, arguments, and expert insights surrounding China's infrastructural expansion on the Yarlung Tsangpo River and to explore its multi-dimensional impact on South Asian hydro-politics and Pakistan's water security posture.

Thematic analysis was employed to identify patterns, underlying strategic discourses, and evolving regional dynamics. The data was coded and grouped into major themes and sub-themes based on relevance to the three core research questions. Particular emphasis was placed on recognizing both direct and indirect implications of China's dam-building activities, reflecting the complex geopolitical interactions among China, India, Bangladesh, and Pakistan. Using a constructivist lens, the analysis interprets not only the material developments (such as dam construction or hydropower output) but also the symbolic and strategic meanings assigned to these actions by different regional actors. The quotes included in each section serve to ground the thematic findings in real-time public discourse and expert commentary, ensuring transparency and authenticity of interpretation. The findings are presented in response to the three primary research questions, each followed by thematically organized data, quotations from secondary participants (media experts, scholars, analysts), and interpretive insights. This approach provides a nuanced understanding of how China's water infrastructure policy in the Tibetan Plateau is reshaping regional water governance, altering strategic equations, and creating new opportunities and challenges for Pakistan in particular and South Asia in general.

Research Question 1: What are the key infrastructural developments initiated by China on the Yarlung Tsangpo, and what strategic objectives underpin these projects?

Theme 1: Strategic Infrastructural Developments on the Yarlung Tsangpo

China's construction of hydropower and water control infrastructure on the Yarlung Tsangpo in the Tibet Autonomous Region has been widely documented in regional media, scholarly articles, and policy analyses. These projects are primarily characterized by large-scale dam construction, planned mega-hydropower plants, and potential water diversion schemes aimed at utilizing Tibet's high-altitude river systems for energy and strategic leverage.

Sub-theme 1.1: Existing Dam Projects on the Yarlung Tsangpo

The most frequently mentioned and completed project is the Zangmu Dam, China's first large-scale hydropower plant on the Yarlung Tsangpo, completed in 2015. In addition to Zangmu, China has constructed the Gyatsa, Jiacha, Dagu, and Jeixu dams. These are part of a cascade of hydropower installations to utilize the river's steep gradient and fast flow.

"China's Zangmu Dam, despite its official framing as a clean energy project, was clearly the beginning of a new strategic era in water management in Tibet."

(NDTV Expert Panel Discussion, 2022)

Sub-theme 1.2: Planned Super-Dam at the Great Bend

One of the most alarming developments, as per policy experts, is the proposed mega-dam near the "Great Bend," where the river takes a sharp U-turn before entering India's Arunachal Pradesh. This project, announced in 2021, is expected to generate around 60 gigawatts of electricity twice the capacity of the Three Gorges Dam.

"This dam is not just about electricity. It's about establishing irreversible control over the flow of the Brahmaputra before it leaves Chinese territory."

(Dr. Manoj Joshi, Observer Research Foundation Webinar, 2022)

This project is seen as potentially the most disruptive not only environmentally but also politically, as it is situated just kilometers from the Indian border.

Theme 2: China's Strategic Objectives Behind Infrastructural Development

China's infrastructural pursuits in Tibet are not solely about energy. Thematic analysis revealed three interrelated strategic motivations: energy security, regional influence, and hydro-hegemony.

Sub-theme 2.1: Energy and National Development Goals

China frames its dam projects under its green development narrative and long-term energy security strategy, particularly as it transitions away from coal. The hydropower potential of the Yarlung Tsangpo is unmatched in terms of altitude and flow rate, making it ideal for renewables.

"The river system in Tibet offers China one of the cleanest and most consistent energy sources. It's not only about development; it's about

setting a precedent in climate leadership."
(CGTN Broadcast, "China's Renewable Frontier", 2023)

Sub-theme 2.2: Strategic and Military Control

Several experts pointed to dual-use possibilities of the infrastructure dams that could serve both civil and military purposes. The ability to regulate or disrupt downstream flow gives China significant leverage in potential diplomatic or military standoffs.

"In peacetime, these dams generate electricity; in times of conflict, they become tools of pressure. It's strategic hydrology."
(Col. (R) Riaz Khattak, PTV World Interview, 2024)

Furthermore, the location of these projects along contested border areas (near Arunachal Pradesh) adds a geo-strategic dimension to the infrastructure.

Sub-theme 2.3: Establishing Hydro-Hegemony in Asia

Drawing from Zeitoun & Warner's theory of hydro-hegemony, the thematic analysis highlights China's intent to dominate regional water politics through early development, dam-building supremacy, and control over data. China is the only riparian power in the Brahmaputra basin that does not engage in water-sharing treaties, giving it a unique strategic advantage.

"This is not about sharing water it's about owning it. China controls the tap, and that gives it unparalleled political capital."
(Dr. Srinivas Chokkakula, India Water Security Forum, YouTube Panel, 2023)

Table 1: ***Summary of Key Findings RQ1***

Theme	Sub-Themes	Key Insights
1.Strategic Infrastructure	1.1 Zangmu and other dams 1.2 Great Bend super-dam	China has already operationalized multiple dams and is planning a massive project near the Indian border.
2.Strategic Objectives	2.1Energy security 2.2 Military leverage 2.3 Regional dominance	These projects are part of China's dual-use infrastructure model, allowing both economic development and geopolitical control.

The data reveals that China's infrastructural development on the Yarlung Tsangpo is multidimensional in purpose. While it aligns with national energy goals, it also serves as a strategic tool to shape regional power dynamics and assert hydro-political dominance in South Asia. These projects are interpreted by downstream countries not merely as domestic development, but as geostrategic moves that could impact water security, border stability, and regional peace especially in light of unresolved Sino-Indian and broader South Asian rivalries.

Research Question 2: In what ways have these infrastructural interventions influenced the hydro-political relations among South

Asian countries, particularly China, India, and Bangladesh?

Theme 1: Erosion of Trust and Intensification of Strategic Rivalries

Sub-theme 1.1: India's Growing Distrust of China

China's rapid and opaque construction of hydropower infrastructure on the Yarlung Tsangpo has significantly strained its water-related relationship with India. The lack of a binding water-sharing agreement, coupled with China's refusal to share consistent hydrological data, has contributed to deep mistrust.

"India is not only worried about territorial encroachments in Ladakh or Arunachal Pradeshwater is now a new dimension of strategic threat from China."

(Dr. Harsh Pant, ORF Webinar on South Asian Security, 2023)

India perceives the construction of the proposed mega-dam near the "Great Bend" just kilometers from Arunachal Pradesh as a deliberate geo-political provocation.

"Every dam China builds upstream is interpreted as a power projection by New Delhi. It's not just hydrology; it's diplomacy through engineering."

(India Today, Expert Roundtable on Indo-China Relations, 2022)

The deterioration of water diplomacy is also evident in India's increased hydropower activity in Arunachal Pradesh, interpreted as a counterbalance to Chinese upstream control.

Sub-theme 1.2: The China-India Water Rivalry and Its Broader Implications

Experts emphasize that China's unilateral approach to river development violates the principles of transboundary cooperation, such as "prior notification" and "equitable use," recognized in international water law (UN Watercourses Convention, 1997), to which China is not a signatory.

"China has cleverly opted out of the UN water treaties, giving itself maximum flexibility while downstream countries struggle for transparency."

(Dr. Brahma Chellaney, Asia Water Review, YouTube, 2022)

India's response has included pushing for bilateral river agreements with Bangladesh, participating in regional water diplomacy, and enhancing cooperation with international agencies to counterbalance China's hydro-strategy.

Theme 2: Marginalization and Growing Concerns in Bangladesh

Sub-theme 2.1: Downstream Fragility and Dependence

As the third major riparian of the Brahmaputra, Bangladesh faces the most severe ecological and humanitarian risks from any upstream disruption. Its geopolitical position downstream of both India and China limits its agency in shaping upstream developments.

"Bangladesh is the forgotten stakeholder in Brahmaputra hydro-politics. Any change in flow or sedimentation affects our agriculture, yet we have no seat at the table."

(Prof. Imtiaz Ahmed, Dhaka University Panel Discussion, 2022)

Bangladesh's fears revolve around altered flow patterns, seasonal

water scarcity, and increased flooding during monsoon months due to Chinese and Indian upstream interventions.

Sub-theme 2.2: Bangladesh's Efforts Toward River Diplomacy

In recent years, Bangladesh has sought to internationalize the issue, raising concerns in multilateral forums and appealing for greater regional cooperation. Dhaka has also pursued stronger water cooperation with India under existing treaties, such as the Ganges Water Treaty, to include discussions on the Brahmaputra basin.

"We are engaging India more actively, not just bilaterally but also in SAARC and BIMSTEC settings, to voice our concerns on Chinese dam-building."

(Bangladeshi Foreign Secretary's Statement, The Daily Star, 2023)

However, analysts note that without a comprehensive basin-wide framework, Bangladesh remains vulnerable to decisions taken in Beijing and New Delhi.

Theme 3: The Absence of Regional Institutional Mechanisms

Sub-theme 3.1: Lack of a Brahmaputra Basin Treaty

Unlike the Indus River (governed by the Indus Waters Treaty between India and Pakistan), the Brahmaputra has no multilateral treaty governing trans boundary flow or basin management between China, India, and Bangladesh.

"We have three riparian countries with competing interests but no legal architecture to manage disputes. That's a recipe for political friction."

(Dr. Dinesh Kumar, South Asia Water Initiative Conference, 2024)

This institutional vacuum enables upstream powers—especially China—to proceed unilaterally, creating a cycle of reactive diplomacy rather than cooperative basin management.

Sub-theme 3.2: Missed Opportunities for Regional Water Cooperation

While institutions such as SAARC, BIMSTEC, and the Bangladesh-China-India-Myanmar (BCIM) Corridor offer potential platforms for water diplomacy, they have largely failed to facilitate meaningful cooperation on the Brahmaputra issue.

"Hydro-politics is the missing pillar in regional integration. Water is too politicized, and no one wants to talk about it openly."

(Asia Foundation Water Governance Report, 2023)

Table 2: *Summary of Key Findings RQ2*

Theme	Sub-Themes	Key Insights
1.Strategic Rivalries	1.1 India-China mistrust 1.2Weaponization of infrastructure	China's dam projects have worsened water and territorial tensions with India.
2.Bangladesh's Fragility	2.1 Ecological vulnerability 2.2Diplomatic marginalization	Bangladesh faces environmental risks but lacks institutional power to influence upstream developments.

Theme	Sub-Themes	Key Insights
3.Institutional Gaps	3.1Lack of basin treaty 3.2 Ineffective regional forums	Absence of multilateral water-sharing agreements perpetuates unilateralism and conflict.

The evidence suggests that China's infrastructural interventions on the Yarlung Tsangpo have intensified regional hydro-political tensions. India perceives these projects as threats to its territorial sovereignty and water security, contributing to a deteriorating bilateral relationship. Meanwhile, Bangladesh though not directly targeted is caught in the downstream dilemma, suffering from environmental risks and strategic exclusion. Overall, the absence of a multilateral treaty, China's non-participation in international water law, and regional distrust have prevented meaningful cooperation. Instead of fostering integration, these developments have transformed the Brahmaputra from a shared natural resource into a strategic flashpoint, risking long-term regional instability.

Research Question 3: To explore the indirect implications of China's upstream activities on Pakistan's water security and strategic regional posture.

Theme 1: Pakistan's Downstream Dependency and Hydrological Vulnerability

Although Pakistan is not a direct riparian state of the Yarlung Tsangpo/Brahmaputra River, China's upstream projects indirectly affect the regional hydrological system, and by extension, Pakistan's strategic water posture especially due to its downstream dependence on Indus Basin rivers originating in the Himalayas.

Sub-theme 1.1: Interlinked River Systems and Climate Impact

Experts argue that while the Brahmaputra does not flow through Pakistan, climatic and glacial activities in the Himalayan-Tibetan region, influenced by Chinese damming, may eventually impact glacial melt, monsoon cycles, and water availability in the western Himalayas, which feed Pakistan's Indus Basin.

"Hydrologically, what happens on the eastern side of the Himalayas doesn't stay there. Chinese dams may alter climate patterns affecting water flows into Pakistan's northern zones."

(Dr. Pervaiz Amir, Climate and Water Expert, Dawn News, 2023)

Sub-theme 1.2: Regional Precedent and Strategic Spillover

Participants in media discussions raised concerns that China's upstream dominance over the Yarlung Tsangpo may set a precedent for similar control over the upper Indus tributaries, such as the Sutlej and Shyok Rivers, which originate in Tibet-controlled regions.

"Today it's the Brahmaputra, tomorrow it could be the Shyok. Pakistan must view Chinese river engineering as a regional pattern, not an isolated action."

(Col. (R) Hassan Askari Rizvi, Strategic Affairs Analyst, PTV World, 2024)

While no major dam on the Indus headwaters by China has been officially acknowledged, the possibility remains under-discussed but geopolitically potent.

Theme 2: Strategic Realignments and Diplomatic Sensitivities

Sub-theme 2.1: Diplomatic Silence and Strategic Ambiguity

Unlike India, Pakistan has not openly criticized China's upstream behavior, partly due to the China-Pakistan Economic Corridor (CPEC) and strong strategic relations. However, this diplomatic silence raises concerns about future dependency and strategic imbalance.

"Pakistan walks a diplomatic tightrope. Its silence on Chinese dams reflects economic dependence, but this could backfire if Tibet's rivers are ever militarized."

(Editorial, The Express Tribune, 2022)

Several panelists in national television debates emphasized **that Pakistan must maintain strategic autonomy** and **engage in water diplomacy** to protect its long-term interests.

Sub-theme 2.2: Water Security as a Strategic Domain

Pakistan's strategic posture, historically centered on India-Pakistan water disputes under the Indus Waters Treaty, may need to evolve to consider multilateral dynamics, including China's hydrological footprint.

"China is the unseen player in Pakistan's water calculus. Ignoring its hydropower rise is a strategic oversight."

(Dr. Ayesha Siddiqi, South Asian Geopolitics Analyst, Dunya News, 2023)

Theme 3: Regional Hydro-Politics and the Case for Multilateralism

Sub-theme 3.1: The Need for a Broader South Asian Water Dialogue

Analysts argue that Pakistan **must rethink its water diplomacy beyond India-centric narratives and push for regional or trilateral frameworks involving China, India, and Bangladesh especially on climate-induced water threats.**

"Pakistan should join calls for a Brahmaputra basin dialogue not because of direct access, but because of downstream solidarity."

(Asia Water Review Roundtable, YouTube, 2024)

Sub-theme 3.2: Environmental Security as Strategic Security

With China building dams across several Himalayan rivers, the environmental and ecosystemic disruptions are not confined to one country. Sediment flow, aquatic life, and flood management all present regional consequences.

"Water is the next theater of strategic contestation and unless countries like Pakistan engage, they risk being passive recipients of upstream decisions."

(UNESCAP South Asia Report, 2023)

Table 3: ***Summary of Key Findings RQ3***

Theme	Sub-Themes	Key Insights
1.Downstream Vulnerability	1.1Climate-impact linkage	Pakistan is indirectly vulnerable due to interconnected glacial

Theme	Sub-Themes	Key Insights
	1.2Strategic precedent	ecosystems and regional dam-building patterns.
2.Strategic Posture	2.1Diplomatic silence 2.2Limited strategic foresight	Pakistan's close ties with China limit public discourse on water threats, possibly compromising long-term autonomy.
3.Regional Realignment	3.1Call for multilateralism 3.2Environmental security	Pakistan is encouraged to broaden its hydro-diplomatic engagement beyond the Indus Treaty and include regional voices.

Although China's dams on the Yarlung Tsangpo do not directly affect Pakistan's surface water availability, their strategic and environmental consequences are indirectly significant. As upstream control becomes a tool of geopolitical leverage, Pakistan's silence on the issue rooted in economic and political alignment with China may compromise its long-term water autonomy. Moreover, the lack of a basin-wide or multilateral institutional mechanism leaves Pakistan in a reactive rather than proactive position. As a downstream state of Himalayan rivers, and a strategic partner of both China and Central Asian powers, Pakistan should engage in preventive water diplomacy, expand its hydro-political lens, and prepare for an era where transboundary water management is inseparable from national security.

Discussion

China's aggressive infrastructure development on the Yarlung Tsangpo (Brahmaputra) River is reshaping the hydro-political dynamics of South Asia. Through the construction of major hydropower projects such as the Zangmu Dam and the proposed mega-dam at the Great Bend, China is not only meeting its domestic energy and environmental goals but also consolidating strategic control over one of the most critical transboundary rivers in the region. These dam constructions, situated close to India's contested northeastern borders, are not neutral acts of development but are perceived by India and other downstream states as calculated moves to project power and establish hydro-dominance. This behavior is best explained through the lens of hydro-hegemony theory, which posits that upstream states can manipulate and dominate shared water resources to exert political and strategic influence over downstream nations. China, as the upper riparian state and a non-signatory to key international water-sharing treaties such as the UN Watercourses Convention (1997), has taken advantage of this positional authority to operate unilaterally, without meaningful transparency or cooperation with downstream stakeholders.

India, the immediate downstream nation, views China's infrastructural activities as an extension of territorial and strategic contestation. From India's perspective, the construction of multiple

dams in close proximity to Arunachal Pradesh and the withholding of critical hydrological data during the flood season are part of China's broader approach to apply geopolitical pressure in South Asia. This has led to a deterioration of trust between the two nuclear neighbors and triggered countermeasures from India, including ramping up its own dam-building initiatives in Arunachal Pradesh and engaging more actively with Bangladesh through bilateral water-sharing dialogues. The India-China rivalry over the Brahmaputra has also highlighted a regional failure: there exists no multilateral treaty or basin-wide institution for managing the shared waters of the Yarlung Tsangpo/Brahmaputra. Unlike the Indus Waters Treaty that governs water-sharing between India and Pakistan, the absence of any formal institutional mechanism in the Brahmaputra basin has created a dangerous void where unilateral actions dominate over cooperative governance. This has turned a naturally shared resource into a political and strategic tool—fueling water nationalism rather than sustainable development.

Bangladesh, situated farthest downstream, bears a disproportionate share of the environmental risks associated with upstream damming. Although not directly engaged in the Sino-Indian rivalry, Bangladesh suffers from unpredictable flow patterns, intensified seasonal floods, increased sedimentation, and salinization of its agricultural land due to reduced freshwater inflows. Despite these challenges, Bangladesh lacks the institutional or diplomatic leverage to influence upstream decisions. Experts have rightly pointed out that Bangladesh remains the "forgotten stakeholder" in this unfolding crisis. From the standpoint of environmental security theory, this marginalization reflects a broader failure of the region to frame water not just as a resource but as a shared ecological asset critical to human security. As Chinese dams increasingly disrupt the river's natural flow, ecological systems downstream are strained, livelihoods are threatened, and food and water insecurity deepen especially in low-lying, densely populated delta regions like Bangladesh.

Perhaps the most overlooked yet significant finding of this study is the indirect but strategic implications of China's upstream activities for Pakistan. While Pakistan is not a Brahmaputra riparian state, its strategic position and hydrological dependence on the Himalayas link it to the broader impacts of Chinese dam-building in the Tibetan Plateau. Climate experts have suggested that hydrological and climatic interventions in the eastern Himalayas such as large-scale damming and water diversion can influence monsoon systems and glacial behaviors in the western Himalayas, where the Indus Basin originates. This raises the prospect of climate-spillover effects impacting the availability and quality of water that flows into Pakistan. More concerning is the precedent these projects set. China also controls significant parts of the headwaters of the Indus and its tributaries, including the Shyok and Sutlej Rivers. Although no major Chinese infrastructure currently affects these

rivers, the unilateralism displayed on the Yarlung Tsangpo raises the risk that similar strategic developments could be pursued in the future.

What complicates Pakistan's position further is its diplomatic silence on the issue. Unlike India, which has openly contested China's hydro-projects, Pakistan has refrained from criticizing Chinese dam-building due to its deep economic and strategic dependence on China particularly through the China-Pakistan Economic Corridor (CPEC). While this approach may protect short-term bilateral harmony, it leaves Pakistan strategically exposed to long-term water insecurities. The research data indicates that Pakistan's water diplomacy remains overly focused on India and the Indus Waters Treaty, neglecting the growing influence of China as an upstream actor. From the realist perspective, Pakistan must reconsider whether its current alignment serves its long-term national interest, especially as trans boundary water becomes an increasingly important domain of national security. Given the ecological interdependence of the Himalayan river systems, Pakistan has a clear rationale to participate in regional or trilateral water dialogues that include China, even if its immediate territorial waters are not currently affected.

In synthesizing these findings with the study's theoretical framework, we see strong evidence that China is exercising a form of hydro-hegemony by leveraging its geographic advantage to exert political influence, particularly over India and Bangladesh. The realist assumption that states prioritize national power and self-interest is reflected not only in China's strategic dam-building but also in India's countermeasures and Pakistan's cautious diplomatic posture. Meanwhile, the environmental security paradigm reminds us that the river is not just a symbol of national pride or power, but a life-giving system whose destabilization threatens millions across South Asia. The absence of a robust institutional framework, coupled with competing national interests and a lack of transparency, has transformed the Yarlung Tsangpo from a river of peace into a potential geopolitical fault line.

China's infrastructural activities on the Yarlung Tsangpo have had far-reaching implications beyond its borders. These actions have disrupted regional water politics, undermined trust among South Asian nations, and exposed the absence of cooperative river governance frameworks. The study strongly recommends that downstream countries, especially Pakistan, broaden their water diplomacy to include upstream Chinese behavior, recognizing the interlinkages between hydrology, geopolitics, and environmental security. Only through proactive engagement, institutional reforms, and shared ecological stewardship can South Asia hope to prevent its rivers from becoming flashpoints in future regional conflicts.

Conclusion

The findings of this research provide a comprehensive and critical understanding of the strategic, environmental, and geopolitical

implications of China's infrastructure development on the Yarlung Tsangpo (Brahmaputra) River and its broader impact on South Asian hydro-politics and Pakistan's water security. Based on a methodologically sound documentary analysis including expert interviews, televised debates, policy documents, and regional academic literature this study sheds light on how water, as a natural and strategic resource, is being increasingly politicized and securitized in the region.

China's infrastructural projects, particularly the Zangmu Dam and the proposed mega-dam at the Great Bend, are emblematic of the state's broader approach to achieving hydro-hegemony. These projects are designed not only to fulfill China's energy needs through clean and renewable sources but also to assert strategic dominance over critical trans boundary water resources. The hydro-hegemony theory explains how China, by virtue of being the upper riparian state, leverages its geographical position and technical capacity to control the flow, timing, and distribution of water to downstream nations without legal obligation or cooperative engagement. By abstaining from multilateral water-sharing agreements and withholding hydrological data, China has institutionalized a form of water unilateralism that has wide-reaching consequences for regional peace, cooperation, and environmental security.

India, the immediate downstream country, perceives these developments as a direct challenge to its sovereignty, ecological balance, and water security. India's reaction manifested through counter-dam strategies, bilateral pacts with Bangladesh, and public diplomatic resistance confirms the realist paradigm in international relations. In this model, each state acts in its own national interest, seeking to protect and enhance its strategic position in a competitive and often hostile environment. India's fears are not unfounded, especially considering the fact that these dams are constructed close to the disputed border regions in Arunachal Pradesh, which China refers to as "South Tibet." Consequently, China's infrastructural advances serve a dual purpose: they produce renewable energy and act as potential tools of geopolitical coercion in case of military or diplomatic tensions.

Bangladesh, although geographically downstream of both India and China, remains disproportionately affected by the hydrological and ecological consequences of upstream interventions. Altered seasonal water flows, increased sedimentation, and unpredictable flooding patterns have already started to impact Bangladesh's agricultural economy and freshwater availability. Yet, Bangladesh remains the least empowered stakeholder in this equation, lacking the political and economic leverage to challenge the actions of the more powerful upstream states. The environmental security paradigm becomes highly relevant in this context, emphasizing how degradation of natural resources can exacerbate societal vulnerabilities, fuel conflicts, and undermine

long-term development and peace.

Perhaps the most critically overlooked stakeholder in this water power equation is Pakistan. Although it is not geographically connected to the Brahmaputra system, the research finds that Pakistan faces significant indirect implications due to its hydrological, climatic, and strategic interconnectedness with the wider Himalayan river systems. The effects of upstream Chinese activities particularly in terms of glacial melt, monsoon behavior, and potential future damming of Indus tributaries such as the Shyok and Sutlej pose serious risks to Pakistan's fragile water economy. Moreover, China's behavior on the Yarlung Tsangpo sets a strategic precedent. Should China decide to build similar infrastructure on rivers that eventually flow into Pakistan, the lack of any water-sharing treaty or dispute resolution mechanism between the two countries would leave Islamabad in a severely compromised position.

Compounding this vulnerability is Pakistan's strategic silence and diplomatic restraint on the issue of Chinese dams. This silence, largely driven by Pakistan's close economic and security ties with China through the China-Pakistan Economic Corridor (CPEC), may serve to protect short-term political and financial cooperation. However, it also exposes a major strategic blind spot in Pakistan's foreign policy and national security planning. By choosing not to publicly discuss or diplomatically engage China on water-related matters, Pakistan forfeits the opportunity to shape long-term outcomes that will inevitably affect its own hydrological stability.

This study concludes that the absence of a comprehensive, multilateral water governance framework in South Asia especially for the Brahmaputra basin represents a major regional security failure. In a time when climate change, population growth, and environmental degradation are putting unprecedented pressure on shared water resources, unilateralism and infrastructural nationalism only escalate the risks. The Yarlung Tsangpo is no longer just a river; it is now a contested strategic domain where ecological sustainability, national security, and geopolitical rivalry collide.

To address these challenges, it is imperative for regional stakeholders to shift from unilateral to multilateral water diplomacy. For Pakistan, this means extending its water policy vision beyond the traditional confines of the Indus Waters Treaty with India, and including proactive engagement with China on shared water risks and future hydrological developments. This could involve bilateral dialogue mechanisms, confidence-building measures, data-sharing protocols, or participation in regional environmental forums. This study argues that the future of South Asia's water security lies in institutionalized cooperation, mutual transparency, and environmental justice. Without a collective regional commitment to treat rivers as ecological lifelines rather than strategic weapons, the likelihood of water conflicts direct or indirect will continue to grow. As China tightens its grip over Himalayan rivers, and as downstream nations scramble for adaptation, hydro-politics will remain at the

core of regional security dynamics. The time to act is now before the current of mistrust turns into a flood of conflict.

Recommendations

Based on the findings of this research, it is evident that China's strategic infrastructure development on the Yarlung Tsangpo (Brahmaputra) has significantly influenced the hydro-political landscape of South Asia. It has reshaped power dynamics among China, India, and Bangladesh and presents indirect yet increasingly critical implications for Pakistan's water security. To address these emerging challenges and mitigate future risks, the following recommendations are proposed:

1. Initiate Regional Water Diplomacy Platforms: There is an urgent need for the establishment of a South Asian Multilateral Water Cooperation Forum that includes China, India, Bangladesh, Bhutan, Nepal, and Pakistan. This platform should facilitate transparent communication, conflict resolution mechanisms, and collaborative strategies for the sustainable development and equitable distribution of transboundary river resources. This forum should draw upon models such as the Mekong River Commission or the Nile Basin Initiative to ensure a collaborative governance structure.

2. Develop Bilateral Water Dialogues between Pakistan and China: Pakistan must formally initiate bilateral water diplomacy with China, focusing on rivers such as the Indus, Shyok, and Sutlej that originate from Chinese-controlled territories. The current silence on Chinese dam-building projects reflects a diplomatic vacuum that may prove dangerous in the long run. Bilateral water-sharing protocols, early warning systems for floods, and seasonal data-sharing agreements should be prioritized as part of a water-security pillar under CPEC.

3. Strengthen Data-Sharing and Early Warning Systems: A key issue identified is the lack of real-time hydrological data, especially during flood-prone months. China must be encouraged through diplomatic and regional pressure to regularly share river flow data with downstream countries. Pakistan should support satellite-based water monitoring and join international environmental monitoring networks that offer open-source hydrological intelligence.

4. Build Regional Climate-Water Resilience Strategies: Climate change is exacerbating hydrological stress in the Himalayan region. Pakistan, along with other South Asian countries, should develop a regional Himalayan climate-resilience strategy that integrates environmental science, disaster risk reduction, and water conservation technologies. Trans boundary climate resilience should be recognized as a shared survival concern, not merely a domestic issue.

5. Integrate Water Security into National Security Planning: Water security should be treated as a core strategic issue in Pakistan's foreign policy and defense planning. The National Security Policy of Pakistan must recognize trans boundary water challenges, including potential upstream interventions by friendly states like China, as a matter of strategic urgency. Inter-agency coordination between

Pakistan's Ministry of Foreign Affairs, Ministry of Water Resources, and Ministry of Climate Change should be institutionalized.

6. Advocate for an International Code of Conduct on Trans boundary Rivers: Pakistan, in cooperation with India, Bangladesh, and other stakeholders, should lobby for the formulation and adoption of an International Code of Conduct on Trans boundary Water Projects under the UN framework. This would ensure that all riparian states abide by basic principles of equitable use, no-harm, and prior notification before undertaking any major hydrological interventions.

7. Enhance Academic, Technical, and Civil Society Engagement: Water diplomacy must not remain confined to state-level actors. Pakistan should foster academic collaborations, think tank networks, and civil society partnerships with regional and international water research organizations. Educational exchange, joint research, and public dialogue on trans boundary river governance can help build a culture of shared responsibility and long-term peace building.

The growing complexity of South Asia's hydro-politics compounded by China's infrastructural dominance on the Yarlung Tsangpo calls for immediate, coordinated, and strategic policy action. Pakistan, though not directly downstream of the Brahmaputra, must not remain on the sidelines. A forward-looking water diplomacy strategy, coupled with regional collaboration, climate resilience, and institutional reforms, is essential to safeguard national water security and contribute to long-term regional stability. If ignored, the current unilateralism and mistrust could escalate into future water conflicts that no country can afford.

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