Peacebuilding through water cooperation? Institutional design and peace-relevant functions in the Indus and Nile Basins

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Abstract
Transboundary water cooperation is often promoted as a pathway to peace, but empirical evidence remains uneven and conceptually underspecified. This article advances a mechanism-oriented approach that links institutional design to peace-relevant functions and applies it to two high-salience basins characterized by power asymmetry, infrastructure expansion, and recurring political shocks: the Indus (Permanent Indus Commission, under the 1960 Indus Waters Treaty) and the Nile (Nile Basin Initiative, launched in 1999, currently transitioning toward a permanent commission following the Cooperative Framework Agreement's (CFA) entry into force in 2024). Using structured, focused comparison and process tracing across emblematic episodes (Indus hydropower disputes and third-party adjudication; Nile programmatic cooperation, early warning, and the political processes surrounding the Grand Ethiopian Renaissance Dam [GERD] and the CFA), the analysis identifies a pattern of form-function complementarity. Legalized bilateralism in the Indus Basin is comparatively strong at producing "negative peace" functions: stabilizing expectations, reducing misperception through the routine of data exchange and channelling disputes into precisely defined technical-legal forums. Programmatic multilateralism in the Nile Basin is comparatively strong at cultivating foundations of "positive peace" by building shared knowledge, professional networks, and cooperative benefits that broaden society's demand for stability. Neither form is sufficient on its own: legalized regimes can become brittle without adaptive and participatory capacities, while programmatic platforms struggle to contain high-stakes distributive conflicts without credible legalization and mechanisms of dispute settlement. The article concludes that the benefits of peace depend on the success of combining rule-based stability with bounded flexibility, along transparent knowledge systems and legitimacy-enhancing participation, while simultaneously maintaining harmony between the support provided by external stakeholders and the role of the riparian states without undermining ownership.

Keywords
Environmental peacebuilding, water diplomacy, transboundary water governance, Indus Waters Treaty, Permanent Indus Commission, Nile Basin Initiative, hydro-hegemony, dispute settlement, institutional design.

Békeépítés vízügyi együttműködésen keresztül? Intézményi tervezés és békével kapcsolatos funkciók az Indus és a Nílus vízgyűjtőjén

Kivonat
A határokon átnyúló vízügyi együttműködést gyakran a béke felé vezető útként írják le, azonban ezen feltételezés empirikus bizonyítékai egyenetlenek, és az elméleti megalapozottsága is hiányos. A jelen tanulmányban kidolgozott mechanizmusorientált megközelítés az intézményi kialakítást a békéhez kapcsolódó funkciókkal köti össze, és ezt két kiemelt jelentőségű vízgyűjtő területen alkalmazza, amelyekre hatalmi aszimmetria, infrastrukturális bővülés és visszatérő politikai sokkok jellemzők. Ezek az Indus (az 1960-as Indus Vízegyezmény által felállított Állandó Indus Bizottság) és a Nílus (az 1999-ben alapított Nílus-medence Kezdeményezés, amely jelenleg egy állandó bizottság létrehozása felé halad a Kooperatív Keretmegállapodás [CFA] 2024-es hatálybalépését követően) vízgyűjtői. Az elemzés strukturált, fókuszált összehasonlítás és folyamatkövetés segítségével, jellegzetes eseteken keresztül (Indus-vízerőműviták és harmadik fél általi döntőbíráskodás; Nílus menti programalapú együttműködés, korai előrejelzés és a Nagy Etióp Reneszánsz Gát [GERD] körüli politikai folyamatok, valamint a CFA), egy forma–funkció komplementaritási mintázatot azonosít. Az Indus-medencében a jogilag szabályozott bilaterális együttműködés viszonylag erős a „negatív béke" funkcióinak megteremtésében: stabilizálja az elvárásokat, rutinszerű adatcsere révén csökkenti a félreértések lehetőségét és a vitákat jól körülhatárolt technikai-jogi fórumok keretei közé tereli. A Nílus-medencében a programalapú multilateralizmus viszonylag erős a „pozitív béke" alapjainak kiépítésében azáltal, hogy közös tudást, szakmai hálózatokat és együttműködési előnyöket hoz létre, amelyek kiszélesítik a stabilitás iránti társadalmi bázist. Egyik forma sem elegendő önmagában: a jogilag szabályozott rendszerek rugalmatlanná válhatnak adaptív és részvételi kapacitások nélkül, míg a programalapú platformok nehezen kezelik a nagy téttel bíró elosztási konfliktusokat hiteles jogi szabályozás és vitarendezési mechanizmusok nélkül.
A tanulmány arra a következtetésre jut, hogy a békéből származó előnyök attól függenek, hogy sikerül-e ötvözni a szabályalapú stabilitást a korlátozott rugalmassággal, az átlátható tudásrendszerekkel és a legitimációt erősítő részvétellel, mindezt úgy, hogy a külső szereplők támogatása összhangban marad a folyóparti államok tulajdonosi szerepével, anélkül, hogy aláásná azt.

Kulcsszavak
Környezeti béketeremtés, vízdiplomácia, határon átnyúló vízkormányzás, Indus-vízegyezmény, Állandó Indus Bizottság, Nílus-medence Kezdeményezés, hidrohegemónia, vitarendezés, intézményi tervezés.

INTRODUCTION

Freshwater basins frequently cut across political borders, turning water into a collective-action problem in which upstream decisions often generate downstream externalities and uncertainty. In policy discourse, this interdependence is regularly framed as an opportunity: negotiated rules and joint institutions can create predictability, reduce conflict risks, and secure cross-sector benefits (*Conca and Dabelko 2002, Sadoff and Grey 2002*). Yet, the "water for peace" narrative sits alongside two persistent doubts. First, cooperation is common, but peace outcomes are not automatic; many river basins have agreements while still experiencing intense securitized bargaining. Second, cooperation can coexist with, or even legitimize, durable inequalities, especially where power is asymmetric and knowledge is politicized (*Zeitoun and Warner 2006, Mirumachi 2015*).

This article addresses these doubts by reframing the research problem from "Does cooperation create peace?" to "Which institutional functions plausibly contribute to peace, through what mechanisms, and under what conditions?" The argument is that peacebuilding effects depend less on whether states cooperate in general and more on the specific institutional pathways that cooperation creates. These include monitoring and transparency regimes; regularized communication; credible compliance management; adaptive operating rules; and participation and accountability arrangements that shape perceived legitimacy (*Giordano et al. 2014, Pahl-Wostl 2015*). These pathways can produce two analytically distinct, though related, forms of peacebuilding:

- Negative peace functions: preventing escalation and containing disputes (*Galtung 1969*).
- Positive peace functions: building legitimate, inclusive and resilient governance that can accommodate change and distributional claims (*Pahl-Wostl 2015, Richmond 2014).*

The study applies a comparative empirical strategy. The Permanent Indus Commission (PIC) and the Nile Basin Initiative (NBI) are prominent and unusually well-documented institutions that embody contrasting design philosophies. The PIC is a treaty-mandated bilateral commission embedded in a dense legal-technical rule system and a formal dispute-settlement ladder. The NBI is a multi-riparian, transitional platform centred on programme delivery, shared knowledge and capacity building, historically underpinned by substantial donor financing and only recently moving toward a more formal legal-institutional order via the Nile Cooperative Framework Agreement (CFA). Both institutions operate under pronounced power asymmetries and high hydropolitical salience, making them suitable "stress tests" for institutional performance under rivalry.

This article argues that the peacebuilding potential of transboundary water cooperation depends not primarily on the existence of institutions, but on the specific functions those institutions perform. It identifies five institutional functions – transparency, predictability, compliance management, adaptive learning and legitimacy – that mediate the relationship between cooperation and peace outcomes. Through a structured comparison of the Indus and Nile basins, it shows that different institutional designs produce distinct bundles of these functions. Durable peacebuilding is most likely when these functions are combined rather than treated as substitutes.

ENVIRONMENTAL PEACEBUILDING AND INSTITUTIONAL DESIGN: CONCEPTS AND EXPECTATIONS

Environmental peacebuilding and the "contingency" problem

Environmental peacebuilding examines how environmental interdependence can be leveraged to mitigate conflict risks and promote cooperative relations (*Conca and Dabelko 2002, Ide 2018*). Early environmental security debates often assumed a direct link between resource scarcity and violent conflict. Subsequent research has largely rejected deterministic claims, instead emphasizing that scarcity and variability operate as risk multipliers filtered through institutions, governance capacity and political contestation.

The central theoretical challenge is contingency: institutions can enable cooperation but can also fail or succeed in narrow ways that do not translate into broader peace. Liberal institutionalist accounts emphasize how legalization (precision, monitoring, adjudication) reduces transaction costs and creates credible commitments (*Keohane 1984, Abbott et al. 2000*). Adaptive governance scholarship highlights that rigid rules can become maladaptive under climatic uncertainty and socio-technical change; institutions must therefore combine predictability with bounded flexibility and learning (*Cosens et al. 2014, Pahl-Wostl 2015*). Political ecology and hydro-hegemony critiques argue that cooperation may reflect and reproduce power, shaping "whose knowledge counts" and how costs and benefits are distributed (*Zeitoun and Warner 2006, Cascão 2009*). From this perspective, peacebuilding hinges on legitimacy: whether affected actors perceive outcomes as fair and procedures as accountable.

Water diplomacy, institutions and peace-relevant functions

Water diplomacy refers to the use of negotiation and institutional design to prevent, manage and resolve disputes over shared waters while enabling equitable and sustainable use (*Sadoff and Grey 2002*). With regard to peacebuilding, the relevant question is not merely whether institutions exist, but which functions they reliably deliver. This article focuses on five peace-relevant institutional functions, each linked to observable mechanisms:

(1) Transparency and shared facts: joint monitoring, standardized datasets and information-sharing routines reduce uncertainty and rumour-driven escalation (*Giordano et al. 2014*).

(2) Predictability and expectation management: clear rights and obligations, time-bound procedures and regular meetings stabilize behaviour even when trust is low (*Abbott et al. 2000*).

(3) Credible compliance management: escalation ladders and third-party processes provide authoritative interpretations and reduce incentives to "test" the other side through unilateral action (*Brochmann and Hensel 2009*).

(4) Bounded flexibility and learning: review clauses, standing technical groups and iterative joint studies allow adaptation to shocks without compromising predictability (*Cosens et al. 2014*).

(5) Legitimacy and inclusion: participation, public transparency and attention to distributional fairness reduce contestation and strengthen domestic buy-in for cooperation (*Derman and Ferguson 2003*).

These functions map imperfectly onto negative and positive peace. Transparency, predictability, and compliance management are most directly linked to negative peace (containment). Learning, inclusion, and fairness are central to positive peace (legitimacy and resilience), though they also reduce escalation risks by lowering grievance intensity.

The following diagram (*Figure 1*) summarizes the article's conceptual framework, linking institutional design to peace-relevant functions and outcomes:

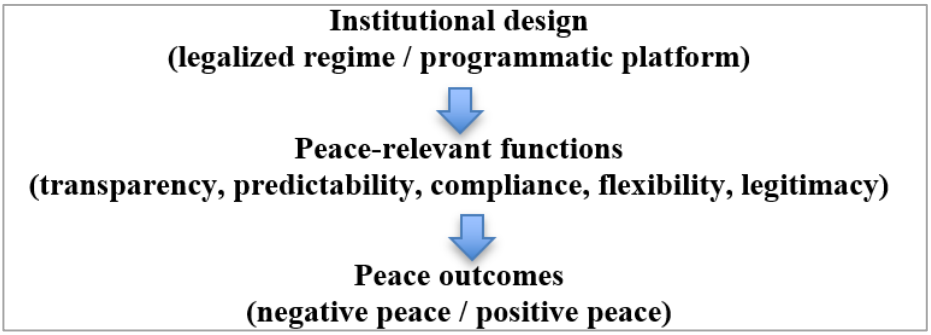

Figure 1. Conceptual framework (own work)
1. ábra. Fogalmi keretrendszer (saját szerkesztés)

Testable expectations

The framework yields four hypotheses, treated as probabilistic rather than deterministic factors:

- H1 (Transparency–stability): credible monitoring and accessible information correlate with fewer/shorter crises over water operations (*Giordano et al. 2014*).
- H2 (Flexibility–resilience): institutions that combine clear rules with bounded flexibility sustain cooperation better during climatic or political shocks (*Cosens et al. 2014*).
- H3 (Inclusion–legitimacy): formal mechanisms for stakeholder participation and accountability increase perceived fairness and reduce contestation (*Derman and Ferguson 2003, Pahl-Wostl 2015*).
- H4 (External support–durability): aligned external finance and facilitation strengthen institutions when embedded in local ownership and sensitive to sovereignty (*Paisley and Henshaw 2020*).

METHODS AND COMPARATIVE FRAMEWORK

Research design and evidence base

The analysis employs a qualitative, structured, and focused comparison (*George and Bennett 2005*). It combines (i) document analysis of treaty texts, institutional reports, and third-party records; (ii) indicator-based assessment to structure cross-case comparison; and (iii) process tracing of selected episodes to identify causal mechanisms linking institutional practices to peace-relevant outcomes (*Beach and Pedersen 2013*).

The unit of analysis is the institutional regime at the basin scale: the Indus Waters Treaty/Permanent Indus Commission regime and the Nile Basin Initiative regime, including its current transition towards a permanent commission under the Cooperative Framework Agreement (CFA). The empirical focus is primarily on the period since the late 1990s, when both basins faced intensified infrastructure development and climate-related variability.

The Indus and Nile cases constitute a most-different institutional design comparison. The Indus regime represents a highly legalized bilateral treaty with detailed rules and a formalized dispute-resolution ladder. The Nile Basin Initiative represents a programmatic multilateral platform emphasizing joint projects, knowledge production, and gradual institutionalization. Despite these institutional differences, both basins exhibit similar structural challenges – power asymmetry, infrastructure expansion, and recurrent political tension – making them suitable comparative stress tests for assessing how institutional design conditions peace-relevant functions.

Comparative indicators

To compare different institutional forms, the framework operationalizes peace-relevant performance across the following dimensions:

A. Cooperation capacity: precision and adaptability of rules, operational coordination, data exchange, and monitoring.

B. Conflict management: early-warning and shock-response protocols, dispute-settlement design and use, and crisis performance.

C. Participation and accountability: stakeholder voice, transparency, and distributional fairness signals.

D. External influences: donor engagement, geopolitics, and third-party facilitation.

Indicators are scored on an ordinal 0–3 scale (absent to strong/embedded) based on observable evidence. The

purpose is not to produce a definitive ranking but to provide a comparison, highlight consistent strengths and gaps, and guide process tracing toward mechanisms rather than outcomes alone.

HISTORICAL, TECHNICAL AND WATER-RELATED CONFLICT DIMENSIONS OF THE INDUS AND NILE BASINS

The preceding framework links institutional design to peace-relevant functions. That link becomes clearer if the Indus and Nile cases are presented as historically layered and technically specific water conflicts instead of merely generic examples of cooperation under scarcity. In both basins, disputes over institutional form are inseparable from earlier state-building projects, inherited legal claims, contested hydraulic infrastructures, and uncertainty over future hydrology. This chapter, therefore, supplements the comparative analysis by specifying the historical, technical, and water-related dimensions that activate the five institutional functions identified above.

The analytical point is that historical narratives shape what riparian states regard as legitimate, while technical design choices determine how much discretion infrastructure operators possess and how easily suspicions can lead to concerns over national security. Water-related risks such as floods, droughts, storage operations, sedimentation, environmental flows, and seasonal variability then determine whether institutions merely process paperwork or provide useful risk-reduction capacity. The chapter thus treats the two basins as hydropolitical systems characterized by the interaction of legal rules, engineering choices, and political attitudes.

Indus: partitioned hydraulic space and low-trust engineering

The Indus conflict is rooted in the abrupt political partition of an already integrated irrigation system. Colonial Punjab had been transformed through canals, barrages, and command areas, the logic of which followed gradients, soils, and headworks rather than later international borders. The 1947 partition divided this system between India and Pakistan, leaving several important headworks upstream in India while major canal-dependent command areas lay downstream in Pakistan. The resulting 1948 canal-water crisis converted a technical problem of irrigation continuity into an existential concern for the new Pakistani state (*Alam 2002*, *Zawahri 2009*).

The 1960 Indus Waters Treaty stabilized this conflict by replacing joint basin development with a territorialized allocation of rivers. India obtained use of the Eastern Rivers (Ravi, Beas, and Sutlej), while Pakistan obtained the main use of the Western Rivers (Indus, Jhelum and Chenab), subject to limited Indian non-consumptive, agricultural, and run-of-river hydropower uses under the Treaty and its annexures (*UNTS 1960*). The bargain worked because it reduced day-to-day bargaining over volumes, but it also locked the parties into a compartmentalized form of cooperation. It can be described as peace-preserving arrangement rather than a basin-planning arrangement.

The political setting made this design especially significant. The headwaters and several hydropower sites lie in or near Jammu and Kashmir, a territory central to the India-Pakistan rivalry. Water disputes, therefore, become easily entangled with sovereignty, territorial security, and national identity. Even when disagreements are of a technical nature, they are rarely interpreted as pure technicalities in domestic debate. This explains why the PIC can keep communication open without necessarily improving broader political trust. It also explains why India's April 2025 decision to hold the Treaty "in abeyance" had hydropolitical significance beyond its immediate hydrological effects; the move signalled that the water regime itself could become an instrument of political pressure during security crises (*Singh and Shahid* 2025, *von Lossow 2025*).

Technically, contemporary Indus disputes concentrate on the design and operation of Indian run-of-the-river hydropower projects on the Western Rivers. The central question is not simply whether India may build such projects – the Treaty permits them within limits – but how design features affect the possibility of flow manipulation. Spillway gates, low-level outlets, pondage, drawdown flushing, sediment management, intake elevations, and dead storage are, therefore, politically sensitive engineering parameters. They define the margin between legitimate hydropower generation and perceived upstream control.

The Baglihar proceedings, closed in 2007, illustrate this pattern. Pakistan challenged design features of the Baglihar plant on the Chenab, especially matters linked to gated spillways, pondage, power intake levels, and flood design. The Neutral Expert accepted some of India's engineering arguments but required modifications and emphasized that Treaty interpretation had to take account of contemporary engineering standards as well as the Treaty text (*Salman 2008*). The episode demonstrates that technical modernization can be incorporated through adjudication, but also that in the absence of agreed updating mechanisms, each new project can reopen questions embedded in the 1960 design logic.

The Kishenganga arbitration of 2013 added an ecological and diversion dimension. The Court of Arbitration allowed India to proceed with a hydropower diversion but required a minimum flow in the Kishenganga/Neelum River and clarified limits on drawdown flushing (*PCA 2013*). The award is important because it shows how water-related conflict has expanded from allocation to the interaction of hydropower efficiency, environmental flows, sediment management, and downstream livelihoods. In this sense, the Indus regime increasingly manages technical externalities that were not central to the original partition bargain.

Hydrologically, the Indus Basin is exposed to seasonal and climatic uncertainty. Upper Indus flows depend on snowmelt, glacier melt, and monsoon rainfall, with substantial sub-basin variation. Glacier and snow processes buffer flows during dry periods, but climate change may alter the timing, variability, and reliability of that buffering effect (*Lutz et al. 2014, Biemans et al. 2019*). This matters for conflict because a delayed monsoon, extreme flood, rapid melt event, or low-flow season can turn routine dam operations into evidence for hostile narratives. The peace-relevant value of the PIC's data exchange and inspection routines therefore lies not only in legal compliance but in reducing misperceptions during hydrological stress.

The Indus case thus has a distinctive conflict structure. It is historically rooted existential dependence, technically precise but contested hydropower rules, and water-related risks intensified by climatic variability. This combination explains why the PIC is strong at negative peace. It converts a dispute about possible upstream coercion into a reviewable claim about design criteria, data, and procedure. However, the same structure also shows the limits of this form. Without a legitimate pathway for updating technical standards, sediment rules, environmental flow practices, and extreme-event protocols, the Treaty may increasingly rely on litigation-like processes to solve adaptive problems. The basin-specific supplement to the article's findings is, therefore, that Indus peacebuilding requires not only preserving the IWT's dispute ladder but also modernizing its technical interface with climate, sediment, and ecological realities.

Nile: historical rights, upstream development and reservoir coordination

The Nile conflict is historically different from the Indus because it did not originate in a single territorial partition of infrastructure. Instead, it developed from a long legal and diplomatic history in which downstream control and prior-use claims were privileged. In the past two centuries, a total of ten water-related agreements were concluded in the Nile basin, all of which favoured Egypt and failed to resolve conflict between countries *(Azizi and Leandro 2025).* The 1929 arrangements and the 1959 Agreement between Egypt and Sudan entrenched downstream allocations and administrative understandings without the consent of most upstream riparian states. The latter agreement allocated 55.5 billion cubic metres annually to Egypt and 18.5 billion cubic metres to Sudan, measured at Aswan, while no quantitative share was allocated to Ethiopia or the equatorial riparian states (*UAR and Sudan 1959, Waterbury 2002*).

This historical settlement became a legitimacy problem as upstream states gained capacity and sought space for development. Ethiopia, whose highlands contribute most of the Blue Nile flow, rejected the idea that colonial or bilateral agreements could permanently constrain its development options. The Nile Basin Initiative, launched in 1999, attempted to move beyond this legal deadlock by emphasizing a shared vision, technical studies, and cooperative investment preparation. Yet the underlying disagreement over historical rights versus equitable and reasonable utilization remained unresolved (*Cascão 2009, Salman 2013*).

The Cooperative Framework Agreement (CFA) represents an effort to transform that disagreement into a basin-wide legal framework. Its entry into force in October 2024 among ratifying parties is therefore a major institutional development. However, it is also a partial one because Egypt and Sudan have refused to join the settlement. The transition from the NBI to a permanent Nile River Basin Commission thus occurs under a paradox: legal institutionalization is progressing, but not yet inclusively enough to settle the most sensitive downstream-upstream disputes (*NBI 2024*).

Technically, the Nile dispute is centred on large reservoir operation rather than on the detailed design criteria of many small or medium projects. The Grand Ethiopian Renaissance Dam (GERD) is the key infrastructural facility. Located on the Blue Nile near the Sudanese border, it has a reservoir volume of approximately 74 cubic kilometres, roughly equivalent to more than one annual Blue Nile flow at key downstream gauges, depending on the hydrological baseline used (*IHA n.d.).* The dam is designed primarily for hydropower generation, not consumptive irrigation. Nevertheless, the timing of filling, drought-year releases, and coordination with Sudanese dams and Egypt's High Aswan Dam have major distributional consequences.

The technical disagreement is therefore not reducible to whether Ethiopia may generate hydropower. It concerns who bears hydrological risk during filling, prolonged drought, and multi-reservoir operation. From Ethiopia's perspective, faster filling and flexible operation improve energy security and sovereign development. From Egypt's perspective, however, the crucial issue is the reliability of downstream supply during low-flow sequences. Sudan's position has been more ambivalent because the GERD can offer flood regulation, sediment reduction, and electricity benefits, while also creating operational risks if information and coordination are insufficient (*Waterbury* 2002, *Wheeler et al. 2020*).

The water-related dimension is amplified by the Nile's variability. The Blue Nile is highly seasonal, with the Ethiopian highlands providing a large share of annual flow during a concentrated wet season. Climate variability affects both flood and drought risks, and future climate change may increase uncertainty around the frequency and severity of extremes (*Conway 2005, Swain 2011*). Under these conditions, a technically rational dam operation from one national perspective may be interpreted as threatening from another if data, rules, and communication are inadequate. The peace-relevant challenge is, therefore, to transform hydrological uncertainty into jointly managed risk rather than politically exploitable suspicion.

Sediment and flood management also complicate the picture. The GERD can trap sediment and regulate flood peaks, creating benefits for hydropower operation and downstream infrastructure, but these benefits depend on coordinated reservoir rules, reliable seasonal forecasts, and a shared understanding of risk thresholds. Quantitative modelling shows that coordinated operation and transparent drought-management rules can reduce risks for multiple parties, whereas unilateral operation increases the probability of extreme hydrological conditions becoming political crises (*Wheeler et al. 2020*).

The Nile case has a conflict structure built around contested legal history, a rebalancing of upstream development capacity, and a technical need for multi-reservoir coordination under uncertainty. This explains why the NBI is strong at positive peace foundations but weaker at acute conflict containment. Shared tools, professional networks, and joint studies are valuable, but they do not themselves specify how much risk each party will bear during a prolonged drought or how release decisions will be verified. The basin-specific supplement to the article's findings is, therefore, that Nile peacebuilding requires the programmatic gains of the NBI to be translated into modular, credible and inclusive operating rules for data exchange, drought triggers, emergency coordination, and long-term reservoir management.

Comparative conflict profile

Table 1. Historical, technical, and water-related conflict profile (own work)
1. táblázat. A konfliktus történeti, műszaki és vízügyi profilja (saját szerkesztés)

Dimension	Indus Basin	Nile Basin
Historical conflict driver	Partition of an integrated irrigation system; Kashmir-linked security rivalry; downstream dependence after upstream headworks remained in India.	Colonial and bilateral downstream legal claims; upstream exclusion from earlier allocation arrangements; changing regional power balances.
Primary technical object	Run-of-river hydropower design on Western Rivers: spillways, pondage, outlets, intake levels, sediment and diversion impacts.	Large-reservoir filling and operation: GERD coordination with Sudanese dams and High Aswan Dam, drought releases and flood regulation.
Water-related risk	Low-flow periods, monsoon floods, glacier/snowmelt variability, project-specific flow manipulation fears and ecological flow impacts.	Multi-year drought, high seasonal variability, flood-risk management, sediment trapping and distribution of storage benefits and risks.
Peace-relevant institutional need	Protect routine data exchange and dispute procedures while adding adaptive protocols for modern hydropower, sediment, environmental flows and extremes.	Preserve NBI knowledge systems while developing credible operating rules for data sharing, drought triggers, coordinated releases and inclusive CFA/NRBC transition.

Cross-case implications for the analysis and conclusions

Three cross-case implications can be drawn from the above. First, historical path dependence heavily influences the legitimacy of institutions. In the Indus, legitimacy rests on the Treaty as a substitute for trust after partition; in the Nile, legitimacy is contested because the inherited allocation order excluded many upstream riparian states. This means that similar institutional functions can have different political meanings. A dispute-settlement procedure in the Indus may be viewed as protecting a hard-won bargain, while a legal framework in the Nile may be viewed by non-parties as either a corrective to historical exclusion or as a new source of bloc politics.

Second, technical specificity shapes the kind of peacebuilding that is possible. Indus disputes are often project-specific and can be translated into design criteria, measurements, and adjudicative questions. This favours legal-technical containment. Nile disputes are more system-wide because GERD operation interacts with downstream reservoirs and drought management across the basin. This favours joint modelling, scenario planning, and operating rules, but also requires political agreement on risk sharing. The comparison, therefore, confirms that institutions do not perform peace functions in the abstract; they perform them through the technical objects they are able to govern.

Third, water-related risks are temporal. Conflict is not only about average annual allocation but also about timing: when water is stored, released, withheld, diverted, or forecast. Both basins show that peace-relevant institutions must be designed for hydrological sequences rather than static entitlements. In the Indus, project notifications and inspections must remain reliable during floods, droughts, and security crises. In the Nile, drought-year rules, seasonal forecasts, and reservoir-operation transparency are more important for crisis prevention than general declarations of cooperation.

The practical implication is a modular reform agenda. For the Indus, priority modules would include updated technical guidance on contemporary hydropower design, sediment management, environmental flows, extreme-event data exchange, and non-politicization of Commission contacts. For the Nile, priority modules would include real-time GERD data exchange, agreed drought

triggers, coordinated operation protocols, independent joint fact-finding, and pathways for non-parties to participate in technical cooperation even where legal accession remains politically difficult. In both basins, peacebuilding through water cooperation depends on making historical grievances discussable, technical claims verifiable, and hydrological risks jointly manageable.

CASE I: PERMANENT INDUS COMMISSION UNDER THE INDUS WATERS TREATY

Institutional origins and design logic

The Indus Waters Treaty of 1960, negotiated with World Bank involvement (*UNTS 1960*), is often cited as a durable example of water diplomacy between adversarial neighbours. Its central bargain is a geographical partition of rivers, coupled with a detailed operational-technical rule system. The Permanent Indus Commission was established as the routine bilateral mechanism for treaty implementation in the Indus River basin. *(See Figure 2 for map.)* It is mandated to exchange data, review planned measures, undertake inspections, and serve as the first forum for questions under the treaty.

The IWT's core bargain was a geographic partition of rivers: India received rights over the "Eastern Rivers" (Ravi, Beas, Sutlej), while Pakistan received rights over the "Western Rivers" (Indus, Jhelum, Chenab), subject to limited Indian "non-consumptive uses" (e.g., run-of-river hydropower) and agrarian transition on the Eastern system (*UNTS 1960, Arts. II–III*). To enable Pakistan to replace irrigation supplies lost from the Eastern Rivers, the parties concluded, alongside the Treaty, the Indus Basin Development Fund Agreement (IBDF), mobilizing an unprecedented international financing package administered by the World Bank and contributed by Australia, Canada, Germany, New Zealand, the United Kingdom, the United States, India (via Treaty payments), and the Bank itself (*IBDF 1960, WB 1960–1975*).

The IWT's design reflects a "low-trust engineering" logic: instead of relying on broad principles and flexible bargaining, it encodes specific entitlements and constraints and provides procedures to test compliance. This is visible in its annexes governing hydropower and storage design parameters and in its graduated dispute-settlement ladder: the PIC addresses questions first; certain "differences" can proceed to a Neutral Expert; and specified "disputes" can proceed to a Court of Arbitration. The design aims to (I) reduce uncertainty, (ii) limit discretionary space, and (iii) ensure that disagreements are handled within bounded procedures rather than through coercive signalling.

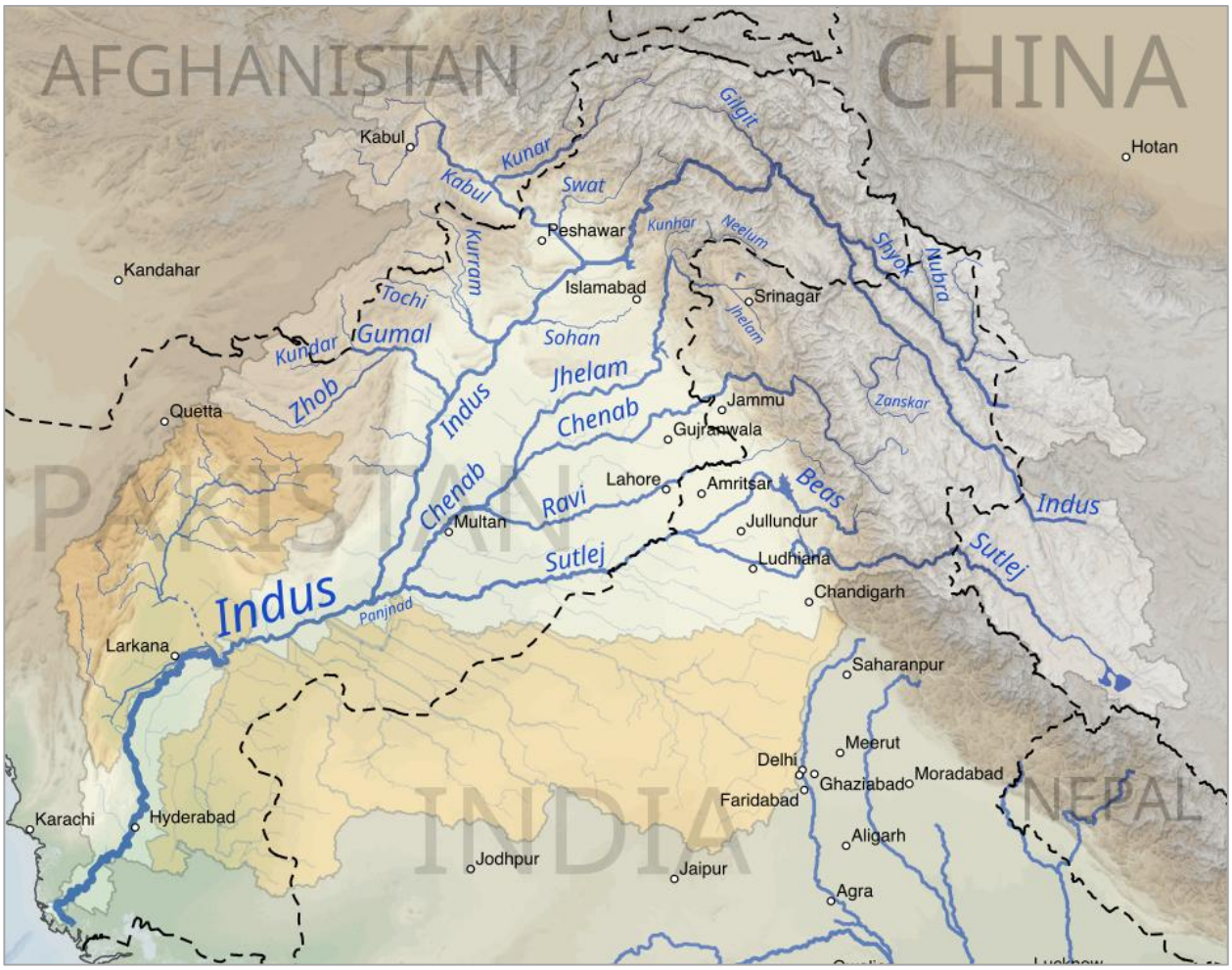

Figure 2. Map of the Indus River basin (URL1)
2. ábra. Az Indus folyó vízgyűjtője (URL1)

Peace-relevant practices: communication, data and bounded adjudication

The Pick's peace-relevant contributions arise from what can be described as routine-based, technical diplomacy. Regular meetings, systematic data exchange, and the possibility of joint inspections create repeated interaction even when political relations deteriorate. This interaction does not eliminate rivalry, but it provides a predictable channel through which concerns can be expressed and clarified.

The dispute-settlement ladder is central to compliance management. It lowers the temptation to respond to contested infrastructure with retaliatory measures by providing a forum in which claims can be assessed against treaty criteria and technical evidence. Two widely discussed episodes illustrate the mechanism.

Baglihar (Neutral Expert, 2005–2007): Pakistan challenged aspects of an Indian hydropower project's design on a western river, arguing that certain features could enable manipulation of flows. The Neutral Expert's decision allowed particular design choices while requiring modifications, balancing treaty constraints with contemporary engineering considerations (*Salman 2008*). The peace-relevant mechanism lies in procedural containment. Rather than triggering retaliatory infrastructure development or broader diplomatic escalation, the Baglihar dispute was translated into a technical-legal process governed by the treaty's dispute-settlement ladder. (The treaty established three-tiered dispute resolution system [PIC → Neutral Expert → Court of Arbitration] with specific technical annexures detailing design and operational parameters for Indian projects on the Western Rivers (*UNTS 1960, Arts. VII–IX; Annexures D–G*). The Treaty has often been cited as a "gold standard" for hydro-diplomacy because it has survived multiple wars [1965, 1971, 1999], territorial crises, and prolonged diplomatic freezes while providing a continual venue for notification, data exchange, site inspections, and disagreement management (*Zawahri 2009*). The Neutral Expert's decision clarified design parameters and required specific engineering modifications, allowing project construction to proceed while addressing Pakistan's concerns. The episode demonstrates how legalized procedures can transform potentially escalatory infrastructure disputes into bounded technical disagreements subject to authoritative determination.

Kishenganga *(PCA 2013*): Pakistan initiated arbitration concerning a hydropower diversion project. The tribunal permitted India to proceed with the diversion for hydropower but required a minimum environmental flow and placed limits on certain storage practices, thereby clarifying contested interpretations (*PCA 2013*). Again, even though both sides criticized aspects of the award, the process produced an authoritative reference point that enabled project continuation under constraints, reducing the likelihood of unilateral escalation.

These episodes support the claim that legalized precision, combined with third-party procedures, can convert disputes into "bounded" technical-legal disagreements. This tends to contribute to negative peace by containing escalation and by maintaining communication under stress.

Institutionalized routines as a channel of negative peace

The PIC's everyday work is mundane by design: exchanging hydrological and operational data, reviewing planned measures, organizing inspections, and producing annual reports. Yet this routine-based process is precisely what can matter for negative peace. In crises, the greatest escalation risks often arise from uncertainty and worst-case assumptions, for example, fears that an upstream actor may be withholding water, manipulating reservoir releases, or using infrastructure as a coercive tool. Data exchange at regular intervals and the possibility of verification through inspections reduce the plausibility of such claims and provide decision-makers with an alternative to public accusation.

The durability of these routines is often emphasized in studies on the Indus regime because the treaty and commission persisted through major interstate crises and wars. This persistence should not be overstated as evidence of "friendship", but it does indicate that both states historically perceived continued technical engagement as instrumentally valuable, even when political relations collapsed. From a peacebuilding perspective, the PIC therefore functions as an institutional "firebreak": it does not resolve conflict, but it reduces the likelihood that water issues become accelerants during broader confrontations.

Limits: brittleness, narrow scope and legitimacy constraints

The PIC's strengths are also its constraints. The IWT prioritizes allocation stability and dispute containment but provides limited scope for joint basin planning, benefit, sharing or ecological governance. Environmental considerations are weakly embedded: participation is largely confined to state water bureaucracies; and transparency to the public is limited, often mediated through national political narratives. From a positive peace perspective, the institutional model produces a "thin" form of cooperation whose legitimacy depends on state acceptance and performance rather than on broader societal accountability.

A second limit is adaptability. The treaty's detailed engineering provisions were designed for mid-twentieth-century conditions. As infrastructure technologies evolve and climatic variability intensifies, these precise rules can become focal points of contestation rather than stabilizers. Adjudication can substitute for explicit flexibility to a point, but repeated litigation-like processes increase transaction costs and can politicize technical disagreements.

A third limit is the vulnerability of procedure to politics. Legalization only supports peacebuilding if parties continue to recognize the legitimacy of the process. When political leaders seek to renegotiate, suspend, or reinterpret commitments, or when parallel legal tracks create the possibility of conflicting outcomes, the very architecture meant to contain disputes can become a fault line. This highlights a general peacebuilding lesson: institutions that rely on procedure must be insulated from geopolitical shocks to preserve their stabilizing functions.

Third parties and the politics of procedural credibility

Third-party roles are unusually prominent in the Indus regime and help explain its resilience. The World Bank's involvement in the treaty's formation and in the financing package that enabled Pakistan's post-partition "replacement works" created reputational and material stakes in maintaining the agreement. More importantly for contemporary peacebuilding, the treaty assigns external appointment functions in the Neutral Expert and arbitration procedures. These functions are narrow, but they matter because they sustain a credible pathway when bilateral political relations stall. In institutional terms, third parties increase the credibility of commitments by lowering the risk that one party can unilaterally block dispute settlement.

As a sign of severely deteriorating relations between the two countries, India announced the immediate unilateral suspension of the IWT in April 2025 following a terrorist attack in Kashmir that claimed the lives of multiple civilians. While deliberately falling short of formal withdrawal, the move reflected the growing inclination to use the IWT, and treaties in general, as instruments of political pressure (*Zehra 2025*). One year after India's decision, it remains unclear whether it was a genuine break in cooperation or rather an episode of prolonged tactical manoeuvring.

CASE II: NILE BASIN INITIATIVE AND THE CFA TRANSITION

Institutional logic: shared vision, program delivery and gradual legalization

The Nile Basin Initiative, launched in 1999, was designed as a transitional platform to move the basin from fragmented arrangements toward cooperative, basin-wide planning in the Nile River basin (*Figure 3*). Its institutional architecture includes a council of ministers (Nile-COM), a technical advisory committee (Nile-TAC), and a secretariat (Nile-SEC), alongside sub-basin implementation centres in the Eastern Nile and the Nile Equatorial Lakes. Unlike the IWT, the NBI did not begin with a binding basin-wide allocation treaty. Its core instruments were programmatic: joint studies, capacity building, shared information systems, and cooperative investment preparation. Obviously, Egypt and Sudan would have strongly objected to an IWT-like treaty as they insist on historical rights and their bilateral water-sharing agreement from 1959, which distributed the entire flow volume between the two countries.

The NBI's "shared vision" approach reflects a different cooperation theory. In politically contested basins, sustained joint work on information and projects can build trust, professional networks, and shared problem definitions that later support legalization. This approach has been supported by extensive donor engagement, including trust-fund financing and the involvement of development banks, which enabled data systems and investment pipelines that many riparian states could not fund alone (*NBI n.d.*)

Programmatic cooperation and the production of cooperative constituencies

The NBI's comparative strength lies in its capacity to generate what might be termed "cooperative constituencies." When basin initiatives produce tangible outputs – such as improved flood forecasting systems, regional power interconnections, or jointly prepared investment projects – state agencies, utilities and regional planners acquire practical interests in maintaining cooperation. These actors can act as stabilizing forces within national policy debates, advocating continued engagement with basin institutions even when interstate rhetoric becomes confrontational (*Sadoff and Grey 2002*).

In practice, such constituencies are uneven across the Nile. They are strongest in the Nile Equatorial Lakes region, where cooperative power and infrastructure projects can be linked to regional integration agendas. They are weaker in the Eastern Nile, where dam operations and drought risk distribution dominate security narratives and where benefits and risks are perceived as concentrated. The NBI's peacebuilding effects are therefore spatially differentiated: it can contribute to stabilization and integration in some sub-basins while remaining peripheral to the most securitized disputes in others.

Peace-relevant practices: knowledge systems, early warning, and cooperative benefits

The NBI's peace-relevant contributions are most evident in mechanisms that reduce uncertainty and generate cooperative benefits. Basin-wide decision-support tools and scenario analysis strengthen the epistemic basis for planning and can reduce factual contestation. Flood forecasting and early warning in parts of the basin provide an applied form of risk management that can save lives and strengthen the perceived utility of cooperation. In the Nile Equatorial Lakes region, cooperative hydropower and electricity network interconnection projects create material incentives for collaboration: shared infrastructure and cross-border power trade can broaden constituencies that benefit from stability.

These practices align closely with the foundations of positive peace. They foster social learning and professionalize interaction among riparian agencies; they can improve administrative capacity; and they can make

cooperation visible through tangible outputs. The NBI's participatory architecture, though uneven, is also generally more developed than the PIC's state-centric model: consultations and stakeholder forums are used in several programmes to engage line ministries, utilities, and, at times, civil society and local actors (*Paisley and Henshaw 2020*).

Figure 3. Map of the Nile River basin (URL2)

3. ábra. A Nílus vízgyűjtője (URL2)

Limits: high-stakes distributive politics and the challenge of non-participation

The NBI's principal limitation is that programmatic cooperation does not necessarily resolve high-stakes distributive conflicts where sovereignty and national identity are salient. The construction and staged filling of the GERD on the Blue Nile and the unresolved negotiations over long-term drought management and coordinated operations illustrate this limitation. While the NBI has facilitated basin-wide dialogue and technical work, the most politically charged bargaining has often been handled in separate forums under the auspices of the African Union or through ad hoc negotiations. Where trust deficits are high and perceived risks are existential, cooperative projects and knowledge products may be insufficient to prevent securitized escalation narratives unless paired with credible legal commitments. Quantitative risk-modelling work suggests that coordinated reservoir operation and transparent rules could reduce drought-management risks for multiple parties (*Wheeler et al. 2020*).

A second limitation is fragmentation through non-participation. Egypt and Sudan have remained outside the Cooperative Framework Agreement and contest aspects of its approach to "water security." This constrains the prospect of a truly basin-wide legal-institutional settlement and raises transition risks: the movement from a transitional initiative (NBI) to a permanent commission (Nile River Basin Commission, NRBC) must preserve existing knowledge systems and cooperation routines while creating incentives for non-parties to engage. The NBI experience therefore illustrates an important institutional dilemma: inclusiveness in membership may be necessary for legitimacy, but achieving inclusive legalization can be politically difficult, and partial legalization may harden bloc politics if not managed carefully.

The 2024 CFA entry into force: opportunity and stress test

The CFA's entry into force in October 2024 represents a significant step towards formalizing basin-wide cooperation among ratifying parties. In principle, it enables a shift from donor-dependent programme delivery to

a more permanent governance structure with clearer mandates. At the same time, because major downstream actors remain outside, the CFA's institutionalization is also a stress test for whether partial legalization can coexist with basin-wide functional cooperation. If the transition is perceived as exclusionary, it may reduce the NBI's capacity to serve as a neutral platform; if it is managed as a flexible, open-ended framework that preserves technical cooperation and offers pathways for accession, it can strengthen both negative and positive peace functions over time (*Muhumuza 2024*).

At the same time, third-party involvement also creates vulnerability in terms of legitimacy. When parties contest the competence of a tribunal or accuse external actors of bias, procedural credibility can erode, and water disputes can re-enter the arena of geopolitical signalling. The Indus experience therefore suggests that third-party roles must be carefully designed: they should be predictable, limited to clearly defined functions, and embedded in mutually accepted rules that reduce the scope for politicized contestation.

Financing, capacity and the donor-state bargain in the Nile

External support has been central to the NBI's institutional development. Donor financing enabled the creation and maintenance of the NBI's three-centre architecture (secretariat and sub-basin offices), supported basin-wide knowledge systems, and underwrote the preparation of cooperative investments. This support can be interpreted as a "donor-state bargain": donors provided resources to a cooperative platform that promised regional benefits, while riparian states retained sovereignty by emphasizing that the NBI is not a supranational authority but an intergovernmental partnership.

The bargain has clear benefits for peacebuilding: it makes cooperation materially feasible, sustains regular interaction, and enables the production of visible cooperative goods. Yet it also generates a well-known risk: when core budgets and programme pipelines depend heavily on external finance, perceptions of donor-driven agendas may undermine ownership. The NBI's trajectory therefore underscores H4's caveat: external support strengthens durability when it is aligned with basin priorities, transparent in accountability, and paired with gradual increases in member-state financing and political commitment (*NBI 2020*).

The CFA transition as institutional evolution

The CFA's entry into force offers a window into institutional evolution, e.g. how basins attempt to move from functional cooperation to a more formal legal order. This is of prime importance because different tasks incur different political costs. Data sharing, joint training and early warning can often be agreed upon earlier than allocation rules; project-based cooperation can proceed under flexible understandings even when legal status is contested. Over time, successful delivery can create a climate within public opinion and professional networks that makes legalization more feasible.

However, the order or ranking of the various measures can also fail. If legalization is pursued without sufficient political inclusion, it may create institutional fragmentation; if functional cooperation is pursued without a credible pathway to address distributive disputes, it may be dismissed as technocratic "window dressing." The NBI illustrates both possibilities. Its knowledge and project work have created cooperative capacity, but the most contentious allocation and dam-operation issues have not been settled within its framework. The CFA may strengthen the legal pathway for some riparian states, but its peacebuilding value will depend on whether it can remain open, preserve basin-wide technical cooperation, and create incentives for eventual broader participation (*Mohammed 2025*).

COMPARATIVE FINDINGS: HOW INSTITUTIONAL FORM INFLUENCES PEACE-RELEVANT FUNCTIONS

The following table provides a comparison of the peace-relevant functions of both river basin regimes.

Three core claims can be drawn from the comparison:

- Legalized regimes are comparatively strong at negative peace functions.

The PIC's core design choice-detailed legalization combined with a dispute-settlement ladder-makes it well-suited for containing disputes under low trust. Transparency is embedded through routine data exchange and notification; predictability arises from clear entitlements and time-bound procedures; and compliance management is supported by third-party adjudication. The Baglihar and Kishenganga episodes show how contentious infrastructure disputes were processed into implementable technical-legal outcomes rather than driving open-ended escalation. This pattern is consistent with findings that legalization and institutionalized river claims management correlate with a reduced risk of military conflict (*Brochmann and Hensel 2009, Wolf et al. 2003*).

- Programmatic platforms are comparatively strong at positive peace foundations.

The NBI's design – centred on shared knowledge, capacity building, and cooperative projects – is well suited for building professional networks, reducing factual uncertainty, and producing visible cooperative gains. These mechanisms contribute to legitimacy and resilience by creating constituencies for cooperation and by improving the problem-solving capacity of basin institutions. The NBI's participation practices, though uneven, generally exceed those of the PIC and better align with positive peace claims about inclusion and accountability (*Pahl-Wostl 2015, Paisley and Henshaw 2020*).

- The two forms are complementary rather than substitutable.

The Indus case shows that legalization can stabilize cooperation without delivering broad legitimacy or adap-

tive capacity. The Nile case shows that programmatic cooperation can build knowledge and benefits without being able to contain acute distributive disputes among pivotal actors. In other words, each form covers a different subset of peace-relevant functions. The implication is "functional pluralism": robust peacebuilding architectures combine rule-based containment with adaptive learning and legitimacy-building participation.

Table 2. Peace-relevant institutional profile (diagnostic summary)
2. táblázat. A békével kapcsolatos intézményi profil (diagnosztikai összefoglaló)

Function / design feature	PIC (Indus)	NBI (Nile)
Rule precision and predictability	Strong: detailed treaty annexes constrain discretion	Moderate: guidance and programmes, limited binding allocation rules
Routine communication	Strong: mandated commissioner channel and regular meetings	Moderate: ministerial/technical forums, intensity varies by sub-basin
Transparency and verification	Moderate-strong internally; limited public transparency	Moderate: growing data tools, uneven openness and coverage
Dispute settlement / compliance	Strong: Neutral Expert and arbitration ladder	Weak-moderate: political forums and ad hoc negotiation, limited adjudication
Flexibility and learning	Moderate: adaptation mainly via adjudication	Strong: iterative studies, tools and programme learning
Participation and accountability	Weak: state-centric technocratic model	Moderate: stakeholder forums, consultations, uneven but more developed
Material cooperative benefits	Limited: treaty stabilizes entitlements, few joint projects	Stronger in some sub-basins: joint investments and capacity building
Exposure to geopolitics	High; procedures can buffer rivalry but are vulnerable to politicization	High; programmatic cooperation persists but struggles in mega-project politics

Evidence relative to expectations (H1–H4)

H1 (Transparency–stability) is broadly supported. In the Indus, transparency mechanisms are reinforced by adjudication, which makes information credible and actionable. In the Nile, transparency through shared tools and early warnings contributes to routine risk management, but its stabilizing effect is more contingent because it lacks an accepted basin-wide adjudicative backstop.

H2 (Flexibility–resilience) is partially supported and design-dependent. The NBI's programmatic approach institutionalizes learning and can respond iteratively to new information and shocks. The Indus regime adapts to new challenges more slowly because its flexibility is largely "imported" through dispute settlement rather than through explicit review clauses or adaptive operating rules. Where political commitment to procedures weakens, this pathway becomes fragile.

H3 (Inclusiveness–legitimacy) is asymmetrically supported. The NBI's stakeholder engagement practices more plausibly contribute to legitimacy and compliance, particularly in project-based cooperation. The PIC's state-centric design provides efficiency but limits societal voice; legitimacy is therefore more vulnerable to domestic politicization and nationalist framing, especially during crises.

H4 (External support–durability) is supported with caveats. In both basins, third parties have been catalytic: they provided resources, convening power, and, in the Indus, procedural roles that strengthened credible commitments. However, external engagement also carries risks: donor agendas can distort priorities, and perceived intrusion into sovereignty can trigger backlash. The durable support of peacebuilding therefore requires alignment with basin-defined priorities and transparent accountability arrangements.

Conflict mitigation versus conflict resolution

A central lesson from both basins is the analytical difference between mitigating disputes and resolving underlying conflicts. The PIC is optimized for mitigation: it provides a routine for communication, predictable procedures for "planned measures," and a legal-technical ladder that can translate disagreements into decisions. This helps prevent water issues from becoming triggers in a wider security rivalry. Yet the PIC is not designed to resolve deeper distributive grievances, identity conflicts, or territorial disputes that shape India–Pakistan relations. Its contribution is therefore best described as a stabilizing "buffer" around a vital resource rather than a pathway to political reconciliation.

The NBI illustrates the inverse pattern. Its programmatic portfolio can contribute to conflict transformation in limited ways by building habits of cooperation, establishing linkages between technical communities and society at large, and generating cross-border benefits. However, when core questions of entitlement and risk distribution are securitized – as in debates over large dam operations and drought management – programmatic cooperation has limited leverage. In those moments,

conflict resolution requires a political settlement on rules, not only projects and studies. The implication is that claims to peacebuilding must be specified: institutions can generate negative peace (containment) without resolving political conflict, and they can generate positive peace foundations without guaranteeing settlement on allocation.

Power asymmetry, hydro-hegemony, and the politics of knowledge

Both cases also show that institutional design interacts with power. In the Indus, India's upstream position on several tributaries and its larger economic and military capacity create bargaining advantages; Pakistan's downstream dependence and security concerns encourage a defensive posture. The IWT's precise rules and third-party procedures can be interpreted as "soft equalizers": they narrow discretion and provide Pakistan with a procedurally legitimate channel to contest designs. At the same time, the treaty's partition logic also reflects historical power and bargaining constraints; it stabilizes expectations but does not create a joint developmental vision.

In the Nile, historical hydro-hegemony has been associated with downstream influence, particularly by Egypt, anchored in diplomatic leverage and legacy agreements. Over the last decades, upstream states have increasingly mobilized finance, technology, and coalition-building to pursue hydropower and irrigation development, reshaping the dynamics of bargaining (*Cascão 2009*). The NBI's shared-vision approach partly sought to depoliticize these contests by building a common knowledge base. Yet the politics of knowledge remains central: whose models are accepted, which scenarios are emphasized, and how uncertainty is communicated can all affect perceived legitimacy. In this sense, transparency is not only about releasing data but also about establishing trusted processes for joint fact-finding and interpretation. Institutions that neglect this risk seeing technical debates re-securitized in the public sphere.

A mechanism typology for peace-relevant water institutions

Synthesizing across the two cases, the following mechanisms appear especially important for negative peace and for positive peace, respectively.

Negative peace mechanisms:

(1) Proceduralized communication: predictable meetings and notification routines keep channels open and reduce misperceptions during crises.

(2) Verifiable transparency: data exchange tied to monitoring standards and inspections provides a shared evidentiary base.

(3) Bounded adjudication: time-bound escalation ladders and third-party determinations reduce incentives for unilateral escalation.

Positive peace mechanisms:

(4) Social learning and epistemic community building: joint tools, models and studies generate shared problem definitions and professional norms.

(5) Legitimization through inclusion and benefit visibility: participation and tangible cooperative outputs broaden constituencies that value stability.

The PIC strongly instantiates (1)-(3) and only weakly (4)-(5). The NBI strongly instantiates (4) and, in part, (5), while (1)-(3) depend more on political conditions and remain uneven at the basin scale. The key theoretical implication is that different institutional forms can be functionally plural: they can deliver different bundles of peace-relevant mechanisms. This helps explain why empirical claims about "water cooperation" often appear inconsistent; what matters is which mechanisms are present and credible in a given institutional setting.

Detailed case scores and justifications can be found in the *Annex* to this study.

Limitations and scope conditions

Two limitations constrain the findings. First, peacebuilding outcomes such as trust and legitimacy are difficult to measure directly; the analysis therefore relies on observable proxies (institutional routines, dispute trajectories, transparency practices, and participation architectures). Second, the study focuses on interstate institutions and thus only indirectly captures subnational impacts. In both basins, domestic politics, centre–province relations, and national development narratives can override institutional incentives. These factors do not negate institutional effects, but they shape their scope conditions: even well-designed institutions cannot substitute for political willingness to cooperate, and poorly designed domestic governance can erode transboundary legitimacy.

Future research can strengthen causal inference by combining comparative institutional analysis with micro-level evidence on how affected communities perceive fairness and how national bureaucracies internalize transboundary commitments. It can also examine how "modular" cooperation (data, forecasting, emergency rules, joint investments) may accumulate into more comprehensive legal settlements over time.

Comparative profile in brief

The indicator-based assessment can be summarized as a diagnostic profile rather than a scorecard. The PIC is strongest where legalization, verification, and escalation procedures matter, and weakest where legitimacy-building transparency and inclusion are imperative. The NBI is strongest where knowledge production, project delivery, and stakeholder engagement matter, and weakest where binding basin-wide rules and enforcement would be required to contain distributional disputes.

This profile helps clarify what it means to "strengthen cooperation." For the Indus, strengthening is less about adding more rules and more about modernizing and legit-

imizing existing ones. For the Nile, strengthening is less about producing additional studies and more about translating knowledge and programme experience into credible, inclusive rule systems for risk sharing-while keeping non-parties engaged.

CONCLUSION

Comparative evidence suggests that peacebuilding through water cooperation is most plausible when institutions deliver a balanced portfolio of functions. The following implications can be drawn from the analysis:

1. Pair legal precision with bounded flexibility.

Precise rights and obligations reduce uncertainty, but rigidity increases friction under change. Institutions should include review clauses, emergency operating rules, and standing technical groups that can update procedures without reopening fundamental bargains (*Cosens et al. 2014*). Where full treaty revision is politically infeasible, side protocols can specify drought/flood coordination, data standards, and technical design updates.

2. Treat knowledge systems as peace infrastructure.

Shared models, interoperable datasets, and transparent forecasting reduce factual contestation and can de-escalate rumours during crises (*Giordano et al. 2014*). Investments in data systems should include tiered public access to strengthen legitimacy while protecting sensitive security information.

3. Maintain a credible, time-bound dispute pathway.

Dispute ladders contribute to negative peace by offering authoritative decisions and limiting forum shopping. Their credibility depends on clear rules of ranking, predictable timelines, and recognized gatekeeping. Where adjudication is politically contested, advisory joint fact-finding or third-party technical panels can still lower uncertainty and provide face-saving options.

4. Expand participation to strengthen domestic buy-in.

Transboundary institutions depend on domestic politics. Structured engagement with subnational authorities, user associations and affected communities can strengthen legitimacy and reduce contestation (*Derman and Ferguson 2003*). Participation should be designed to be meaningful rather than symbolic consultations; e.g. feedback loops for consultations should be included.

5. Focus on distributional legitimacy and risk-sharing.

Peace dividends are fragile when benefits and risks are perceived as imbalanced. Institutions should prioritize joint scenarios that make distributional effects explicit (especially under drought) and develop compensatory or benefit-sharing arrangements where feasible (*Sadoff and Grey 2002*).

6. Align external support with ownership and accountability.

External finance and facilitation are most valuable when they enable long-term capacity building and reinforce local priorities (*Paisley and Henshaw 2020*). Donors should avoid designs that substitute for political commitment; instead, they can support monitoring infrastructure, joint training, and the institutionalization of transparent budgeting and evaluation.

7. Insulate technical cooperation from geopolitical shocks.

Where political relations deteriorate, technical channels and data exchange become even more valuable. Crisis-communication protocols, protected working-level contacts, and jointly agreed non-politicization norms can preserve cooperation during shocks.

Basin-specific implications: Indus

For the Indus, the key priority is to protect and modernize the containment functions that have historically reduced escalation risks. This implies safeguarding routine data exchange and meetings even when broader diplomacy deteriorates, because these routines are the institution's core asset in terms of peacebuilding. Technical modernization should focus on reducing recurring design disputes by clarifying, through agreed technical protocols or updated annex guidance, how contemporary hydropower and sediment-management practices can remain consistent with treaty objectives. An explicit, jointly agreed "shock protocol" – for example, for extreme floods, drought years, or major infrastructure incidents – would provide bounded flexibility without reopening the treaty's fundamental bargain.

At the same time, strengthening legitimacy requires moving beyond a purely state-centric model. Without transforming the PIC into a broad stakeholder forum, incremental steps are feasible: more systematic publication of non-sensitive meeting summaries, clearer public communication of dispute procedures, and structured interfaces with affected subnational authorities and expert communities. Such measures can reduce rumour-driven politicization and help maintain domestic support for continued procedural engagement.

Basin-specific implications: Nile

For the Nile, the central challenge is to preserve the NBI's functional cooperation while transitioning toward a more formal legal order. The impending creation of a permanent commission should not disrupt the knowledge systems, technical staffing, and project pipelines that the NBI has accumulated. A practical approach is to treat these systems as shared "basin public goods" and insulate them from political contestation over legal status.

Because the most securitized disputes relate to dam operations and drought risk-sharing, modular agreements can provide a bridge where comprehensive settlement is politically infeasible. For example, riparian states could negotiate technical rules for data sharing on reservoir levels and planned releases, joint drought triggers, and principles for coordinated emergency response, without requiring immediate agreement on permanent allocations. Independent joint fact-finding panels – potentially sup-

ported by regional organizations or mutually acceptable third parties – can help establish trusted baselines for negotiation and reduce the incentives for public escalation.

Cross-basin lesson: design for complementarity

Across basins, institutional reform agendas should avoid copying a single "model." Instead, reforms should diagnose which peace-relevant functions are missing and add design elements accordingly. Where legalization exists but is brittle, invest in adaptive capacity, participation, and trusted knowledge production. Where programmatic cooperation exists without credible conflict containment, develop time-bound procedures for dispute management and modular legal commitments that can gradually expand.

A checklist for practitioners

Across both basins, the following questions provide a quick diagnostic for whether a cooperation arrangement is likely to generate peace-relevant effects:

- Can parties verify key claims (flows, storage, operations) through shared monitoring and agreed data standards?
- Are there predictable meeting and notification routines that persist during political downturns?
- Does the framework provide a credible and time-bound pathway for moving disagreements from technical consultation to a binding or authoritative resolution?
- Do operating rules specify how risks are shared during extremes (droughts, floods) and how rules are reviewed?
- Are affected stakeholders able to contest and inform decisions through structured participation, and are non-sensitive outputs publicly communicated?
- Are cooperative benefits visible enough to create domestic constituencies that value stability?
- Is external support aligned with basin priorities and designed to reinforce, not replace, ownership?

If several answers are "no," cooperation may still exist, but its claims of contributing to peacebuilding should be treated cautiously.

The comparison of the PIC and the NBI shows that water cooperation can contribute to peacebuilding, but not automatically and not uniformly. Effects emerge when design features, practices, and context align to generate transparency, predictability, reciprocity, learning, and legitimate risk sharing. In an era of climatic variability and infrastructure expansion, durable cooperation is more likely when stability-oriented legal procedures are coupled with adaptive and inclusive programmatic capacities, supported by external actors in ways that reinforce rather than replace basin ownership. The comparison suggests that peacebuilding through water cooperation should be understood as contingent institutionalism: institutions contribute to peace not by their mere existence but by the specific functions they perform. In practice, stable cooperation emerges when rule-based containment mechanisms are complemented by institutions that generate shared knowledge, adaptive capacity, and broader constituencies for cooperation.

The APPENDIX (attached in a separate file: *Évf. 106 szám EN1 (2026) | Hidrológiai Közlöny*) documents the indicator codebook, scoring rules, and case-specific justifications used in the thesis's comparative analysis. It is designed to maximize transparency and replicability. The framework contains four dimensions (A–D), each with three indicators (1–3). Each indicator is scored on a 0–3 scale. Scores are justified for both cases: the Permanent Indus Commission (PIC, Indus Basin) and the Nile Basin Initiative / Nile River Basin Commission (NBI/NRBC, Nile Basin). Three worked examples per basin illustrate the coding procedure and evidence trace

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