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The Weaponization of Water: Transboundary River Dispute Resolution Frameworks Under Stress

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ABSTRACT

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Increased strategic use of transboundary water for political leverage threatens the resilience of international river governance. Traditional cooperation through treaties and organisations faces growing challenges posed by geopolitical competition, climate variability, and infrastructure inequality. This qualitative study of the Indus, Nile, Mekong, Euphrates-Tigris, and Brahmaputra basins integrates theories of hydro-hegemony, international law, and environmental security. The research defines "water weaponisation" as the deliberate upstream manipulation of flows or infrastructure for political gain when downstream states lack timely institutional recourse. While mechanisms like mediation and joint monitoring are essential, their effectiveness is often undermined by data secrecy, inflexible legal obligations, and broader security conflicts. The study concludes that institutional success depends on facilitating communication and monitoring behaviour during crises rather than the mere existence of a treaty. Proposed reforms include modernised legal protections, "crisis preparedness," independently auditable hydrological data, and climate-responsive allocation rules. These changes aim to reduce the strategic value of unilateral manipulation, thereby safeguarding regional stability.



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Introduction

Transboundary freshwater can be viewed both as an ecological system and as an input to a food or energy production system, as well as a public health medium or a medium for the integration of the exercise of territorial sovereignty by states. Shared rivers are thus physically bonding societies' bodies and, in fact, dividing them into bodies of Jurisdiction. This dichotomy has engendered much cooperation, including the signing of treaties to allocate water, the sharing of data by commissions and river-basin coordination of plans. It also brings strategic vulnerabilities, as water can be stored and diverted upstream, hydropower generation can be scheduled, decisions can be made about whether water is available downstream and when, and information control can manipulate and enhance water quality. Scholarship has now moved beyond deterministic "water war" forecasts to one of institutional capacity, politics, cooperation, and conflict (Wolf, 2007; Biswas & Tortajada, 2019; Zeitoun & Mirumachi, 2008; Varady et al., 2023). The key issue of security is not whether environmental stresses inevitably lead to violence, but under what conditions politics projects environmental stresses onto coercive leverage or destabilizing uncertainty (Gleick, 1993; Koubi, 2019; Mach et al., 2019).

The intentional use of use of weaponisation of water resources, infrastructure, access, or a credible threat of control is considered water weaponisation. It also has a more focused scope than water scarcity (a condition of supply and demand) and water conflicts (incompatible claims), and a more purposeful scope than water politics more generally, the field of hydro politics, which is the politics of water allocation and development. It can take place during times of war, such as in the attack on pumping and irrigation systems. Still, bureaucratic and infrastructural weaponisation weaponization can also be done, for example, an accelerated filling, an abrupt release, or conditional data sharing or even the suspension of cooperative procedures. Examining intent, control, target vulnerability, and political purpose together is necessary not only as Daoudy's (2020) analysis shows, but also to dispel the misconceptions that have shrouded the debate over the Palestinian moment of national liberation and the right to armed struggle. A dam

for electric power and flood-control purposes is not, in and of itself, a weapon. The weaponisation weaponization process starts where operational control is made an explicit coercive influence (or an explicit threat of coercive influence in bargaining).

Problem Statement

In the traditional approach to water governance, an assumption of a compartmentalization prevails: technical institutions are free to carry on information exchanges as political leaders fight about everything else. But this supposition is more and more shaky. But strategic competition can render data "sensitive" while power imbalances can make treatiness "usual state of affairs," while climate change can cause the "fixed rules" to become "maladaptive," and the "securitization" of water can tie the performance of treaties to unrelated conflicts. An acute illustration of the Indus system is provided. On April 23, 2025, India has indicated it would suspend the 1960 Indus Waters Treaty till certain changes are made in Pakistan's behavior, which was rejected by Pakistan. In June 2025, the Court of Arbitration held that such an announcement would not take away the competence of the court with respect to the ongoing Western Rivers case (Ministry of External Affairs, Government of India, 2025b; Permanent Mission of Pakistan to the United Nations, 2025; Permanent Court of Arbitration, 2025). However strong or weak the proposals on both sides, basing a water-governance regime on a broadened security relationship is a qualitative stress test of one of the key arguments in favor of the idea that river institutions are immune to security crises.

Research Gap

There are existing studies that provide strong, but partially disjointed explanations. Under international water law equitable and reasonable uses, prevention of significant harm, notification, cooperation and peaceful settlement is evaluated (McCaffrey, 2019; Leb, 2013; Eckstein, 2020). Hydro-hegemony research demonstrates the ways in which material, bargaining and ideational powers outcome in seemingly cooperative solutions (Zeitoun & Warner, 2006; Zeitoun & Allan, 2008 and Zeitoun et al., 2017). However,

environmental-security research examines the interaction between environmental pressures and vulnerabilities and political institutions, and the river-governance research focuses on the design of the organization and its adaptive capacity (Dresse et al., 2019; Schmeier, 2013; Schmeier et al., 2016; Cosens, 2018). While these reviews of the recent scholarship illustrate the diversity of writing on transboundary issues, they also show that the domains of law, power, climate and governance are poorly integrated, particularly in the context of Global South basins (Varady et al., 2023; Sahana, Dhali, & Lindley, 2024). Still under-studied is how geopolitical enmities get into institutional pressures via strategic water manipulation, and what might prevent this kind of institutional contamination.

Research Questions

The study asks:

- RQ1:** How does the weaponization of transboundary water resources challenge existing river-dispute resolution frameworks?
- RQ2:** What governance mechanisms can strengthen the resilience of transboundary river institutions under conditions of geopolitical stress?

Research Objectives and Central Argument

The first objective is to examine how water weaponization affects conventional negotiation, mediation, adjudication, treaty, and river-basin mechanisms. The second is to evaluate institutional and legal reforms capable of producing resilient governance. The article's central argument is that conventional frameworks become vulnerable not simply because water is scarce, but because they commonly separate allocation from infrastructure operations, legal obligation from verification, and technical cooperation from security crisis management. Where power is asymmetric, these gaps permit control of dams, flows, or information to create political leverage before formal remedies can operate. Resilience therefore requires layered arrangements that preserve communication during crises, generate jointly trusted evidence, regulate infrastructure across hydrological extremes, and connect flexible political management to enforceable legal limits.

Literature Review

The literature refers to the use of “water as a weapon” which encompasses diverse methods of attack on water systems, manipulations of water supplies, and access to water. This is not enough if the impact or result of the implementing project is bad, if it is eerie, if it is adverse downstream consequences. Some indicators of cumulations are helpful: the actor has to have significant control over a water-related asset; it has to take place on purpose, not as an external side effect of something else; the target has to be politically relevant, and to experience asymmetric exposure; and, the act is supposed to be compelling, punitive, deterring, territorializing, or gain bargaining power (Daoudy, 2020). These assets include hydropower scheduling, water-treatment systems, hydrological information, dams, reservoirs and irrigation canals, as well as river flows. The first formulation is the one used to present the concepts of 'weaponization' as opposed to 'contested development'. Infrastructure can be unjust with its redistributions of risk and benefits, even if it is not deployed coercely—or instrumentally, as it were; an apparently technical use of infrastructure like denying access to flood data can be coercive if it appears when and where it is useful as a tool of conflict. This distinction is analytically and normatively significant as it can prevent these types of legitimate "development" claims, and dampen the evidential basis for legal action.

Water is used as a political weapon both by means of capability and communication. Storage provides a timing option, diversion an availability option, hydro cascades a coordinated releases option and data control an option about what is known and can be prepared by downstream states. The communication can be explicit, such as by giving an incentive to cooperate with water policy based on an action taken in another policy area; or implicit, such as through unclear operational discretion that increases the expected cost of withholding cooperation. As agenda setting, financing, expertise and stories of sovereignty or development, finns demonstrated in the hydro-hegemony scholarship, leverage can also function as another mechanism to accomplish this.

Warner, 2006; Zeitoun & Allan, 2008). So coercion doesn't have to include catastrophe flow

termination. There may be bargaining power all on its own: if it is not possible to tell the difference between climatic variation and the operation or failure of the reservoir, industry and politics have to be geared toward the possibility of worst case scenarios. At the same time, cooperation also can be in conjunction with the dominating; routine meetings or data sharing might be a good way to stabilize an inequitable order and not to transform it (Zeitoun & Mirumachi, 2008; Mirumachi, 2015).

Disputes arise out of incompatible sequences of development, sovereignty claims, and demographic and agricultural demands as well as differences in acceptable levels of risk and a decline of the ecosystem. When accepted rules of the game are broken because something has suddenly changed in the physical environment, usually a new dam, diversion or cascade, the most turbulent times happen (Yoffe, Wolf, & Giordano, 2003; De Stefano, Petersen-Perlman, Sproles, Eynard, & Wolf, 2017). What looks like an equitable development and energy security project in the upstream states may be like a threat to established uses in the downstream states. The preferences are not only hydrological; historical entitlement, national identity, territorial issues and local legitimacy all have an impact upon them as well. Discontinuities and changes in institutions are thus found to be more reliable signposts for scarcity than scarcity alone elsewhere (Bernauer & Böhmelt, 2014; Wolf, 2007). The effects of climate change exacerbate this challenge as they increase the “flows” and political salience of drought and flood, but also impact governance, economic dependence and conflict histories (Intergovernmental Panel on Climate Change (IPCC) 2022; Koubi (2019)).

The UN Watercourses Convention of 1997 comprises international water law and establishes equitable and reasonable utilization, participation, prevention of significant harm, cooperation, regular exchange of data and information, prior notification of measures or works planned and protection of ecosystems as pillars of international water law, and peaceful dispute settlement is also established as such a pillar (United Nations, 1997; McCaffrey, 2019). Open now to the world, the UNECE Water Convention (United Nations Economic Commission for Europe, 1992) brings joint bodies and significant institutional elements

to the table in terms of monitoring and assessment, consultation, and prevention of pollution. The ICJ doctrine supports and highlights due diligence and procedural value of cooperation. Pulp and Miga, judges were asked to determine if treaty provisions are covertly binding obligations to uphold environmental standards. Courts in Gabčíkovo–Nagymaros and Pulp were asked to decide balance the parties' obligations to perform the treaty with the new environment norms; in Miga, whether the treaty provisions were covertly binding obligations to respect environmental norms.

It was Mills that drew attention to the importance of notification and environmental impact assessment in lawful water resources management for shared waters (International Court of Justice, 1997, 2010). However, there is some potential ambiguity and flexibility in the law itself, and this has its natural boundaries. Equitable use of the land is not mathematically determinate, but rather is a contextual concept; significant harm' is a contested concept, compulsory settlement is uncommon and procedural responsibilities can be more readily articulated than de facto allocation. Leb 2013 and Eckstein 2020 argue that however, framework norms are not necessarily sufficient to keep power balance at bay or to quickly offer a solution in a crisis of operations.

It is a theory, called “hydro-hegemony”, which rectifies legal-institutional approaches that conceptualize states as negotiators on a formally equal footing. The Basin outcomes are determined by a geographic, military and economic position, technical skills, financial resource and discursive legitimacy (Zeitoun & Warner, 2006). Coercion and utilitarian incentives can all be means by which a hegemon secures compliance, but also consent, acquiescence, bargaining and norm entrepreneurship are ways non-hegemonic actors can respond; the latter two involve the development of counter-hegemonic infrastructure (Zeitoun et al., 2017). The plan also warns against ‘upstream position’, which is not equal to ‘hegemony’. Historically, Egypt had both down-flow vulnerabilities coupled to diplomatic and institutional leverage in the Nile and Ethiopia had the GERD which shifted the material balance (Nasr & Neef, 2016 and Cascão & Nicol, 2016). Upstream/downstream and infrastructural advantages exist in Brahmaputra where China is

upstream, India is downstream as well as upstream with respect to Bangladesh and these roles are dyadic (Ho, 2016; Barua, Vij, & Rahman, 2018). So that is the relation of power, depending on the circumstances of the issue.

Water is connected to environmental security which is connected to state security, displacement, livelihoods, food security, energy security, health and ecological integrity. While earlier studies focussed on the strategic importance of water, recent studies have contested single cause explanations for the link between hydrological stress and war (Gleick, 1993; Mach et al., 2019). Agricultural damages, price shocks, unequal exposure, inadequate services, and political exclusion are those factors that influence conflict risks due to climate hazards. They can also encourage co-operation – institutions bring together issues that are perceived as common problems of co-operation, common risk. This contingent knowledge is at the heart of 'weaponization' - drought doesn't on its own coerce but it enhances the leverage of those who can manipulate storage, releases, or information. On the other hand, through joint drought planning, the political pay-off of manipulation can be reduced by setting up pre-agreed rules and pre-established baselines.

Transaction costs are reduced and expertise is maintained and venues for repeated interactions are created through riverbasin organizations, joint commissions, and treaty secretariats (Schmeier, 2013; Schmeier et al., 2016). They work best including the key riparians and with stable funding, technical independence, as well as monitoring compliance, agree to planned action and escalate issues that cannot be resolved. Resilience brings in a temporal dimension - the ability to take shocks, as described in this document, and still keep working and learn from shocks (Cosens, 2018). A recent comparative study reveals that whilst the existence of institutions of cooperation can help to stop conflict between actors over hydropower, it is institutionalized cooperation itself that is important (Schmeier, 2024). For instance, the Mekong River Commission (MRC), which consists of organizations and individuals from 4 member countries, produces a lot of knowledge, but does not include the State of China and Myanmar, and depends on the extensive use of

consultative procedures. The Nile Basin Initiative puts out basin-wide analysis, but is not the contractual regulating authority of the GERD. An institutional density may thus exist in just the areas where coercive leverage is strongest and a governance gap.

Research Gap

There is a lack in the literature to link the operational anatomy of weaponization with performance of dispute resolution over time. Legal studies: Does behaviour violate a rule? üzerine sorar. Power research: What are the preferences of what group taking precedence? üzerine sorar. Security research: Is there an increase in stress that can lead to malfunctioning? üzerine sorar. Governance research: Do the organizations cooperate or not? üzerine sorar. This missing synthesis relates to sequence: rivalry as a source of asymmetric infrastructure control; asymmetric control as the source of coercive or ambiguous behavior; ambiguous behavior as a source of stress on institutions; and the timing of and delay in, or limitedness of remedies, as a source of escalation. This article seeks to fill the gap in an integrated approach and 5 case comparison.

Theoretical and Conceptual Framework

Hydro-hegemony is an answer to who can/who cannot do what in a basin. It focusses attention on the power to build and to operate infrastructures, to offer an agenda for negotiations, to fund technical skills and to help legitimate preferred interpretations (Zeitoun & Warner, 2006; Zeitoun & Allan, 2008). These capabilities are likely to be most successful at being weaponized if they are centralized and can be opposed with a different scale of investment. But the hegemony can also benefit public goods, if the understood leadership provides information, funds or concerted activities. It, therefore, analyzes the utilization of the power and not just the possession of power.

International water law provides principles for water-related actions. Equitable utilization disciplines the notion of absolute territorial sovereignty, while the no-significant-harm and due diligence principles require the prevention of risk; notification and information exchange stops the element of surprise; and peaceful settlement provides for the existence of "processes" that are

alternatives to retaliation (United Nations, 1997; McCaffrey, 2019). These rules work best when customized in the form of basin-specific thresholds, operating procedures and review mechanisms. They lack fast compulsive relief, not being evenly engaged in treaties, and indeterminacy of weakness.

Environmental security constitutes an exposure by which the hydrological action becomes a political factor. The impact of a disruption of flows or information is increased when irrigation is relied upon for cultivation, there are few storage options, ecosystems are sensitive and public services are weak. These vulnerabilities are exacerbated by climate variability, but political outcomes are determined by these more than by climatic variability (Intergovernmental Panel on Climate Change, 2022; Mach et al., 2019). These are mediated by key concepts that are institutions, distributive justice and state capacity.

Institutional resilience refers to the ability of an institution to maintain communications, provide credible information, handle shocks, modify rules and reestablish collaboration without having to choose between lack of lawful and equitable use and collapse. It is robust and flexible: capacity and intent of arrangements should not be subject to opportunistic suspension, nor should rules be easily subject to change – due to evolution of hydrology and infrastructure (Cosens, 2018; Schmeier, 2024). Too much flexibility allows flexibility in defining the terms of treaties by the more powerful states; too much rigidity renders them useless.

The four perspectives have come together in figure 1. The top track represents escalation—geopolitical rivalry contributes to the power asymmetry, which in turn facilitates focused infrastructure and information control, which is then manipulated for strategic purposes that lead to weaponization, which adds stress due to institutional delays, exclusion and/or ambiguity, and which in turn increases likelihood of escalation of dispute. The lower pathway is related to interruption mechanisms. Limits provided by law, interaction with joint institutions, factual contestation relatively low on the radar through monitoring and political off-ramps through mediation, and adaptive governance practice for climate and infrastructure change. Together they

make for resilience by reducing the belief in the benefit of coercion and enhancing the credibility of co-operative response.

Research Methodology

Research Design

The research method is very qualitative with a structured focused comparison with a systematic analysis of academic and institutional literature. The same array of questions was used for each of the basins and focused on the identification of causal mechanisms—not on a ranking of each case using one conflict index. Searches used terms pertaining to each basin and/or related to weaponisation, hydro-hegemony, international water law, dam operation, data sharing, dispute resolution and climate resilience. Peer-reviewed scholarship was given preference and this was complemented by treaties, court and arbitral cases, UN documents, government statements, and river-basin reports. The review stressed 2018-2026 period of time, while maintaining seminal works to establish theories and legal principles. Sources were selected or rejected according to whether they explicitly discussed transboundary interaction, institutional design and/or legal obligation, hydrological risk, or infrastructure politics without any supporting evidence or analysis, or whether they were advocacy of some form of weaponization of dams without receiving support or analysis from the text.

Case Selection

The river basins of Indus, Nile, Mekong, Euphrates – Tigris and Brahmaputra were chosen for their theoretical usefulness for variation. The Indus features both a complicated treaty and an adjudicatory ladder, as well as a heightened rival between the states. The Nile is partly a basin project and it has yet to find a consensual definition of rules needed for the transformative upstream dam. In the Mekong basin, the organisation in the lower part of the basin is relatively well developed, but does not have full involvement of the important upstream power. The Euphrates–Tigris has high levels of infrastructure control upstream and is highly segmented, mainly with bilateral governance. The Brahmaputra brings to India a strange mix of strategic considerations, rampant infrastructure boom, data deals, and minimal institutionalization

in the region. As a group, they range in their treaty density, level of organization, power-upstream as opposed to downstream, level of water dependence, and degree of exposure to climate change, so as to see how and why some are abler to absorb shocks than others.

Data Sources

Peer reviewed articles, academic books are all in the evidence base, and the UNECE evidence from 1992 and the academic evidence from 1997 are also included.

UN conventions; material in the Indus and Mekong agreements (1960 and 1995) as well as the GERD Declaration of Principles (2015), ICJ and arbitral decisions, reports by the World Bank, Nile Basin Initiative, Mekong River Commission and official statements where contemporary state positions itself are analytically relevant. Government statements are interpreted as views, not as unbiased findings and are counterchecked with legal and/or scholarly materials.

Analytical Dimensions

The comparison is operationalized in table 1. Institutional resilience: observed and/or potential capability to maintain communication and evidence production, rule-based functioning and escalation control during shocks. To the conclusion that there is a risk of weaponization, the joint assessment of controllable assets, asymmetric vulnerability, political intent or signaling, and weak recourse are necessary, with adverse impact alone insufficient.

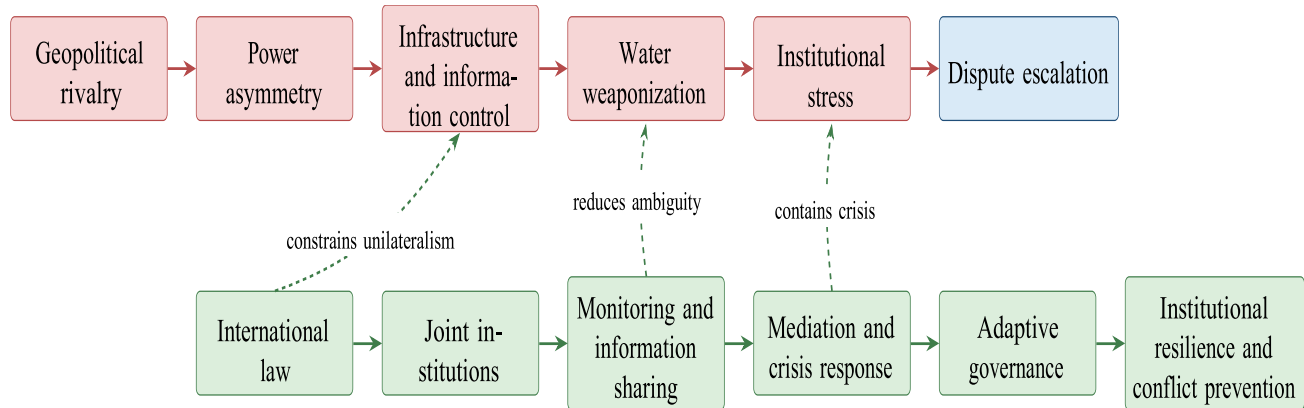
Water Weaponization and Transboundary Governance Under Stress

When a state's control of water use is coupled with a political requirement it creates strategic coercion; the potential of inducing another state to make operational changes because of uncertainty of operation creates strategic coercion. It's a behavioral, not a rhetorical threshold. But it does not mean that an allegation that a project renders the upstream project a threat is in itself an allegation of weaponisation and vice versa that an invocation of sovereignty from the upstream project negates a possible coercion. There needs to be a relationship between the capability, intent and target. This criterion accounts for the fact that in times of war, the seizure or disruption of

pumping is a clear case while the construction of dams is typically a continuum between the cooperative development and deployment of the risk, whereby in certain operational and/or diplomatic scenarios, dams can be transformed into a weapon (Daoudy, 2020; Mianabadi, Davary, Mianabadi, & Karimi, 2020).

Rivers have geographically changed their time dimension as a result of dams. They may help to reduce floods, produce low carbon energy, to provide irrigation and to assist in managing droughts; but they also focus on discretion in filling and releasing. The cascades amplify the effect of that discretion as there can be cascading effects on both seasonal signals and sediments and on quantity (Grumbine, Dore, & Xu, 2012, Middleton, 2022). Manageable control, not capacity, is key to strategic power: hydrology, reservoirs design, downstream tributaries, electricity market needs, safety considerations all constrain power manipulation. Even when infrastructure does not exert their coercive potential, however, it still has one if it operates by the rules that are untransparent and not to be notified. The political impact partially resides on downstream expectations of the action that can be taken by an upstream overload in times of drought or crisis.

Asymmetries in bargaining power with respect to time, capabilities or outside options are not eliminated through formal sovereign equality. If a state is strong then it can withstand the possibility of negotiation delay and the creation of "facts on the ground" through construction; if the state is more dependent, it can implicitly be given "procedurally cooperative but substantively undesirable" options. Thus, hydro-hegemony renders the observation of the sometimes counterproductive power of reproduction by institutions in line with the theory (Zeitoun & Warner, 2006; Zeitoun et al., 2017). However, asymmetry doesn't always remain constant. The counter-hegemonic infrastructure, legal mobilization, coalition building and access to finance are important factors which can shift the balance of power, as GERD has done in the Nile. Especially when undergoing these transitions, institutional resilience calls for mechanisms to stay legitimate rather than giving inherited allocations anything like a new semi-legality or a legal vindication of new capabilities.

Figure 1: *Conceptual Framework of Water Weaponization and Transboundary River Governance Under Stress***Table 1:** *Comparative Analytical Dimensions of the Five River Basins*

Dimension	Operational question	Indicative evidence
Water dependence	How costly is disruption to states and communities?	Irrigation, energy, drinking-water, ecosystem, and livelihood dependence
Power asymmetry	Who can shape options and agendas?	Geography, economic and military power, finance, expertise, diplomatic influence
Infrastructure control	Who controls storage, diversion, release timing, and hydropower cascades?	Dam location, operating discretion, cumulative projects, alternative storage
Legal framework	Which substantive and procedural duties apply?	Allocation rules, equitable use, harm prevention, notification, data, environmental review
Institutional capacity	Can a joint body act continuously and inclusively?	Membership, mandate, finance, technical autonomy, compliance and review powers
Information sharing	Are data timely, reciprocal, standardized, and verifiable?	Real-time gauges, seasonal data, model access, joint monitoring, independent audit
Dispute resolution	Are remedies graduated, accessible, and authoritative?	Negotiation, fact-finding, mediation, neutral expertise, arbitration, adjudication
Climate stress	Can rules perform under droughts, floods, and long-term change?	Drought triggers, flexible allocation, emergency rules, scenario planning
Institutional resilience	Are core functions sustained through political shocks?	Continuity, learning, adaptation, crisis communication, restoration of cooperation

Climate Change as a Multiplier of Water Conflict

The additional institutional stress caused by the

effects of climate change exacerbates the uncertainty in historical flow records used as a basis for allocations or designs and infrastructure design. The impact of the changes on the glaciers

differs case by case because of the changes in glaciological conditions, changes in precipitation, increasingly evaporation and extreme events including increased glacier melt (Intergovernmental Panel on Climate Change, 2022). Climate change alone is not a causal explanation for conflict but it drives a divergence of views about the nature of low flow: is it natural fluctuations or has it been caused by the accumulation of developments and do these exist? It also imbues storage with more political value, thus raising distributional stakes with respect to the operating rules. An absence of drought thresholds, emergency consultation, and periodic review in treaties suggests a license for improvisation for States at a time when it is most lacking.

Information Asymmetry and Strategic Uncertainty

Hydrological information is strategic information and a public good. Better and timely data will lead to better situations/ impacts in flood warnings, reservoir coordination, navigation, agriculture and also in harm attribution. Secrecy and selective data release can be problematic because it can make people less ready and can enable a 'no wrong doors' façade. Data sharing helps foster trust and is often found to be lacking or unreciprocal and/or poorly institutionalized in the case of transboundary practice (Sarfaraz, Hall, & Rotman, 2022). There are still some gaps in information which satellites can help to reduce, but not to the level that operating intentions, gate schedules, or agreed upon drought rules are evident. Therefore, there need to be common principles, duplicate observations, and audits – not simply discretionary goodwill to be resilient.

Erosion of Trust and Cooperative Governance

The loss of trust occurs with infrastructure development without consultation, with securitization of technical processes or with parallel dispute mechanisms giving contradictory outcomes to authorities. Levels of confidence can be rebuilt through repeated interactions, yet only if institutions realize a meaningful – and that is to say efficient – binding effect. Otherwise, talking might result in being act-out. In all five basins, the critical factor is the ability of parties more or less to be able to monitor behavior and to have access to some kind of legitimate process before there are

costs of controversial operations that can never be recovered. That is why the design of institutions must overcome two obstacles: the legal dimension of dispute resolution for allocating rights and the political dimension of conflict management for limiting conflict escalation and inducing compromise and exploring "outsides the box" that may not be placed in a tribunal.

Comparative Case Analysis

Indus River Basin

On one hand, Indus Water Treaty is a net worth of cooperation and on the other, it is an example of rigidity. It assigns the eastern rivers mainly to India, the western rivers mainly to Pakistan and makes provision for certain uses such as restrictions on hydropower development by India on western rivers (Government of India and Government of Pakistan, 1960). It has an unusually detailed escalation ladder, consisting of its Permanent Indus Commission, Neutral Expert process and the Court of Arbitration, which help to clarify design and environmental-flow promises and do not break the treaty (World Bank, 2018; Permanent Court of Arbitration, 2013). This architecture has contributed to providing continuity of cooperation during times of war and crises (Zawahri, 2009). However, within an integrated basin planning context the implementation of integrated planning in this region was hindered by the river allocation system in terms of partition, and the impacts of climate change, groundwater and ecosystem requirements are still underrepresented (Akhter, 2015; Desai, 2021). There were problematic ambiguities in the parallel proceedings in Kishenganga and Ratle before both expert and arbitral tribunals. India's announcement of abeyance in April this year has connected the operations of the treaty to the broader security ties. Sovereign and security concerns was how India justified the step, Pakistan challenges its legality while the arbitral tribunal attempted to assert its competence (Ministry of External Affairs, Government of India, 2025b, Permanent Mission of Pakistan to the United Nations, 2025, and Permanent Court of Arbitration, 2025). This episode does not argue that flows can be used as weapon(s), but that even after a long-term treaty is concluded, institutional involvement can become a strategic mean. Historically, the Indus faces, therefore, a low risk

of failure, but the current legal density puts unilateralism under pretty high pressure; legal density cannot, however, flank political insulation.

Nile River Basin

The Nile case is an example of a change in hydro-hegemony. Ethiopia's downstream neighbors are uncomfortable about the country's new proposed water redirections, particularly Ethiopia's build-out of the GERD, its water securitizing measures as it sees, and water development – an equitable development – according to Ethiopia. There are mixed motives on Sudan's part that range from benefits of regulated flows and power to safety and coordination issues. In the Declaration of Principles in 2015, the 3 countries pledged to cooperate with each other, to use the dam in an equitable manner, to do no significant harm, to share information, for dam safety and for peaceful settlement (Arab Republic of Egypt, Federal Democratic Republic of Ethiopia and the Republic of the Sudan, 2015). However, the Nile Basin Initiative also provides good knowledge about the basin but is not a legally binding operating authority, or Nile Basin Institute, of three partners. In this sense, GERD thus moved material power quicker than the possibility of rules' adaptation, setting up a counter-hegemonic development, if not weaponization per se (Nasr & Neef, 2016; Cascão & Nicol, 2016). There are notable opportunities within the joint filling and operation of reservoirs, particularly for the case where drought risk and related reservoir decisions are managed cooperatively (Wheeler, Jeuland, Hall, Zagana, & Whittington, 2020; Basheer et al., 2023). The key point on the governance failure is not the dam itself; it is that there have not—and cannot—be other more binding and trustworthy procedures relating to droughts, refill, data and also relating to dispute response. Unilateral operation can induce coercive perceptions even if no coercive intent is involved since no jointly enforceable expectations are possible; any unilateral operation infringes ex ante on the expectations downstream states hold, leaving them unable to enforce those expectations as they would like. Thus, from a technical perspective Nile resilience is considered to be of moderate level; but, politically-operational level is considered low.

Mekong River Basin

The Mekong is a mix of advanced cooperation and structuring out. Under Mekong Agreement of 1995, Mekong River Commission (MRC) was set up involving Cambodia, Laos, Thailand and Vietnam with procedures of data exchange, Water Use Monitoring, Notification, Prior Consultation and Agreements (1995), Cambodia, Lao People Democratic Republic, Thailand and Viet Nam. MRC has developed basin models, drought and flood services, strategic assessments and forums which have maintained vexatious projects in a regional diplomatic process (Kittikhoun & Staubli, 2018; Mekong River Commission, 2021). China and Myanmar are dialogue partners, however, and Laos' mainstream projects have a tangible impact on the operations of the basin, as well as those of China's upstream projects in cascade. Hydropower delivers energy and income but this is not equal due to the environmental, fishery, sediment and livelihood impacts (Grumbine et al., 2012; Middleton, 2022). China has used its Lancang–Mekong Cooperation to increase engagement and sharing data, and has been able to set the agenda for priorities in the region with a parallel institution, Wang (2022) observed. MRC consultative processes rarely provide a remedy or a 'veto' and national development decision may exceed regional assessment. The Mekong is not, therefore, a straightforward narrative of weaponization upstream: climate, multiple dams, markets and national projects interact. It is comparatively strong in terms of its technical cooperation but is weak in respect of its complete membership and its restricted powers in respect of its cumulative operations. Resilience is medium: Information Dialogue less surprise, but asymmetry exists where the most consequential operators are bound that is not the case.

Euphrates–Tigris River Basin

The Euphrates-Tigris is highly upstream downstream dependent, has massive infrastructure developments in Turkey, conflicting development plans by the member countries, and lacks an overall basin-wide agreement. Often Turkey has viewed the rivers as one transboundary system, focusing on efficient utilization, while Syria and Iraq have focused on the international-river status and downstream

rights, minimum-flow requirements (Daoudy, 2009; Kibaroglu & Scheumann, 2013). The Southeastern Anatolia Project (Southeastern Anatolia Region Development Project) and the Ilisu dam are intertwined with issues of domestic development, Kurdish politics, war in the region, affected infrastructure, and inadequate water management downstream (Warner, 2012). Armed actors have also directly involved themselves with water installations in Syria and Iraq, where the basin is also under the focus of weaponization literature (Daoudy, 2020). Technical and bilateral cooperation are, however, involved in interstate relations. The 2024

Interactions between Turkey and Iraq suggest a resumption of water cooperation; however, it does not establish a framework for water sharing for Syria, or an autonomous water basin authority, and the region still faces the problem of asymmetry when it comes to negotiations about water sharing. Climate aridification and damage to areas by conflict compounds the vulnerability of Iraq and Syria, and the attribution of the damages is obscured by drought-driven, withdrawal and dam operation impacts. Resilience of Governance: governed by loose terms of reference, they are frequently convened or disassembled, and there are no established processes and rules for real-time, basin-wide implementation, needed to differentiate legitimate upstream development from illegitimate upstream manipulation.

Brahmaputra River Basin

The Brahmaputra/Yarlung Zangbo basin spans four countries (China, India, Bhutan and Bangladesh) and has no comprehensive multilateral river-basin agreement or organization. India is a downstream state to China and is a "power upstream" state to Bangladesh. Current cooperation is largely limited to bilateral exchange of hydrological data and at an expert level, with limited attention being paid to allocation and cumulative impact assessment, coordination of dam operation and the establishment of binding dispute settlement mechanisms (Ho, 2016; Barua et al., 2018; He, 2021). The China–India conflict over Tibet also intensifies strategic mistrust, while alarmist pronouncements need hydrological nuancing as significant flows of the Brahmaputra are from the

downstream catchments fed by the monsoon, allowing limited capability to “switch off” the river (Giordano & Wahal, 2024). However, size of infrastructure is important. There was a major infrastructure project in China - the construction of a five-station lower Yarlung Zangbo hydropower project, which started in July 2025. Though Beijing claims that the project will not have any effect on the downstream areas, it does mention the continued cooperation on data and disaster-related issues, India has formally voiced concern about downstream interests and the livelihoods of people in these areas (State Council of the People's Republic of China, 2025; Ministry of Foreign Affairs of the People's Republic of China, 2025; Ministry of External Affairs, Government of India, 2025a). These contending roles don't necessarily mean weaponization. They do illustrate how infrastructure devoid of joint assessment and inspection turns into a security signal which is meant to be read in a context of more extensive rivalry. Brahmaputra resilience is low to moderate, with a foundation being provided by bilateral data channels and limited institutionalisation leading to no dedicated space for cumulative risk, operational transparency and quick conflict management.

Comparative Synthesis

There are three patterns of cross-cases as shown in Table 2. The first is that the Indus is a much better confiner and divertor of conflict than the Euphrates–Tigris and the Brahmaputra are, both of which have a comparatively weaker legal structure. Secondly, legal form does not suffice—the Indus was still being imposed acute suspension pressure and the Nile Declaration is still principles without operations. Third, inclusive technical institutions are one way of enhancing resilience, and the extent to which they are effective is dictated by membership and authority. Despite the MRC being technically able, binding all upstream operators is impossible, and the NBI is basin-wide in knowledge production, but on the periphery of GERD operation. In general, there is an increase in the risk of weaponization when there is no observation of infrastructure discretion, information asymmetry and geopolitical rivalry intersect, and dispute resolution processes take a long time or are politically discretionary.

Table 2: Comparative Assessment of Transboundary River Governance Mechanisms

Dimension	Indus	Nile	Mekong	Euphrates–Tigris	Brahmaputra
Political rivalry	Very high; India–Pakistan security conflict directly pressures the treaty	High; allocation history, GERD, and regional alignments	Medium; development rivalry within broader China–Southeast Asia asymmetry	High; wars, Kurdish question, and competing security agendas	Very high; China–India territorial and strategic rivalry
Power asymmetry	India has material advantage; treaty constrains discretion	Historically Egypt-centered; GERD shifts material leverage toward Ethiopia	China has upstream and economic leverage; Laos also controls mainstream projects	Turkey has upstream, infrastructural, and bargaining advantage	China upstream of India; India upstream of Bangladesh; dyadic asymmetries
Infrastructure pressure	High; cumulative run-of-river design disputes	Very high; GERD transforms storage and operation	Very high; upstream and mainstream cascades	Very high; GAP and Ilisu amid downstream fragility	Rising sharply; major Chinese and Indian projects
Legal framework	Strong, specific 1960 treaty, but rigid and politically contested	Fragmented; 2015 principles without final operating agreement	Moderate; 1995 agreement applies to four lower riparians	Weak and bilateral; no comprehensive basin treaty	Weak; memoranda and data arrangements, no allocation treaty
Institutional capacity	Permanent commission plus expert and arbitral mechanisms	NBI provides knowledge; no binding GERD operating body	MRC has substantial technical capacity but incomplete membership	Intermittent committees and bilateral cooperation	Expert-level bilateral channels; no basin organization
Information sharing	Treaty-based but vulnerable to political disruption	Politicized and incomplete for reservoir operations	Comparatively developed, though upstream coverage is uneven	Limited, fragmented, and difficult to verify	Seasonal and bilateral; reciprocity and continuity concerns
Dispute-resolution capacity	High on paper; parallel procedures and abeyance dispute create stress	Repeated negotiation and mediation; weak binding closure	Consultation and diplomacy strong; enforceability limited	Low; diplomacy dominates, with little compulsory process	Low; political dialogue without standing adjudicatory path
Climate vulnerability	Very high: glacier, monsoon, drought, and demand pressures	Very high: drought sequencing and evaporation-sensitive storage	Very high: drought, floods, salinity, sediment, and delta exposure	Very high: aridification, drought, ecosystem decline	High: glacier, extreme flood, monsoon, and seismic risks
Governance resilience	Historically high, currently exceptional political stress	Moderate technical potential, low operational legalization	Medium: strong knowledge systems, limited authority and inclusion	Low	Low to moderate

Evaluation of Existing Dispute-Resolution Frameworks

Negotiation is crucial due to states having control over infrastructure and many issues can be discussions of political, distributive choices that are outside the competence of court. It's flexible and can be enhanced with energy packages, trade and benefit sharing packages. But it has one major problem: it is easily subject to delaying and bargaining asymmetries, construction can keep going and negotiations can just carry on, turning it into a management of a *fait accompli* problem. Bilateralism might be implemented, but can lead to a division of multilateral basins and to exclusion of the most vulnerable riparians.

Technical expertise, face-saving compromise and guarantees may be provided by mediation as in the Indus case illustrated earlier in the history of the World Bank (World Bank 2018). Mediators,

however, can only be legitimate politically. No mediation is compulsory or can stand in for agreed evidence and parties can forum shop among regional and global actors. The most useful is for structuring the process, documentation and for making offers packages.

Arbitration and adjudication elucidate a legal claim, correspond with anticipation and authorize unbiased expertise. Both Indus arbitration and ICJ jurisprudence demonstrate their ability to formulate the roles or duties in relation to environment and procedure (International Court of Justice, 2010; Permanent Court of Arbitration, 2013). Nevertheless, they are slow, contented, reactive and not very useful in the real-time control of reservoirs. Perhaps a “dispute” can be considered a political one for which a legal ruling would settle. The necessity to complement this is therefore the interim measures, speeded-up expert

panel and compliance review.

Rules, institutions and procedures diminish uncertainty by means of treaties. Their durability is related to the scope and adaptability. Fixed allocations can give clarity but lack flexibility to the climate and infrastructure change; framework principles can be flexible, but open to alternative interpretation. Amendment/review clauses, drought/flood provisions, environmental flows requirements and some protection against unilateral suspension of treaties should be in place. As with the Indus, there is a lawful and stabilizing and at the same time very present and modern force in detailed legalization.

River-basin organisations help to maintain institutional memory and provide an institutional level beneath the high politics (Schmeier (2013); Schmeier, et al. (2016)). They need to be inclusive, receive delegated authority, have stable finances and have available data for their effectiveness. The MRC has strong technical worth while simultaneously showing the flaws of the advisory power and not having complete participation with the upstream players. The assessments of the organisations should refer to changes in incentives and changes in operations, rather than to the number of meetings.

When thinking about benefit sharing, the types of bargaining can shift from sharing volumes to trade in electricity, flood control, navigation, improved irrigation efficiency and recovery of the ecosystem (Dombrowsky, 2009). Politically appealing if there are direct benefits and vice-versa but it can also result in unequal costs or compensation for legal rights. Transparent valuation, the involvement of affected communities, the guarantee of delivery and making sure there are no strings attached to the water are essential to credible benefit sharing.

Joint monitoring is the most precise reaction on the strategic uncertainty. “Manipulation can be more easily detected through shared gauges, and legitimate operation more strongly defended through shared reservoir dashboards, drought indicators, flood warnings and independent audits in accordance with Mekong River Commission (MRC) guidelines.” (2023 Mekong River Commission (MRC); Sarfaraz et al., 2022). The issue with this isn't sovereignty, but real time operational data in some cases can be considered a security issue. One solution to this is to manage access to a layered system and have trusted technical stewards, reciprocal requirements, and publication of agreed indicators but not all the data.

Table 3: Effectiveness and Limitations of Transboundary Water Dispute-Resolution Mechanisms

Mechanism	Effectiveness	Political feasibility	Legal enforceability	Adaptability	Performance under geopolitical stress
Negotiation/bilateral diplomacy	Essential for distributive bargains and issue linkage	High entry feasibility; outcomes skewed by power and delay	Low unless incorporated into binding text	High	Preserves contact, but may become positional or performative
Mediation/facilitation	Useful for process design, expertise, and face-saving compromise	Medium; depends on accepted mediator	Usually low to medium	High	Valuable as an off-ramp, vulnerable to forum rivalry
Arbitration/adjudication	Clarifies rights and authoritative interpretation	Low to medium; consent and jurisdiction contested	High for parties, implementation may remain political	Low to medium	Strong legal signal but often too slow for operational emergencies
Treaty-based governance	Creates stable expectations and institutions	Medium; difficult to conclude or amend	Medium to high depending on design	Variable; often insufficient	Durable if politically insulated; brittle if suspension or exit is easy
River-basin organizations	Sustains expertise, data, and repeated interaction	Medium to high when inclusive	Low to medium unless powers are delegated	Medium to high	Can maintain technical cooperation, but may be bypassed by major powers
Benefit sharing	Expands positive-sum options	Medium; distribution and valuation are contested	Medium if contractualized	High	Can lower rivalry, but cannot replace rights or harm safeguards
Joint monitoring/early warning	Reduces uncertainty, improves attribution and preparedness	Medium; sovereignty and security concerns persist	Medium with reciprocal protocols	High	Highly resilient if systems are redundant and independently auditable

From the results obtained from Table 3 it is evident that no mechanism is performing well in all the criteria. The most robust architecture is thus of four levels: negotiation with regard to distributive choice; expert determination with regard to technical issues; mediation with regard to crisis management; adjudication for shutting down a dispute in the law; and continuous joint monitoring in order to avoid that factual disputes turn into security crises.

Toward a Resilient Transboundary Water Governance Framework

Disagreements should include such requirements as equitable use, minimizing harm, notification, exchange of data and Environmental Assessment for construction and operation. They should also limit unilateral suspension, have an expedient interim process in place and periodic review. Measurable obligations: Principles need to be expressed as measurable obligations in basin protocols (United Nations, 1997; United Nations Economic Commission for Europe, 1992).

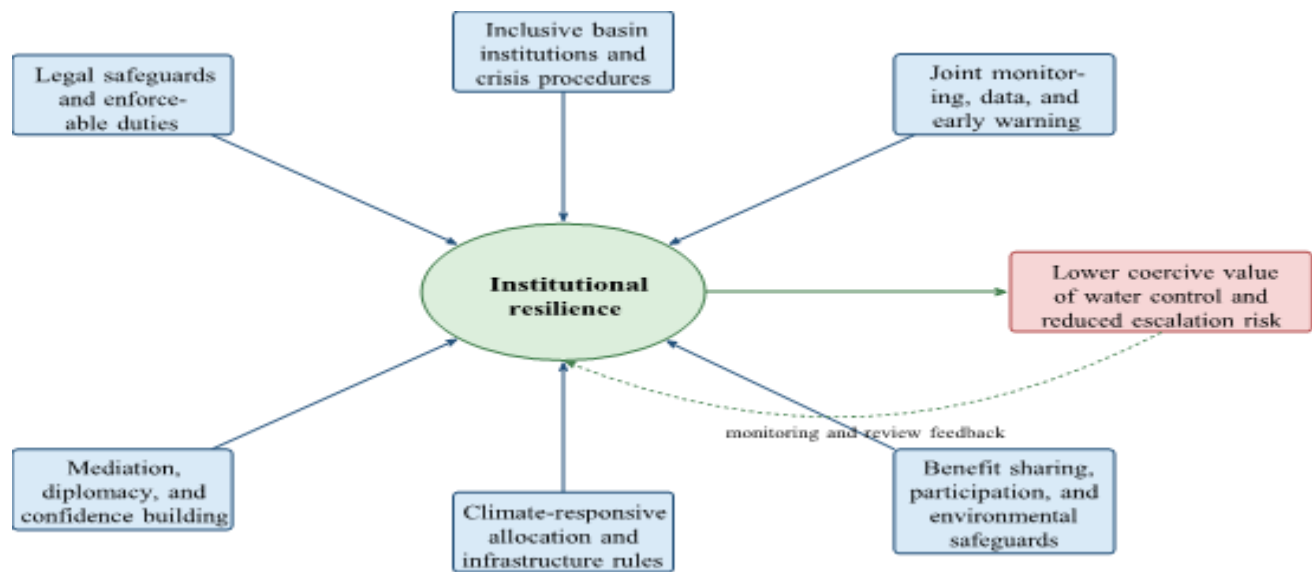
All basins at high risk require a “crisis channel” between the politics and technical players that is safe and protected. The automatic calls should be activated due to serious drought, floods, failures in infrastructure, lack of data and war escalation. A roster of mediators and other experts available to serve neutrally can combat delay with respect to the appointment of mediators.

Resilient monitoring involves common models, independent quality assurance, jointly operated gauges and satellite data along with reservoir levels and times of releases. It lowers the ambiguity and offers operators guard against false

accusations when using a shared baseline. Accredited risk indicators are displayed on the public dashboards and confidential procedures ensure security data is safeguarded in the narrowest of circumstances.

It is essential that pivotal operators be linked to the rules of the basin, whether they're fully members or are bound by protocols or entail interoperability agreements. Climate clauses should be based on drought bands that have flexibility, coordinate refill rules, set environmental-flow floors and should review the scenarios periodically. Established and agreed protocols for transboundary impact assessment, cumulative assessment, safety notification and a plan for coordinated operation for large projects should be followed (International Court of Justice, 2010; Cosens, 2018).

Various formal exchanges and visits, space for joint flood drills in the universities as well as electricity or navigation plans can create constituents for continuity. These measures need to be used as additional to, and not depoliticizing, justice: justice with no view of cost is mistrust; justice without getting affected communities to talk and be heard is distrust as well. An alternative way of visualizing the proposed framework is as an interacting system (Figure 2) instead of as a menu. It is the hotspots lawyers can talk about the rules of the game, atmospheric adaptation can tweak, and diplomacy can handle crises, and technology can verify, and institutions can put in place, and law can regulate. Monitoring and review are done and learning is reflected in constant recalibration of the system.

Figure 2: *Resilient Governance Framework for Preventing Water Weaponization*

Discussion

The comparison provides as an answer to RQ1 a picture that depicts how the temporal and evidential challenging aspects of weaponization, relate to dispute resolution. Conventional mechanisms typically start with a dispute which has been legally manufactured, while coercive advantage can be created *ex ante*, for example by filling decisions, data interruption, institutional suspension or uncertainties. That main governance failure is therefore not necessarily a lack of law; it is a lack of law in the face of very fast accelerating infrastructure action. This is most pronounced in the Euphrates–Tigris and Brahmaputra Rivers but the Indus crisis in 2025 demonstrates the possibility of even dense statute being strategically exerted.

International law still matters as it provides a lexicon by which the lesser powers can challenge sovereignty, and make claims for procedure. But law can only exist in the space of power relations. The potential for compromise is greatest in an area of equitable usage, while indeterminate standards can provide for competing claims and adjudication can clear up the rules and loose ends, but powerful actors can dispute jurisdiction or implementation. Hydro-hegemony and law are thus complementary: the former will account for the generation of rules and their application, and the latter, for due boundaries that, when it comes to a legal dispute, the other party is unable to contract out on.

Many of the ‘conventional’ treaties have tended to

govern over allocation or project design but not cumulative operations, real-time data, climactic extremes, cyber and physical infrastructure security, or links with broader crises. While the Indus is specific and at the same time is have limited, environment-climate adaptation, the Nile principles are broad but are operationally incomplete, and the Mekong regime has an institutional development focus but, at the same time, is geographically incomplete. Settling water positions also depends on the institutions for legal dispute settlement, which cannot solve any identity, territorial or security problems which influence water positions.

To answer RQ2, the focus of evaluating the existence of the institution is taken to discontinuities, verifications, adaptability, and escalation control. Resilient institutions maintain a basic level of cooperation in the crisis, establish facts across all participants and limit the impacts of shocks with previously agreed processes. The cases imply that joint monitoring and traffic between supplier and consumer are not often seen as unusual footholds towards flood control and energy planning, and can be utilized without committing client and supplier to particular allotments. Linking to the legal obligation and neutral review as opposed to being left as voluntary confidence building is an increase in value.

Taking this variation across cases into account, the integrated sequence represented in Figure 1 seems to make sense: Rivalry does not necessarily

promote escalation, but rather through asymmetric control, coercive signaling, and institutional weakness. By contrast, institutions only break up the sequence if the institutions have an impact on information and operations. This conceptually transforms weaponization (in theory) into a governance process and not the "inherent characteristics" of resources or dams. Manipulation should thus be policy's focus, as it is only under opacity, concentration of discretion, delay of remedies, and absence of alternatives that manipulation is useful. Trying to 'depoliticise' shared water is easier said than done and so is reducing those conditions.

Conclusion

Traditional approaches to water conflict resolution at the transboundary level are under threat due to growing geopolitical competition reaching into otherwise technical bodies, alongside increasing climate volatility and the growing importance of operating large infrastructure in the countries concerned. The lack of harmonisation, either in the speed or the transparency of decisions made about dams, flows and data and the speed and comprehensiveness of remedies: "slow" or "not done" or "optional" is the issue in places all across the Indus, Nile, Mekong, Euphrates–Tigris, and Brahmaputra. Make no mistake, water weaponisation doesn't mean water scarcity or even the construction of dams. It may happen in situations of asymmetric control, that are turned into political leverage through intentional or likely manipulation, and in which institutions can no longer provide quick and assured verification and a way to seek recourse.

Implementers of weaponisation will be successful in stressing frameworks by undermining trust, politicising data and participation, playing with legal ambiguities, and setting consequences ahead of adjudication and diplomacy. Resilience is necessary if RQ2 is to be answered; the need is for enforceable procedural safeguards, protected forms of crisis, multi-layered forms of mediation, expertise, and adjudication, joint multi-layered, multi-jurisdictional, and jointly auditable monitoring, basin-wide operating rules geared to support climate responsibility, and inclusive basin institutions. The theoretical contributions are: linking in sequence hydro-hegemony, International law, environmental security, and resilience to explain escalation and interruption. The main policy ramification is that treaties should regulate relations and operations under stress rather than simply distribute water at times when it is not stressed.

The study's positioning as a qualitative study, its use of publicly available information, and the lack of transparency in operations in inferring strategic intent are all limitations. Future studies and analyses should involve a larger sample of reservoirs, use reservoir and satellite data along with process tracing, analyse non-state and cyber threats to water infrastructure, and validate institutional-resilience indicators. With all that being said, the comparative evidence suggests the following: Making the threat of water weaponisation more visible, less operationally viable, and less politically profitable is essential to preventing such weaponisation.

Conflict of Interest

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References

- Akhter, M. (2015). Infrastructure nation: State space, hegemony, and hydraulic regionalism in Pakistan. *Antipode*, 47(4), 849–870. <https://doi.org/10.1111/anti.12152>
- Aldalooi, L. H. (2024). Hydro-political relations between Turkey and Iraq over the Tigris and Euphrates Rivers: Dyadic relationships and structure matter. *Middle East Critique*, 33(4), 593–609. <https://doi.org/10.1080/19436149.2024.2303575>
- Arab Republic of Egypt, Federal Democratic Republic of Ethiopia, and Republic of the Sudan. (2015). *Agreement on declaration of principles between Egypt, Ethiopia and Sudan on the Grand Ethiopian Renaissance Dam Project*. Signed at Khartoum, 23 March 2015.
- Barua, A., Vij, S., & Rahman, M. Z. (2018). Powering or sharing water in the Brahmaputra River basin. *International Journal of Water Resources Development*, 34(5), 829–843. <https://doi.org/10.1080/07900627.2017.1403892>
- Basheer, M., Nechifor, V., Calzadilla, A., Ringler, C., Hulme, D., & Harou, J. J. (2023). Cooperative adaptive management of the Nile River with climate and socio-economic uncertainties. *Nature Climate Change*, 13, 48–57. <https://doi.org/10.1038/s41558-022-01556-6>
- Bernauer, T., & Böhmelt, T. (2014). Basins at risk: Predicting international river basin conflict and cooperation. *Global Environmental Politics*, 14(4), 116–138.
- Biswas, A. K., & Tortajada, C. (2019). Water crisis and water wars: Myths and realities. *International Journal of Water Resources Development*, 35(5), 727–731. <https://doi.org/10.1080/07900627.2019.1636502>
- Cambodia, Lao People's Democratic Republic, Thailand, and Viet Nam. (1995). *Agreement on the cooperation for the sustainable development of the Mekong River Basin*. <https://www.mrcmekong.org/agreement/>
- Cascão, A. E., & Nicol, A. (2016). GERD: New norms of cooperation in the Nile Basin? *Water International*, 41(4), 550–573. <https://doi.org/10.1080/02508060.2016.1180763>
- Cosens, B. (2018). Resilience and law in transboundary water governance. *Idaho Law Review*, 54(2), 235–270.
- Daoudy, M. (2009). Asymmetric power: Negotiating water in the Euphrates and Tigris. *International Negotiation*, 14(2), 361–391. <https://doi.org/10.1163/157180609X432860>
- Daoudy, M. (2020). Water weaponization in the Syrian conflict: Strategies of domination and cooperation. *International Affairs*, 96(5), 1347–1366. <https://doi.org/10.1093/ia/iiaa131>
- De Stefano, L., Petersen-Perlman, J. D., Sproles, E. A., Eynard, J., & Wolf, A. T. (2017). Assessment of transboundary river basins for potential hydro-political tensions. *Global Environmental Change*, 45, 35–46. <https://doi.org/10.1016/j.gloenvcha.2017.04.008>
- Desai, B. H. (2021). Sixty years of the Indus Waters Treaty in the era of climate change: A look ahead in hydro-diplomacy and treaty law. *Environmental Policy and Law*, 51(3), 175–184. <https://doi.org/10.3233/EPL-210013>
- Dombrowsky, I. (2009). Revisiting the potential for benefit sharing in the management of transboundary rivers. *Water Policy*, 11(2), 125–140. <https://doi.org/10.2166/wp.2009.020>
- Dresse, A., Fischhendler, I., Nielsen, J. Ø., & Zikos, D. (2019). Environmental peacebuilding: Towards a theoretical framework. *Cooperation and Conflict*, 54(1), 99–119. <https://doi.org/10.1177/0010836718808331>

- Eckstein, G. (2020). The status of the UN Watercourses Convention: Does it still hold water? *International Journal of Water Resources Development*, 36(2–3), 429–461. <https://doi.org/10.1080/07900627.2019.1690979>
- Giordano, M., & Wahal, A. (2024). Hydro-diplomacy on the Brahmaputra: Examining the interplay of water, territorial claims, and infrastructure. *International Journal of Water Resources Development*, 40(6), 1032–1052. <https://doi.org/10.1080/07900627.2024.2388651>
- Gleick, P. H. (1993). Water and conflict: Fresh water resources and international security. *International Security*, 18(1), 79–112. <https://doi.org/10.2307/2539033>
- Government of India and Government of Pakistan. (1960). *The Indus Waters Treaty 1960*. United Nations Treaty Series, 419, 126. <https://treaties.un.org/doc/Publication/UNTS/Volume%20419/volume-419-I-6032-English.pdf>
- Grumbine, R. E., Dore, J., & Xu, J. (2012). Mekong hydropower: Drivers of change and governance challenges. *Frontiers in Ecology and the Environment*, 10(2), 91–98. <https://doi.org/10.1890/110146>
- He, Y. (2021). Current and future transboundary water cooperation over the Yarlung Zangbo/Brahmaputra River basin: From an interdisciplinary perspective. *Water Policy*, 23(5), 1107–1128. <https://doi.org/10.2166/wp.2021.008>
- Ho, S. (2016). Big brother, little brothers: Comparing China's and India's transboundary river policies. *Water Policy*, 18(S1), 32–49. <https://doi.org/10.2166/wp.2016.103>
- Intergovernmental Panel on Climate Change. (2022). *Climate change 2022: Impacts, adaptation and vulnerability*. Cambridge University Press. <https://doi.org/10.1017/9781009325844>
- International Court of Justice. (1997). *Gabčíkovo–Nagymaros Project (Hungary/Slovakia), judgment of 25 September 1997*. I.C.J. Reports 1997, p. 7. <https://www.icj-cij.org/case/92>
- International Court of Justice. (2010). *Pulp Mills on the River Uruguay (Argentina v. Uruguay), judgment of 20 April 2010*. I.C.J. Reports 2010, p. 14. <https://www.icj-cij.org/case/135>
- Kibaroglu, A., & Scheumann, W. (2013). Evolution of transboundary politics in the Euphrates Tigris river system: New perspectives and political challenges. *Global Governance*, 19(2), 279–305.
- Kittikhoun, A., & Staubli, D. M. (2018). Water diplomacy and conflict management in the Mekong: From rivalries to cooperation. *Journal of Hydrology*, 567, 654–667. <https://doi.org/10.1016/j.jhydrol.2018.09.059>
- Koubi, V. (2019). Climate change and conflict. *Annual Review of Political Science*, 22, 343–360. <https://doi.org/10.1146/annurev-polisci-050317-070830>
- Leb, C. (2013). *Cooperation in the law of transboundary water resources*. Cambridge University Press.
- Mach, K. J., Kraan, C. M., Adger, W. N., Buhaug, H., Burke, M., Fearon, J. D., ... von Uexkull, N. (2019). Climate as a risk factor for armed conflict. *Nature*, 571, 193–197. <https://doi.org/10.1038/s41586-019-1300-6>
- McCaffrey, S. C. (2019). *The law of international watercourses* (3rd ed.). Oxford University Press.
- Mekong River Commission. (2023). *Report on experiences and opportunities for coordinated operating rules and cooperation arrangements on dam operations* (Tech. Rep.). Mekong River Commission Secretariat. <https://doi.org/10.52107/mrc.b193up>
- Mekong River Commission. (2021). *Basin development strategy for the Mekong River Basin 2021–2030 and MRC strategic plan 2021–2025* (Tech. Rep.). Mekong River Commission Secretariat.

- Mianabadi, A., Davary, K., Mianabadi, H., & Karimi, P. (2020). International environmental conflict management in transboundary river basins. *Water Resources Management*, 34(11), 3445–3464. <https://doi.org/10.1007/s11269-020-02576-7>
- Middleton, C. (2022). The political ecology of large hydropower dams in the Mekong Basin: A comprehensive review. *Water Alternatives*, 15(2), 251–289.
- Ministry of External Affairs, Government of India. (2025a, August). *Question No. 2167: China's mega hydropower project on Brahmaputra River*. <https://www.mea.gov.in/rajya-sabha?dtl/39952/>
- Ministry of External Affairs, Government of India. (2025b, April). *Transcript of special briefing by the Ministry of External Affairs, 23 April 2025*. <https://www.mea.gov.in/media-briefings.htm?dtl/39443/>
- Ministry of Foreign Affairs of the People's Republic of China. (2025, July). *Foreign Ministry spokesperson's regular press conference on the Yarlung Zangbo hydropower project*. https://www.mfa.gov.cn/mfa_eng/xw/fyrbt/202507/t20250723_11675813.html
- Mirumachi, N. (2015). *Transboundary water politics in the developing world*. Routledge.
- Nasr, H., & Neef, A. (2016). Ethiopia's challenge to Egyptian hegemony in the Nile River Basin: The case of the Grand Ethiopian Renaissance Dam. *Geopolitics*, 21(4), 969–989. <https://doi.org/10.1080/14650045.2016.1209740>
- Nile Basin Initiative. (2021). *State of the River Nile Basin report 2021* (Tech. Rep.). Nile Basin Initiative Secretariat.
- Permanent Court of Arbitration. (2013). *Indus Waters Kishenganga Arbitration (Pakistan v. India), final award of 20 December 2013*. <https://pca-cpa.org/en/cases/20/>
- Permanent Court of Arbitration. (2025, June). *Indus Waters Western Rivers Arbitration (Pakistan v. India): Supplemental award on the competence of the Court*. <https://pca-cpa.org/en/cases/284/>
- Permanent Mission of Pakistan to the United Nations. (2025, April). *Letter dated 24 April 2025 from the Permanent Representative of Pakistan to the United Nations addressed to the President of the Security Council*. United Nations Document S/2025/252. https://digitallibrary.un.org/record/4081204/files/S_2025_252-EN.pdf
- R. (2017). Transboundary water interaction III: Contest and compliance. *International Environmental Agreements: Politics, Law and Economics*, 17(2), 271–294. <https://doi.org/10.1007/s10784-016-9325-x>
- Sahana, M., Dhali, M. K., & Lindley, S. (2024). Global disparities in transboundary river research have implications for sustainable management. *Communications Earth & Environment*, 5, 786. <https://doi.org/10.1038/s43247-024-01928-0>
- Sarfaraz, M. U., Hall, D. M., & Rotman, R. M. (2022). Data sharing in transboundary water management. *Frontiers in Water*, 4, 982605. <https://doi.org/10.3389/frwa.2022.982605>
- Schmeier, S. (2013). *Governing international watercourses: River basin organizations and the sustainable governance of internationally shared rivers and lakes*. Routledge.
- Schmeier, S. (2024). The role of institutionalized cooperation in transboundary basins in mitigating conflict potential over hydropower dams. *Frontiers in Climate*, 5, 1283612. <https://doi.org/10.3389/fclim.2023.1283612>
- Schmeier, S., Gerlak, A. K., & Blumstein, S. (2016). Clearing the muddy waters of shared watercourses governance: Conceptualizing international river basin organizations. *International Environmental Agreements: Politics, Law and Economics*, 16(4), 597–619. <https://doi.org/10.1007/s10784-015-9287-4>

- State Council of the People's Republic of China. (2025, July). *Chinese premier announces construction of Yarlung Zangbo hydropower project*. https://english.www.gov.cn/news/202507/19/content_WS687b6a8ac6d0868f4e8f4486.html
- United Nations Economic Commission for Europe. (1992). *Convention on the protection and use of transboundary watercourses and international lakes*. <https://unece.org/environment-policy/water/about-the-convention/introduction>
- United Nations. (1997). *Convention on the law of the non-navigational uses of international watercourses*. General Assembly Resolution 51/229, 21 May 1997. <https://legal.un.org/avl/ha/clnuiw/clnuiw.html>
- Varady, R. G., Albrecht, T. R., Modak, S., Wilder, M. O., & Gerlak, A. K. (2023). Transboundary water governance scholarship: A critical review. *Environments*, 10(2), 27. <https://doi.org/10.3390/environments10020027>
- Wang, R. Y. (2022). China's water governmentality and the shaping of hydrosocial territories in the Lancang–Mekong region. *The China Quarterly*, 252, 1149–1172. <https://doi.org/10.1017/S0305741022000615>
- Warner, J. (2012). The struggle over Turkey's Ilisu Dam: Domestic and international security linkages. *International Environmental Agreements: Politics, Law and Economics*, 12(3), 231–250. <https://doi.org/10.1007/s10784-012-9178-x>
- Wheeler, K. G., Jeuland, M., Hall, J. W., Zagana, E., & Whittington, D. (2020). Understanding and managing new risks on the Nile with the Grand Ethiopian Renaissance Dam. *Nature Communications*, 11, 5222. <https://doi.org/10.1038/s41467-020-19089-x>
- Wolf, A. T. (2007). Shared waters: Conflict and cooperation. *Annual Review of Environment and Resources*, 32, 241–269. <https://doi.org/10.1146/annurev.energy.32.041006.101434>
- World Bank. (2018). *Fact sheet: The Indus Waters Treaty 1960 and the role of the World Bank*. <https://www.worldbank.org/en/region/sar/brief/fact-sheet-the-indus-waters-treaty-1960-and-the-world-bank>
- Yoffe, S., Wolf, A. T., & Giordano, M. (2003). Conflict and cooperation over international freshwater resources: Indicators of basins at risk. *Journal of the American Water Resources Association*, 39(5), 1109–1126. <https://doi.org/10.1111/j.1752-1688.2003.tb03696.x>
- Zawahri, N. A. (2009). India, Pakistan and cooperation along the Indus River system. *Water Policy*, 11(1), 1–20. <https://doi.org/10.2166/wp.2009.010>
- Zeitoun, M., & Allan, J. A. (2008). Applying hegemony and power theory to transboundary water analysis. *Water Policy*, 10(S2), 3–12. <https://doi.org/10.2166/wp.2008.203>
- Zeitoun, M., & Mirumachi, N. (2008). Transboundary water interaction I: Reconsidering conflict and cooperation. *International Environmental Agreements: Politics, Law and Economics*, 8(4), 297–316. <https://doi.org/10.1007/s10784-008-9083-5>
- Zeitoun, M., & Warner, J. (2006). Hydro-hegemony a framework for analysis of trans-boundary water conflicts. *Water Policy*, 8(5), 435–460. <https://doi.org/10.2166/wp.2006.054>