

Hydro-Hegemonic Dynamics: China-India Water Geopolitics and Pakistan's Downstream Vulnerabilities

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ABSTRACT

This study analyzes the hydro-hegemonic triangle between China, India and Pakistan, which is the formation of water geopolitics. China is the undisputed upstream owner of the river systems on the Tibetan plateau, India has two stakes: the upstream position in the Indus river of Pakistan; and the downstream position relative to China in the Brahmaputra; and Pakistan is extremely vulnerable on the downstream side. The study is based on qualitative approach and follows the perspective of Hydro-Hegemony (Zeitoun and Warner) to critically discuss the transboundary water treaties, dam construction data, hydrological records and recent policy developments in which the Indus Waters Treaty (IWT) was suspended by India in April 2025. The significant result is that the Medog Hydropower Station in the Yarlung Tsangpo-Brahmaputra is China's biggest damsite investment, estimated to be over 60,000 MW, in upstream resource capture in South Asian hydropolitical history. With 95% of the surface water in the country flowing through the Indus system, the IWT suspension puts a strain on the water resources of Pakistan. The paper seeks to advocate a "triangulated" perspective on "hydro-hegemony," in which Chinese 'upstream' decisions feed into the strategic calculus of the Indian decision-makers, leading to a growing sense of insecurity for Pakistan. Results are policy-relevant for region-wide multilateral water governance reform, IWT modernisation and hydro-diplomacy for adaptation to climate change.

Keywords: Brahmaputra-Yarlung Tsangpo, China-India-Pakistan Nexus, Hydro-Hegemony, Indus Waters Treaty, Medog Dam, Pakistan Water Security, Resource Capture, South Asian Hydropolitics.

INTRODUCTION

Background and Context

Tibet is known as the "Third Pole", the "Water Tower of Asia", the largest freshwater reserve in the world outside the Polar Regions, and has the highest average elevation of any region in the world, over 4,500m. Produces the biggest river systems in Asia including Indus, Brahmaputra-Yarlung Tsangpo and Mekong-Lancang which service more than three billion people (Chellaney 2011; Wirsing et al., 2013). China was the sole sovereign government of this plateau, and its upstream riparian position, resulting from the geographic endowment of the plateau, and the deliberate refusal of China to sign several treaties, are unprecedented in history.

In this context, the water-geopolitical triangle between China, India and Pakistan is one of the most dangerous in today's international system. The three countries are all nuclear-armed countries once enemies

with disputed boundaries and co-riparians of river basins vital to their existence. The water sources of both India and Pakistan are used up by the Chinese people and they have complete control over them. The China-China side of the waters has an unmistakable advantage as being used by India and Pakistan. India also becomes the victim of the Chinese dam building of Brahmaputra, and hegemon of Indus against Pakistan. At the bottom of this hierarchy, Pakistan is vulnerable to a 'doubly upstream' threat, without any strong institutional protections (Zeitoun & Warner, 2006; Ebrahim, 2025).

The stakes of the treaty were ratcheted up yet higher when on 23 April 2025 the Indus Waters Treaty (IWT) was abruptly suspended by India, which is in force for 65 years and is facilitated by the World Bank, following a terror attack in the Kashmir town of Pahalgam (Al Jazeera, 2025; NPR, 2025). The basic building blocks of the water governance framework in South Asia is coming under stress and the unprecedented weaponisation of water as a coercive instrument of diplomacy is an indicator of this fact.

Problem Statement

The issue of water being mobilised as a strategic instrument in the triangle of China-India-Pakistan is the principal issue that has been tackled in this paper. The geopolitical rivalry, the lack of security in specific territories, the institutional disparities and the added stresses of population growth and climate change can pave the way for the intensification of the potential mobilization of these devastating resources between nuclear-armed powers. This is a cascading hydro-hegemony, Pakistan is at the bottom of which it lacks positional, material and ideational power to deal with. China refuses to make any legally binding agreement based on the International Water Law. India has decided to take advantage of its upstream position with regards to the Pakistani and also has been requesting transparency from China. Pakistan has only 95% surface water in the Indus system and suffers from multiple challenges from upstream sources and has no means to address them.

Objectives of the Study

1. To discuss geopolitical, territorial, economic, nuclear and upstream positional aspects and conditions which shape China and India's attitude towards the transboundary rivers and regional dominance.
2. Research of how the use of transboundary water can be utilized as a strategic weapon by China and India; dams construction; manipulation of hydrological data, treaties and infrastructure development.
3. To sensitize the vulnerabilities of Pakistan in the evolving dynamics of water geopolitics between China and India, keeping in mind the consequences of the termination of IWT in April 2025 on food security, economic stability and national security of Pakistan.
4. The effect of the climate change such as rapid melting of glaciers in the Hindu Kush-Karakoram-Himalaya region to heighten the hydro-political conflicts and worsen the structural water insecurity in Pakistan.
5. to investigate the possible multi-lateral hydro-diplomatic cooperation, de-escalation mechanisms and sustainable water governance that would be suitable for the twenty first century.
6. To help advance the scholarly discussion of the idea of 'hydro-hegemony' to the level of tri-adic cascading situations.

Research Questions

- RQ1: What geopolitical factors influence China's and India's approaches to shared transboundary rivers in relation to their pursuit of regional dominance?
- RQ2: How are China and India using transboundary water as a tool of strategic power, and through what specific mechanisms?
- RQ3: What vulnerabilities does Pakistan face within the evolving triangular hydro-political architecture, and what measures can it adopt to mitigate cascading upstream threats?

Significance of the Study

There are three levels of significance of the study. In terms of academic work, it addresses a long-standing gap which has traditionally focused on the China-India and India-Pakistan water relations as separate dyads, failing to consider the cascading logic through which Chinese water upstream decisions structure Indian actions in the case of Pakistan. From a policy perspective, the April 2025 IWT suspension has been the most significant hydro-political incident since the 1960 treaty; understanding what underlies this event is crucial for developing IWT de-escalation policies and a new governance regime. The study also has humanitarian implications as the water crises in Pakistan is converging and is posing a food security threat to hundreds of millions of people and is also escalating risks in a nuclear armed region.

Organization of the Paper

Section 2 explores the existing literature and expounds on the Hydro-Hegemony theoretical framework. The qualitative methodology is presented in this section. The empirical analysis is presented in Section 4, which covers three aspects: the upstream hydro-hegemony of China, the hydropolitical frontier between China and India on the Brahmaputra, and Pakistan's downstream plight and the 2025 IWT suspension. Section 5 summarises the results and proposes policy recommendations. The conclusion, limitations and directions for future research are presented in section 6.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Water as a Strategic Resource

The securitisation of freshwater as a strategic resource has a solid scholarly lineage. Gleick (1993) and Homer-Dixon (1999) found that resource scarcity under conditions of low levels of political institutions in areas highly dependent on water resources can intensify political outrage, which can lead to political instability. This was brought to the regional level by the influential work of Chellaney (2011, 2013) in which he documented the effects of China's upstream dam-building as a form of structural coercion for the neighbouring countries. An alternative institutionalist perspective (Wolf, 1998; Brochmann and Hensel, 2009) warns for the “hydraulic determinism” and shows that water conflicts do more to create cooperation than to trigger armed conflicts. The critical hydropolitics literature (Mirumachi, 2015; Zeitoun et al., 2011; Zeitoun et al., 2016) brings together these positions, claiming that there is a need to take into account the distribution of power, the institutional nature, and the strategic decisions of each player in a structurally asymmetric basin configuration to explain the outcomes.

Securitisation has been a feature of the water discourse in South Asia. This securitised frame is evident in Modi's 'blood and water cannot flow together' rhetoric, India's suspension of IWTs after Pahalgam and

Pakistan's labeling of India's water policies as 'act of war'. In the securitised narratives, as argued by Cascão and Zeitoun (2010), active constructions of hydro-political realities happen, and these serve as the basis for legitimising infrastructure projects and interpretations of treaties that would otherwise be normatively limited.

China's Upstream Hydropolitics

China had built more than 23,000 large dams, with more than half of the world's large dams completed by the mid-2020s, from only three large dams in 1949 (Wauters et al., 2024). Chellaney (2011, 2013) defines this approach as "resource capture" – systematic appropriation of transboundary water resources but without a legal agreement. The information control is the second dimension of China's hydro-hegemony. Historically, Beijing has treated hydrological data as a state secret and during the Doklam stand-off with India in 2017, during the peak of the monsoon season, they showed that they were able to weaponize technical information (Subramanian, 2021). China's third option is treaty abstention, whereby China is not a signatory to the 1997 UN Convention on the Law of the Non-Navigational Uses of International Watercourses and which was used to ensure the maximum operational freedom (Chen et al., 2013; Devlaeminck, 2018).

India's Dual Hydro-Political Position

Hydro-politically India is in a structurally ambiguous situation, downstream of China on Brahmaputra and upstream of Pakistan and Bangladesh on Indus and Ganges. The result of this duality is a characteristic "middle riparian anxiety" that is a vulnerability to Chinese manipulation and a strategic motivation to keep a huge leverage over Pakistan. In its relations with Pakistan, India has been characterised as a regional hydro-hegemon (Hussain, 2017; Mirumachi, 2015; Khan & Majeed, 2021). Praise has been extended to the IWT as a model of conflict management (Beach et al., 2000) but it has also been criticized as institutionalizing the advantage of the Indians in the upstream, progressive hydropower control through the interpretation of treaties, rather than by direct violation (Salman, 2008; Raazia, 2024).

Pakistan's Hydrological Vulnerability

Pakistan is one of the water stressed countries in the world (Briscoe & Qamar, 2006). Around 95% of its water source is from Indus system, over 90% of its withdrawals are used for agriculture and its per capita availability fell from more than 5,000 m³ per capita in 1951 to about 908 m³ per capita in 2017 (Ebrahim, 2025; FAO, 2021). These are also exacerbated by governance issues such as huge irrigation conveyance losses (40-60%) and interprovincial allocation conflicts, and inadequate investment in storage facilities (Qureshi, 2011; Anwar & Bhatti, 2018). The effects of climate change amplify these vulnerabilities, with warming rates in the Hindu Kush-Karakoram-Himalaya (HKKH) much higher than the global average warming rate (Lutz et al., 2014; Immerzeel et al., 2020).

Research Gap: Triangulated Hydro-Hegemony

What is still missing in the literature is a systematic and theoretically grounded study and analysis of the triangular hydro-political dynamics of China, India and Pakistan. Previous research has largely examined the China–India and India–Pakistan water relations as two bilateral entities in isolation, overlooking the cascading logic that can condition India's water behaviour with respect to Pakistan, due to Chinese upstream decision-making. The existing literature has largely treated the China-India and India-Pakistan water relations as two bilateral entities in isolation, overlooking the structural conditioning of India's water behaviour due to the upstream decisions of India's neighbour China. A partial exception is offered by

Godara et al. (2024) who do not go so far as complete theoretical integration. This paper directly fills this gap.

Theoretical Framework: Hydro-Hegemony

This study applies the analytical architecture developed by Zeitoun and Warner (2006) and extended by Casção and Zeitoun (2010) and Mirumachi (2015) that was called the Hydro-Hegemony (HH) framework. Based on Gramscian hegemony and Lukes's three-dimensional concept of power, HH conceptualises how power is manifested in relation to transboundary water resources in three ways: positional power, material power, and ideational power. Drawing from Gramscian hegemony and Lukes's three-dimensional power concept, HH proposes three dimensions: positional power, material power and ideational power. Looking at the China-India-Pakistan nexus, the HH framework shows a cascading and hierarchical process: the upstream decisions of China are channeled through strategic considerations in India to create cascading insecurity for Pakistan, a central theoretical contribution of this paper.

RESEARCH METHODOLOGY

Research Design and Approach

This study is of the qualitative, descriptive type and interpretative, which are derived from critical geopolitics and political geography approaches (Mirumachi, 2015; Zeitoun & Warner, 2006) whereby river basins are seen as contestatory sites, characterised by relations of power. It is however an appropriate quantitative approach as the objects of study (geopolitical competition, strategic water use, the instrumentalisation of treaties, securitisation discourse) cannot be quantified and can only be understood in the context of the state practice, institutional processes and geopolitical relations in specific historical and spatial contexts.

Data Sources and Methods

The study used a primary and secondary data. The primary sources include the official legal documents like Indus Waters Treaty, 1960, Ganges Treaty, 1996, Sino-Indus-watercourses Memoranda of Understanding, official government publications of Pakistan, India and China, hydrological data and satellite imagery and reports from Indus Waters Commission. Peer-review academic journals (2020-2026), policy reports from CSIS, Stimson Center, Lowy Institute and Clingendael Institute, and good journalism reporting from Al Jazeera, NPR, TIME Magazine, and Dawn. Two type of analytical approaches are employed: content analysis to analyse the official documents based on the normative and strategic framework, and thematic analysis to find patterns and debates in the secondary documents.

Case Study Design

In this study, a comparison/contrastive case study approach is adopted, both analytically different but causally related hydro-political spaces are compared and contrasted with each other between the two river basins of Brahmaputra and Indus. Brahmaputra is a case in point of the hydro-hegemony of China and the “middle riparian anxiety” of India. The Indus case involves the spillover effects of the hydro-hegemony, from the suspension of IWT till 2025, from India to Pakistan. Comparative analysis can help in identifying cross case patterns, in this case, as patterns of objections from upstream states to binding legal regimes, and how these state-leverage the infrastructure to make the establishment of 'facts on the ground' irreversible, and in bringing to the fore variations in institutional design and the leverage of the downstream states.

Limitations

This study has the following main limitations: (1) the opacity of the Chinese dam operation and hydrological data, which are a source of information asymmetry; (2) the relatively short time period (post-2000) used for the study for judging long-term trends; and (3) the literature studied is primarily in English and may have underestimated Chinese academic views.

ANALYSIS AND DISCUSSION

China's Hydro-Hegemony

The problem of China's hydro-hegemony must be analysed in the context of the National China government's water insecurity that is the core of the Chinese state. Understanding of the deep water insecurity in the Chinese state is crucial in examining China's hydro-hegemony. China has a huge amount of freshwater resources in the world, but at the same time China is facing a serious problem of shortage of freshwater per capita, and there is a serious imbalance in space. Only 19% of water resources are available in the northern part of the country where 64% of territorial area and 47% of the population is living. The northern part of the country, which has 47% of the population and 64% of the country's area, only uses 19% of the water resources. On average, Beijing has ~120m³ of water per capita, similar to the conditions in the desert (Baker Institute, 2022; China Power Project, 2024). The climate change is worsening this domestic problem as 82% of China's glaciers have been retreating since the 1950s (Earth.org, 2023). The South-North Water Diversion Project is one such example of the internal logic of Chinese hydraulic engineering that underpins its transboundary strategy: water from the Yangtze is diverted more than 1400 kilometres to northern cities and projects costs of more than \$62 billion. This local shortage makes the strategic asset of location upstream a key factor.

The Medog (Motuo) Hydropower Station under construction at the Great Bend of the Yarlung Tsangpo in Tibet is the most prominent manifestation of China's hydro-hegemonic policies in today's world. The Medog project, which is believed to be the largest hydroelectric plant in the world with a capacity of more than 60,000 MW and is expected to have an annual generation of 300 billion kWh, is one of them (Lowy Institute, 2025; The Hill, 2025; Modern Diplomacy, 2025). The project is located in close proximity to the Indian state of Arunachal Pradesh which is bordering China, and thus provides the most control of cross border water flows. These systems at this scale alter the timing of water releases, trap sediment and give operators some tactical flexibility when releasing water, but are described as "run-of-river. Together with the existing dams at the Zangmu, Gyatsa and Jiacha, the Medog dam forms the backbone of a far-reaching cascade system which allows Beijing to have unprecedented hydraulic leverage over 50 million people in north-eastern India and Bangladesh (India Sentinels, 2025; Asian Confluence, 2025).

Table 1: Major Chinese Hydropower Infrastructure on Transboundary Rivers of the Tibetan Plateau

Dam / Project	River System	Capacity (MW)	Status (2025)	Downstream Impact
Medog (Motuo) HPP	Yarlung Tsangpo / Brahmaputra	~60,000+	Under Construction	India, Bangladesh: flow regulation, sediment disruption, flood/drought risk

Dam / Project	River System	Capacity (MW)	Status (2025)	Downstream Impact
Zangmu / Dagu / Jiexu Cascade	Yarlung Tsangpo (upper)	~2,510	Operational	India: reduced dry-season baseflows; increased flood risk
Nuozhadu / Jinghong Cascade	Mekong (Lancang)	~5,850	Operational	SE Asia: drought intensification; fishery collapse documented 2019–2020
Three Gorges Dam	Yangtze	22,500	Operational	Domestic benchmark; flood/drought control precedent

Note. Source: Compiled from Wauters et al. (2024); Lowy Institute (2025); Asian Confluence (2025); CSIS China Power Project (2024).

The empirical evidence for predicting the consequences of the Medog Dam for the Brahmaputra comes from China's Mekong (Lancang) River. Eyes on Earth (EoE) research found that during the 2019 regional drought, China continues to hold water in its dams, while the catchment area to which the water is drawn received above average precipitation levels (Stimson Center, 2020). The flow at Chiang Saen in Thailand build up during the monsoon season was not observed to increase in the last five months due to the Chinese cascade dams. This was unprecedented in modern hydrological records, as increased flow was not observed at Chiang Saen, Thailand, for five consecutive months despite the monsoon season. The decreased catches of fish in Cambodia's Tonle sap Lake, the drying up of rice paddies in north-eastern Thailand, and saltwater invasion of the Mekong Delta (Vietnam) were cited as examples of the impacts (Asia Matters for America, 2020). This Mekong precedent would mean that Beijing would divert the river flows to satisfy its own needs, release them when it pleases and withheld downstream states any necessary data to prepare or mitigate. Moreover, China's non-signature of the 1997 UN Watercourses Convention strengthens this attitude by maintaining the operational freedom of the dam operators without any legal responsibilities (Chen et al., 2013; Devlaeminck, 2018).

The Sino-Indian Hydropolitical Frontier

The course examines the hydropolitical frontier between China and India in terms of its institutional void and the nature of the asymmetry. The water governance between the two countries is underdeveloped and stands out as a particular contrast with the strategic importance. There is no treaty of any kind with the two states that govern them regarding sharing water in common. Their entire institutional relationship is with the Memoranda of Understanding for the exchange of hydrological data, which are neither binding nor have any provisions for allocation, dispute resolution or enforcement, but are only for exchanging hydrological data during the monsoon flood season. In the Doklam stand-off in 2017, during the peak of the monsoon, China withheld information on the hydrology of the territory. Hydrological information can be weaponized as was done in the Doklam stand-off in 2017 during the height of the monsoon season (Subramanian, 2021; Ho, 2021). Additionally, following the MoU on data-sharing that expired in 2002, it was not renewed by June 2023 (Geopolitical Monitor, 2025), compounding the already weak institutional framework. In response to such upstream dam-building, India has its own fast-track hydropower programme, which includes the proposed Upper Siang Multipurpose Project (USMP) with a capacity of around 11,517 MW, which aims to create the conditions for establishing prior appropriation rights to Brahmaputra flows and lessen dependence on water from the Chinese-controlled upstream water (Bhattacharyya, 2025). It is a good

example of Jervis' (1978) security dilemma applied to the construction of dams: the building of dams by one state is seen by the other as a threat, which leads to an escalatory spiral neither side is able to disengage from until some other development of the relations takes place in the broader diplomatic realm of issues relating to territory and security.

Table 2: Hydro-Hegemonic Power Distribution in the China-India-Pakistan Triangular Architecture

State	Positional Power	Material Power	Ideational Power	HH Position
China	Dominant: controls headwaters of all major S. Asian rivers	Dominant: 23,000+ large dams; \$62B diversion projects	High: frames dams as development; refuses treaty obligations	PRIMARY HEGEMON
India	Dual: downstream re China; upstream re Pakistan/Bangladesh	Moderate-High: major dam-builder; growing hydropower capacity	Moderate: uses IWT instrumentally; "blood and water" rhetoric; treaty suspension	SECONDARY HEGEMON (re Pakistan)
Pakistan	Weak: entirely downstream on Indus; indirect Brahmaputra exposure	Weak: limited storage (~30 days); severe fiscal constraints	Low: IWT now suspended; no treaty with China; limited legal recourse	DOWNSTREAM VULNERABLE

Note. Adapted from Zeitoun & Warner (2006); Cascão & Zeitoun (2010); synthesised by author.

In accordance with the research question 3 (RQ3), 4.3 Pakistan's Downstream Predicament: Cascading Crises and Structural Vulnerability examines the cascading crises and structural vulnerability in Pakistan. The hydrological condition of Pakistan has a uniqueness, in respect of the structural dependency, the weakness of institutions and its physical vulnerability. The Indus River system is the source of about 95% of Pakistan's surface water resources, which water about 80% of Pakistan's agricultural land and support an agriculture industry which contributes about 24% of GDP and 37% of employment (Ebrahim, 2025; FAO, 2021). In 1951, the per capita annual water availability was more than 5,000 cubic metres, but by 2017, this figure had dropped to about 908 cubic metres – which is near the threshold of absolute scarcity (500 cubic metres per capita) and is due to rise to 372 million per year by 2050 (Shah, 2025). Per capita water storage capacity in Pakistan is about 150 m³ while it is more than 2,000 m³ in China, which leads to increased sensitivity to upstream operations and climatic variability. The suspension of India's participation in IWT on 23rd April 2025, following the terrorist attack in Pahalgam and in the backdrop of the cross-border military tension in May 2025, has been the most significant hydro-political development in the South Asia since the signing of IWT in 1960 (NPR, 2025; Al Jazeera, 2025; CSIS, 2025). The treaty had withstood all wars, the Kargil war of 1998 and various crises during the last 65 years (Khan, 2025). Its suspension breaks one of the main institutional protections for the rights of Pakistan to utilise the water resources of the western rivers and leaves the legal landscape subject to ambiguity and confusion which can be used by India to divert significant amounts from the western rivers. This suspension didn't come out of nowhere. The "blood and water cannot flow together" statement by Prime Minister Modi in the public discourse, since the attack in Uri in 2016, had already intimated a more militarised attitude towards the water management issue (Banerj & Sitaraman, 2025). Expansionary projects Baglihar Dam on the Chenab

(900MW, 0.321MAF storage), Kishanganga project (330MW) on the Jhelum tributary, plans for the expansion of Ranbir Canal and the controversial Wullar Barrage had continued to chip away at the boundaries of the IWT over the years before the formal suspension of the IWT (Salman, 2008; Raazia, 2024).

Table 3: Major Indian Infrastructure Projects on IWT Western Rivers (Contested by Pakistan)

Project	River	Capacity	Status	Pakistan's Legal / Strategic Concern
Baglihar Dam	Chenab	900 MW; 0.321 MAF	Operational	Exceeds IWT run-of-river limits; neutral expert claim (2005); partial ruling favoured India
Kishanganga HPP	Jhelum (Neelum)	330 MW	Operational	Inter-tributary diversion reduces AJK flows; ICJ arbitration (2013) partially upheld Pakistan
Ranbir Canal Expansion	Chenab	~8,000 cusecs	Post-IWT suspension planning	Consumptive diversion; estimated 5–7 MAF additional annual withdrawal; direct IWT violation
Wullar Barrage	Jhelum	Storage barrage	Stalled (1987–present)	Pakistan objects to any storage on western rivers; alleged IWT violation; unresolved

Note. Compiled from Salman (2008); Raazia (2024); CSIS Michel (2025); Bhattacharyya (2025).

Climate Change as a Threat Multiplier

Climate Change as a threat multiplier Climate change exacerbates structural hydro-political vulnerabilities listed above. Immerzeel et al. (2020) confirmed that the Hindu Kush-Karakoram-Himalaya (HKKH) region is one of the most threatened water towers in the world. Some 45–50% of the flow in the Indus basin originates from snow and glacier melt, with Pakistan being particularly vulnerable to cryospheric change (Applied Water Science, 2024; Lutz et al., 2014). In the short-term, fast glacier melt leads to increased river flow and with it an increased likelihood of flooding, while in the medium to long term the loss of glaciers will lead to significant reduction in dry-season baseflow, resulting in permanent water deficits in the Indus plain (Shah, 2025). Research estimates that water demand in the Upper Indus Basin will grow by 66% from 35.74 billion cubic metres in 2020 to 60.28 billion cubic metres in 2035 (MDPI, 2024), leaving this region with ever increasing demand and a growing gap between demand and supply as the IWT is suspended and diversion plans from India are implemented.

Table 4: Pakistan's Water Security Indicators — Trajectory and Threshold Analysis

Indicator	Current (c. 2025)	Projected Risk (2050)
Per capita water availability (m ³ /yr)	~908 (2017–2025)	Below 500 (absolute scarcity threshold) at current trajectory
% surface water from Indus system	~95%	Increasing precariousness given IWT suspension and Indian diversion plans

Indicator	Current (c. 2025)	Projected Risk (2050)
Water storage per capita (m ³)	~150 (vs. China: 2,000+)	Severely under-built; no significant expansion without major investment
Glacier-dependent share of Indus base flow	~45–50%	Long-term decline post-peak water (~2040–2060); permanent dry-season deficit
Agriculture's share of water consumption	>90%	Unsustainable without major irrigation efficiency reforms and IWT restoration

Note. Compiled from Ebrahim (2025); Shah (2025); FAO (2021); Immerzeel et al. (2020); MDPI (2024); World Bank (2019).

RECOMMENDATIONS

For Pakistan: Immediate Actions (2025–2027)

One, Pakistan need to have a sense of urgency in playing multilateral diplomacy. It should formally call World Bank's good-offices mechanism (Article IX, IWT) to action, bring the suspension before the UN Security Council as an issue involving international peace and security and involve the Shanghai Cooperation Organisation (SCO), of which both Pakistan and China are members, to internationalise the matter. The IWT suspension is described by the Clingendael Institute (2025) as "a pause on cooperation, not an end" – Pakistan can use this language and at the same time, keep up the legal pressure through international arbitration.

Secondly, there is the need to improve Pakistan's water holding capacity in a hurry. Pakistan's buffer against upstream manipulation is very low at around 150 cubic metres per capita as compared to 225 and 2000+ per capita in India and China respectively. Domestic priorities include expediting construction of the Diamer-Bhasha Dam, enforcing the 1991 Water Apportionment Accord, and a national programme to improve irrigation efficiency, focusing on the estimated 40–60% conveyance losses (World Bank, 2019; IISD, 2021).

Thirdly, Pakistan needs to work on water data sharing with China on a bilateral basis. In spite of China being upstream on the Indus tributaries in Gilgit-Baltistan and China's political leverage in promoting stability in the region, with Pakistan being its main geopolitical partner, Pakistan should avail the diplomatic avenues via the CPEC to reach a hydrological data sharing agreement with China, and also seek Beijing's diplomatic pressure to take measures for restoring IWT with India.

For the Region: Medium-Term Governance Reform (2027–2035)

Fourth, South Asian water governance has one key institutional reform left – the setting up of a multilateral Brahmaputra Basin Commission. China, India and Bangladesh should be approached with international help and assistance, either from the Danube River Protection Convention or the UNEP, and would be best served by having a commission made up of the three nations with binding data sharing, environmental flow, sediment management, and an enforceable dispute resolution mechanism that sets aside the precedent from the 1996 Ganges Treaty between India and Bangladesh.

Fifth, provisions of all three states should be included in transboundary water governance that is adapted to climate change. Water Security and Water Cooperation are two issues which are partially separate for Pakistan, India and Bangladesh due to the commonality of vulnerability to Himalayan glacial retreat. The common vulnerability to glacial retreat in the Himalayas partially separates water security from water cooperation in Pakistan, India and Bangladesh. There are also practical measures that can be taken for building confidence without having to resolve underlying political issues, such as joint monitoring programmes, climate triggered treaty review systems, and coordinated flood early-warning systems.

Sixth, the IWT is in need of modernisation, irrespective of the solution of the 2025 suspension crisis. The 1960 treaty was drafted under a hydro regime and demographics that have since changed. Modernisation should include environmental flow provisions, participatory groundwater governance, mechanisms for climate change adaptation, such as for adaptive allocation triggers, real-time, third-party verified data on hydrological conditions and combined flood management provisions.

CONCLUSION

Summary of Findings

In this paper, it has been established that the China-India-Pakistan water geopolitical triangle is a kind of structurally different and highly perilous hydro-hegemonic triangle. The triangular structure is similar to that of the bilateral water disputes that are played out in a cascading logic in which Chinese resource appropriation structurally determines the hydro-political attitude of India towards Pakistan – and turns a Sino-Indian competition into a double downstream vulnerability for a state that is constrained not only by the lack of institutional, material and positional resources to resist the challenges of the upstream state, but also by the lack of resources to withstand the downstream pressures of the second. The triangular structure is analogous to that of the bilateral water disputes that are deployed in a cascading logic: the Chinese appropriation of the water resources structurally shapes the hydro-political stance of India towards the second state, thus converting a Sino-Indian rivalry into compounding downstream vulnerabilities in India. The most significant institutional protection of Pakistan's water access, the Indus Waters Treaty, will soon expire in April 2025, thus ushering a pivotal moment that heralds the end of the potentially most important institutional framework safeguarding Pakistan's water access – at a time when climatic pressures are driving glacial retreat and diminishing the long-term water security of the basin. The construction of Chinese upstream points of hydrological concentration, combined with the suspension of Indian treaties and diversion planning, and the hydrological changes in climatic conditions can lead to a water crisis at the civilisational level, which has implications for feeding several hundred million people.

Theoretical Contribution

The paper introduces the notion of cascading hydro-hegemony – China's hydro-hegemony in the upstream does not have a symmetrical impact on India and Pakistan, but rather leaves India as a vulnerable downstream partner and encourages it to pursue hydro-strategic gains in the upstream zone from its own perceived vulnerability. This cascade shifts the nature of bilateral relations, moving from bilateral power relations to a systemic regional security architecture, which is not captured by a bilateral analytical approach. The study builds on the existing dyadic version of the Hydro-Hegemony framework of Zeitoun and Warner (2006) and applies it to a more complete trilateral cascading. The study applies existing dyadic (Zeitoun and Warner 2006) applications of the Hydro-Hegemony framework, but extends this to a more complete trilateral cascading.

Limitations and Future Research

The main drawbacks of this study are: information asymmetry caused by the opacity of China; the rapidly changed post-IWT suspension environment; the focus of this study is post-2000; and the use of only English language scholarship. Future research should include: (1) quantitative hydrological modelling studies on the Indus system under various diversion and glacial retreat scenarios; (2) analysis of China's strategic calculus on the management of Indus water in G-B; (3) studies about the domestic political economy of water governance reforms in Pakistan; and (4) comparative studies with similar trilateral configurations, like the Nile between Ethiopia and Sudan and Egypt; and the Amu Darya between Tajikistan and Uzbekistan and Turkmenistan; to develop general theoretical understanding of cascading hydro-hegemonic processes.

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Conflicts of Interest

The author has no conflicts of interest with any entity or any commercial entities that are specifically related to this research.

Ethical Statement

All the resources used in this research are secondary sources that are publicly available. There was no primary data that included human subjects. No Institutional Approval was required. This paper is an original scholarly paper and has not been submitted elsewhere for publication.

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