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Engineering Asia's Water Tower: Transboundary Governance Challenges of China's Tibetan Plateau Mega-Projects

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China is advancing an interconnected suite of hydraulic mega-projects on the Tibetan Plateau driven by severe domestic water and energy security imperatives. This paper examines three projects central to this strategy that affect transboundary rivers: the Mêdog (墨脱) Hydropower Station, now under construction on the Yarlung Tsangpo; the Red Flag River (红旗河) inter-basin transfer proposal, not officially approved but, if built, would become the world's largest inter-basin water transfer project, redirecting water from transboundary rivers in Tibet to arid northwest China; and the upper Lancang–Mekong (澜沧江–湄公河) hydropower cascade, China's 12-dam operational system on the upper Mekong, which provides the most instructive precedent for what large-scale Chinese dam operations mean for downstream governance. What is conspicuously absent is any commensurate advance in the governance architecture for managing their transboundary effects. The China–India hydrological data-sharing MoU on the Brahmaputra expired on June 5, 2023; full data sharing has been suspended since then, with only a limited, conditional arrangement emerging following high-level diplomatic engagement in 2025. Bangladesh, the most exposed downstream state, has no formal mechanism to assert its interests. This paper argues that the governance gap is not inevitable—it reflects the absence of institutional architecture that all parties have a shared interest in building—and advances targeted recommendations for European governments, multilateral institutions, and downstream states.

Introduction

The Qinghai–Tibet Plateau—often called Asia's "Water Tower"—is the headwater source of 10 major river systems, supplying freshwater to approximately 1.4 billion people across China and downstream nations. China's hydro-engineering ambitions on the plateau are driven by structural necessity that is both real and well-documented. Groundwater levels are falling by approximately one meter per year across parts of the North China Plain, causing land subsidence and permanently compromising future recharge capacity as underground pore spaces collapse.[1] Approximately three-quarters of China's national grain output comes from irrigated land, and that irrigated agriculture faces intensifying water

scarcity concentrated in the north.[2] China's green energy transition also requires the mobilization of Tibet's hydropower potential: the Mêdog project's projected 300 billion kilowatt-hours of annual generation connects directly to China's carbon neutrality commitments and to surging artificial intelligence and data center electricity demand, which the International Energy Agency projects will increase by approximately 170 percent between 2024 and 2030.[3]

China shares over 40 major transboundary watercourses with neighboring countries and has described its water infrastructure as contributing to regional flood prevention and stability.[4] The governance critique advanced in this paper is not premised on the absence of legitimate Chinese interests, nor does it presume bad faith on Beijing's part. It rests instead on the structural inadequacy of existing frameworks to accommodate China's legitimate domestic interests alongside the equally legitimate concerns of downstream nations—a gap that, left unaddressed, ultimately serves no party well, including China itself.

The character of China's transboundary water governance arrangements reflects the broader geopolitical texture of its bilateral relationships. China has developed its strongest institutional frameworks with northern neighbors. With Kazakhstan, a landmark 2001 Cooperation Agreement on the Use and Protection of Transboundary Rivers established a formal Joint River Commission, supplemented by a 2011 Water Quality Protection Agreement and ongoing allocation negotiations covering more than 20 shared rivers.[5] With Russia, a 2008 Agreement on the Reasonable Utilization and Protection of Transboundary Waters—formally archived by China's Ministry of Foreign Affairs (中华人民共和国外交部)—established a Joint Commission with dedicated working groups on water quality monitoring, resources management, and emergency response to pollution incidents.[6] With Mongolia, a 1994 Agreement on the Protection and Utilization of Transboundary Waters establishes the principle that utilization "shall not cause harm to the reasonable use of transboundary waters" and explicitly addresses ecological conservation and equitable use.[7] By contrast, China's arrangements with southern riparian states are consistently narrower, more consultative, and less legally substantive. As Wouters and Devlaeminck have documented, this asymmetry reflects the structural tendency of China's transboundary water governance to prioritize upstream sovereign prerogatives over legally binding basin-wide rules—a tendency most pronounced in its most geopolitically contested river relationships.[8] The institutional precedents for more substantive arrangements exist within China's own treaty portfolio, as the comparative table (Table 1) demonstrates.

One further dimension shapes the analysis. Glacier area on the Qinghai–Tibetan Plateau decreased over 58 percent between 1976 and 2024, with large-scale retreat across the Himalayas, Hengduan Mountains, and Qilian Mountains.[9] Accelerating melt currently inflates river flows, but the long-term trajectory will reduce base flows as ice reserves are exhausted, progressively altering the hydrological baseline against which dam operations are assessed. As climate change alters what rivers carry naturally, attribution of downstream flow variability—to dam operations, glacial retreat, or rainfall patterns—will become extraordinarily difficult without independent, verifiable data. This makes building transparent data-sharing architecture now, before the Mêdog cascade is operational, a matter of practical urgency for all parties.

Three projects define China's current plateau strategy. This paper assesses each in turn, before examining the governance architecture on the Lancang–Mekong as a comparative framework and drawing out the governance deficit and

policy implications for European and Indo-Pacific actors.

The Mêdog Hydropower Station (墨脱水电站)

On July 19, 2025, Premier Li Qiang presided over the groundbreaking of what will be the world's largest hydropower facility on the lower reaches of the Yarlung Tsangpo (雅鲁藏布江) in Tibet, near the disputed Sino-Indian border. The project will consist of five cascade hydropower stations with a total investment estimated at approximately 1.2 trillion yuan (about USD 167.8 billion).[10] Premier Li described it as the "project of the century" (世纪工程). The installation will have a projected installed capacity of 60,000 megawatts (MW), with annual generation of approximately 300 terawatt-hours—exceeding the United Kingdom's entire annual electricity generation of approximately 285 terawatt-hours.[11] The project was formally approved by China's State Council (国务院) in December 2024, following years of planning and the inclusion of downstream Yarlung Zangbo hydropower development as a strategic priority in the 14th Five-Year Plan (第十四个五年规划, 2021–2025). [12]

Mêdog is expected to supply power to over 300 million people and contribute materially to China's carbon neutrality commitments. The project also connects directly to China's "East Data West Computing" initiative (东数西算), launched in 2022, which channels artificial intelligence training and data storage workloads to western and southwestern provinces where hydropower is abundant—making Mêdog's clean energy output directly relevant to China's digital economy strategy, not only its grid decarbonization goals.[13] The project also advances Tibet's economic integration—a long-standing national development priority. As one of the present authors has noted, Beijing presents Mêdog as a symbol of clean energy modernity, but its implications extend well beyond the energy sector.[14]

The project site is located in Mêdog County (墨脱县) where the Yarlung Tsangpo makes its dramatic Great Bend (大拐弯), dropping approximately 2,000 meters in elevation over roughly 50 kilometers through the Earth's deepest canyon.[15] The engineering plan involves boring tunnels through Namcha Barwa (南迦巴瓦峰) mountain to harness this extraordinary hydraulic head; the canyon's geological complexity and high landslide susceptibility have raised independent concerns about construction feasibility and downstream safety.[16] The Yarlung Tsangpo flows east across Tibet before turning south into India as the Siang River and onward into Bangladesh as the Brahmaputra and Jamuna. Operational decisions at Mêdog—reservoir regulation, release scheduling, drawdown cycles—will therefore affect downstream hydrology across Assam, Bangladesh, and Bhutan. Even a nominally run-of-river design will modify downstream hydrographs through the operational patterns of a five-dam cascade in ways that require transparency to manage responsibly. Depending on the final configuration of diversion tunnels, impoundments, sediment-management facilities, and power-operation rules, the project may alter the timing, magnitude, and short-term variability of flows entering India. Publicly available information is presently insufficient to quantify those effects.

China's Ministry of Foreign Affairs spokesperson Mao Ning stated at the time of State Council approval that "China has always been responsible for the development of cross-border rivers" and that the project "aims to speed up developing clean energy and respond to climate change and extreme hydrological disasters."[17] Spokesperson Guo Jiakun confirmed at a July 2025 press briefing that the project "will not adversely affect downstream regions" and that China "is engaged in cooperation with downstream coun-

tries on sharing hydrological data, flood prevention and disaster reduction."[18] India's Ministry of External Affairs has consistently conveyed to Chinese authorities the need for transparency and consultation with downstream countries, including during External Affairs Minister S. Jaishankar's meeting with Chinese Foreign Minister Wang Yi in July 2025 and Wang Yi's visit to India in August 2025.[19] The dam site sits in a high seismic zone—the location of the catastrophic 1950 Assam–Tibet earthquake—and high landslide susceptibility in the canyon amplifies downstream risk, making real-time operational data sharing a practical safety requirement as much as a diplomatic one.

Bangladesh: the most exposed riparian party

As the terminal riparian state, Bangladesh bears the accumulated impact of all upstream interventions with the least institutional leverage to address them. The Brahmaputra constitutes approximately 65 percent of Bangladesh's total river water, sustaining the livelihoods of millions of people dependent on agriculture, fisheries, and freshwater supply.[20] The sediment dimension deserves particular attention: the Brahmaputra carries one of the world's highest sediment loads, which is the primary mechanism by which Bangladesh's delta maintains elevation against sea-level rise. Cascade dams trap sediment upstream—a well-documented effect at the Three Gorges Dam—and an analogous outcome on the Brahmaputra could have severe and long-term consequences for Bangladesh's delta morphology. India's parliamentary record confirms that Bangladesh, alongside India, has raised concerns about the dam's potential impact on downstream flows and ecology.[21] Bangladesh has no bilateral Memorandum of Understanding (MoU) with China on hydrological data and no seat at any formal governance mechanism—a situation that serves neither party's interest in stable regional water relations, and that represents the sharpest illustration of the governance deficit examined below.

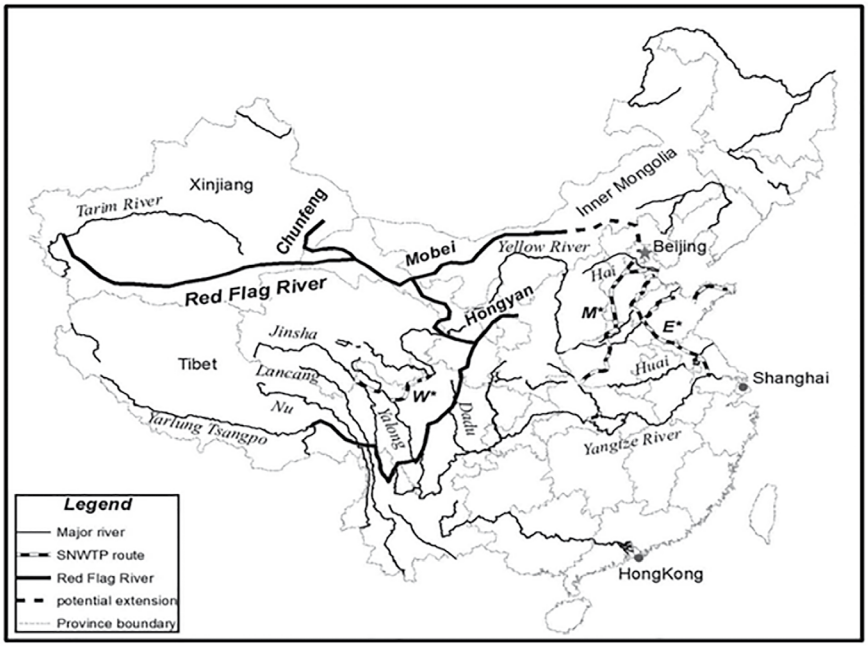
The Red Flag River (红旗河工程建议)

The Red Flag River project proposal aims to divert 60 cubic kilometers of water annually from six river basins on the Tibetan Plateau—including the transboundary Yarlung Tsangpo (Brahmaputra), Nu (Salween), and Lancang (Mekong)—westward along the plateau's eastern margins to Xinjiang's Taklamakan Desert (see Figure 1).[22] The proposed channel would span over 6,180 kilometers, including approximately 1,000 kilometers of tunnels through seismically active terrain. The proposal was developed by the S4679 Research Group, led by Tsinghua University's Professor Wang Hao—engineer-in-chief of the China Institute of Water Resources and Hydropower Research and a core member of the Ministry of Water Resources Counsellor Advisory Committee—and unveiled at a symposium attended by central government representatives in November 2017. Cost estimates converge on approximately four trillion yuan (approximately USD 560 billion).[23]

Official Status

The proposal has not been formally adopted as a construction project, and treating it as equivalent in immediacy to Mêdog would be analytically inaccurate. As documented in Dawson and Schrader, a "threat inflation" dynamic has distorted Western understanding of the project's status, with speculative Chinese-language internet content amplified by foreign media outlets.[24] The proposal is best understood as residing within the Overton window of Chinese water policy—seriously discussed among elite engineers and researchers, but not yet a central government commitment. The instructive parallel is Mêdog itself, once regarded as implausibly ambitious before its formal State Council approval in December 2024. The 2023 South–North Water Diversion annual report confirmed internal consensus on advancing a western route transfer

Figure 1: Proposed Red Flag River Diversion Project



Source: Authors' own.

scheme—indicating that appetite for plateau-scale inter-basin transfer is growing in official circles, and that the line between speculative proposal and approved megaproject can shift quickly once the political and engineering preconditions are judged to be in place.[25]

Feasibility Challenges

Peer-reviewed Chinese academic research published in *Acta Geoscientica Sinica* in 2019 found that the proposal's claimed "self-flowing" headwater route is largely unsupported by the region's actual topography, and that available headwater volumes from the six source rivers are considerably less than the project's stated diversion figure would require.[26] A separate peer-reviewed assessment by Yang Qinye and colleagues at the Chinese Academy of Sciences, published in the *Journal of Natural Resources* in 2018, modeled the proposal's two headline goals—irrigating 200 million mu of new farmland and establishing a 150,000–200,000 sq. km ecological greenbelt—against the 60 cu.km diversion volume the S4679 Research Group proposes. Their calculation, using existing net irrigation quotas in Xinjiang of approximately 600 cu. m per mu, found that the full diversion volume could support a maximum of only 100 million mu of farmland—half the proposal's stated target—while the greenbelt alone would require more than 110 billion cubic meters annually, an amount the project cannot supply even before accounting for the irrigation demand. Achieving both goals simultaneously, the authors concluded, is not possible with the proposed volume.[27] China's own mega-project experience counsels caution on cost: the South–North Water Transfer Project was approved in 2002 at a projected cost of USD 62 billion and costs have continued to escalate as construction has proceeded across the eastern and middle routes.[28] The Wanjiazhai diversion in Shanxi operates at roughly five percent of design capacity because delivered water prices reached levels far above local rates—a cautionary precedent for

Xinjiang, where current irrigation water remains heavily subsidized relative to likely Red Flag River delivery costs.[29]

Chinese scholars within the Ministry of Water Resources advisory ecosystem have themselves raised these concerns. Zhang Hongquan, writing in *Water Resources Protection* in 2018, identified soil salinization from irrigation in the receiving region, accelerated evaporation in wind-exposed semi-arid zones, and seepage losses along the long-distance open-channel route as central structural constraints, proposing an alternative strategy centered on the Lop Nur basin instead.[30] A 2025 peer-reviewed study of cultivated land in Xinjiang found that soil salinity ranged up to 27.7 g/kg in 2021, with salinity levels notably higher in southern Xinjiang—the area most likely to receive Red Flag River water—than in the north.[31] Additional irrigation water at the scale the project proposes could plausibly intensify these dynamics in precisely the region where they are already most acute. China's own State Council "16-character policy" of "water conservation first, spatial balance, systematic governance, and leveraging both government and market forces" signals a policy orientation that, if consistently applied, could reduce the domestic rationale for supply-side mega-engineering at this scale.

Transboundary Dimensions

The proposal's most consequential feature for regional relations is its explicitly transboundary character: it would reduce flows in the Yarlung Tsangpo, Nu, and Lancang before those rivers cross international borders, affecting India, Bangladesh, Myanmar, Laos, Thailand, Cambodia, and Vietnam. India's Parliamentary Standing Committee reports that only hydrological data-sharing MoUs exist with China—not formal water-sharing treaties—and express concern about integrated management and flood forecasting.[32] If realized alongside the Mêdog cascade, the Red Flag River would represent a two-stage hydraulic intervention on the Yarlung Tsangpo, occurring simultaneously at the headwaters and at the Great Bend—interception before the river gains most of its volume, and regulation at the point of maximum hydraulic head. No comparable combination of upstream interception and downstream regulation exists on any other major transboundary river system in Asia. The proposal is missing one crucial element: information sharing and consultation with the many downstream countries whose water access could be affected. This absence, more than the engineering ambition itself, is what requires urgent attention from the regional governance community.

The Upper Lancang–Mekong Hydropower Cascade (澜沧江–湄公河水电梯级)

Scale and Strategic Context

The Lancang–Mekong (澜沧江–湄公河) flows approximately 4,900 kilometers from its source on the eastern Qinghai–Tibetan Plateau in Qinghai Province, southward through China's Yunnan Province before crossing into Myanmar, Laos, Thailand, Cambodia, and Vietnam, where it empties into the South China Sea.[33] The river sustains approximately 60 million people across the basin and supports one of the world's largest inland fisheries. According to the Mekong River Commission, China operates 12 mainstream dams on the upper Lancang, with a combined active reservoir storage of approximately 25 billion cubic meters and a total installed hydropower capacity of approximately 21,300 MW.[34] Several additional dams remain under construction or planned, which could raise total reservoir volume to approximately 63 billion cubic meters and capacity to over 30,000 MW by the early 2030s.[35]

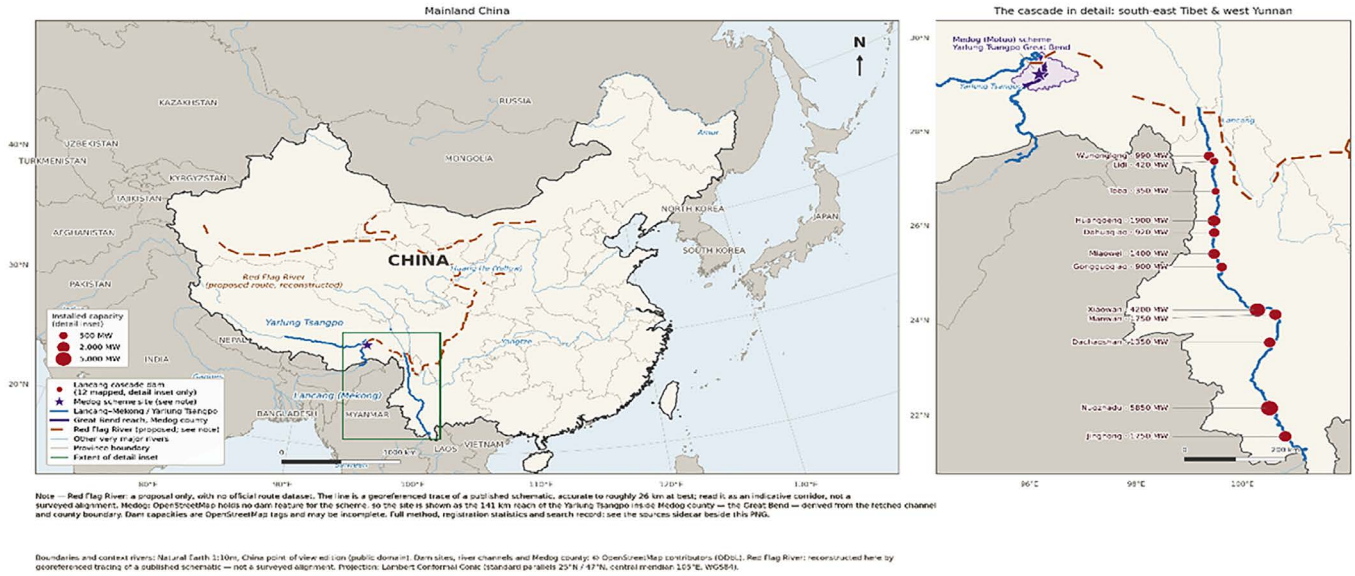
The two largest dams by reservoir storage volume—Nuozhadu (糯扎渡, 5,850 MW installed

capacity, approximately 22–24 billion cubic meters reservoir capacity) and Xiaowan (小湾, 4,200 MW installed capacity, approximately 15 billion cubic meters reservoir capacity)—together account for the substantial majority of the cascade's total active storage, giving them disproportionate influence over the cascade's capacity to regulate downstream flows compared to the smaller dams further upstream.[36] As the Stimson Center's Mekong Dam Monitor has documented through satellite analysis across 2019–2024, monitoring how these two reservoirs are filled and drawn down is particularly informative for understanding the cascade's downstream hydrological impact—and offers a useful methodological template for what independent monitoring of the Mêdog cascade would need to track.[37]

Downstream Hydrological Impacts

The Lancang cascade's downstream effects have been the subject of sustained scientific investigation and diplomatic dispute. During the severe 2019 drought that devastated lower Mekong communities, satellite measurements showed that China's Yunnan province had slightly above-average combined rainfall and snowmelt during the May to October wet season. Yet water levels downstream at the Thai-Lao border were at times up to three meters lower than expected under natural conditions, suggesting dam operations were limiting outflow.[38] China's Ministry of Foreign Affairs disputed the findings, with spokesperson Geng Shuang attributing conditions to natural drought while asserting that China had "continued to do its utmost to guarantee reasonable discharge volumes."[39] The Stimson Center's Mekong Dam Monitor reports through 2024 show that combined end-of-wet-season reservoir levels for the cascade have actually declined since 2021, very likely due to poor water availability conditions—suggesting that in recent years the dams have operated at below-optimal levels due to insufficient inflows rather than deliberate withholding.[40] This is an important empirical nuance: the cascade's hydrological influence varies considerably with rainfall conditions, and attributing specific downstream outcomes solely to dam operations remains methodologically challenging. This is precisely the gover-

Figure 2: The Lancang–Mekong Cascade and Mêdog Scheme in Context



Note — Red Flag River: a proposal only, with no official route dataset. The line is a georeferenced trace of a published schematic, accurate to roughly 26 km at best; read it as an indicative corridor, not a surveyed alignment. Medog: OpenStreetMap holds no dam feature for the scheme, so the site is shown as the 141 km reach of the Yarlung Tsangpo inside Medog county — the Great Bend — derived from the fetched channel and county boundary. Dam capacities are OpenStreetMap tags and may be incomplete. Full method, registration statistics and search record: see the sources sidecar beside this PNG.

Boundaries and context rivers: Natural Earth 1:10m, China point of view edition (public domain). Dam sites, river channels and Medog county: © OpenStreetMap contributors (ODbL). Red Flag River: reconstructed here by georeferenced tracing of a published schematic — not a surveyed alignment. Projection: Lambert Conformal Conic (standard parallels 25°N / 47°N, central meridian 105°E, WGS84).

Source: Produced by Richard Farr for this paper.

nance point. Without real-time, independently verifiable operational data shared proactively by the upstream operator, definitive attribution is impossible—and this informational asymmetry has been the persistent source of diplomatic friction over more than a decade of Lancang dam operations.

On sediment, the findings are less contested. Research estimates that Lancang cascade dams have already reduced sediment loads reaching Vietnam by approximately 74 percent, of which around 40 percent is attributable to the six Chinese mainstream dams (see Figure 2).[41] This sediment dynamic offers a close parallel to the concern raised earlier regarding Bangladesh's delta: in both basins, the cumulative effect of upstream cascade development on sediment transport may ultimately prove more consequential for downstream livelihoods than any single dispute over flow volumes during a drought year.

Governance Architecture: MRC and LMC as Comparative Framework

Two Mechanisms, Different Logics

The Lancang–Mekong basin is the most institutionally developed of the transboundary river systems on which China operates as the dominant upstream dam-builder. Two mechanisms govern, or attempt to govern, its water relations: the Mekong River Commission (MRC) and the Lancang-Mekong Cooperation mechanism (LMC, 澜沧江–湄公河合作). Their comparison offers the most directly relevant model—and cautionary tale—for the Brahmaputra.

The MRC was established in 1995 under the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin, signed by Cambodia, Laos, Thailand, and Vietnam. China and Myanmar participate as Dialogue Partners—not as treaty signatories—meaning Beijing is not legally bound by the MRC's procedural obligations to notify or consult downstream countries over mainstream dam construction or water regulation on the Lancang.[42] The MRC nonetheless received flood-season hydrological data from China for over 19 consecutive years, and since 2020 has received full-year data through the dedicated Lancang-Mekong Water Resources Cooperation Information Sharing Platform.[43]

The LMC was launched on March 23, 2016, at a leaders' meeting in Sanya, Hainan Province, convened at the initiative of Premier Li Keqiang. Its founding coincided closely with a severe regional drought, driven by El Niño conditions since late 2015, during which China carried out an emergency release of water from the Jinghong Hydropower Station (景洪水电站) in Yunnan between March and April 2016 to provide relief to downstream countries—an act Beijing described as neighborly cooperation and one of the first concrete demonstrations of the new mechanism's stated cooperative intent.[44] The LMC's dedicated water resources arm, the Lancang-Mekong Water Resources Cooperation Center (澜沧江–湄公河水资源合作中心), operates the information sharing platform and convenes annual forums on basin governance. At the Fourth LMC Leaders' Meeting in December 2023, Premier Li Qiang called on all sides to "fully respect the legitimate rights and interests of all countries in rational development and utilization of water resources" and stated that China is ready to explore cooperation on "whole-basin governance."[45]

The Mekong governance architecture's achievements should be acknowledged. Since 2020, China has shared full-year hydrological data from the Yunjinghong (云景洪) and Man'an (曼安) stations with all five downstream countries through the LMC information platform.[46] The 2016 emergency water release from Jinghong provided measurable relief to downstream communi-

ties, demonstrating that upstream-downstream cooperation can function concretely under the LMC framework when the diplomatic incentives align. The architecture's limitations are, however, directly relevant to the Brahmaputra challenge. First, China's participation in both the MRC and LMC is voluntary and non-binding; Beijing is not legally obligated to notify downstream countries of dam operations, share operational data, or consult on infrastructure decisions affecting downstream flows.[47]

Second, the 2019 drought dispute demonstrated that even improved data-sharing has not resolved the fundamental attribution problem: when satellite evidence suggested Chinese dam operations were limiting outflow, China disputed the findings, and the absence of independently verifiable real-time operational data from the dams themselves meant the dispute could not be definitively resolved.

Third, regional scholars have observed that the LMC embeds a state-centric orientation and an expansive economic framing that tends to de-emphasize dam construction and its downstream consequences.[48]

Implications for the Brahmaputra

The contrast is stark and instructive. The Mekong has a 30-year-old treaty-based commission, a dedicated China-convened cooperation mechanism, a full-year hydrological data sharing platform, ministerial-level annual dialogue, and ongoing technical collaboration between China and the MRC Secretariat. The Brahmaputra has a bilateral MoU covering three monitoring stations, limited to flood-season data, which expired in June 2023 and has not been formally renewed, with full data sharing suspended since that date.[49]

This contrast carries both a warning and a model. The warning is that even the Mekong's more developed architecture has proved insufficient to prevent attribution disputes and diplomatic friction when major dam operations intersect with downstream drought conditions. The Brahmaputra, with less institutional coverage and a far more politically sensitive bilateral context, faces correspondingly greater governance risk. The model is that the essential elements of a more functional architecture are identifiable from Mekong experience: regular data sharing from multiple stations covering both flood and dry seasons; a dedicated multilateral information platform accessible to all riparian states; ministerial-level dialogue convened regularly; and technical cooperation on flood and drought management as a confidence-building entry point before more contentious issues are addressed directly.

Addressing the Governance Gap

The transboundary governance architecture on the Brahmaputra is dangerously thin relative to what China's infrastructure program now requires. Two formal bilateral mechanisms exist between China and India: the China–India Expert Level Mechanism on Trans-Border Rivers (ELM), established in 2006, which provides a broader forum for discussing shared river issues including hydropower projects and hydrological data; and the hydrological data-sharing MoU, first signed in 2002 and renewed in 2008, 2013, and 2018, covering only three monitoring stations and limited to flood-season data.

Neither constitutes a basin commission, water-allocation arrangement, or mechanism that obliges China to obtain India's approval for upstream projects. As Wouters and Devlaeminck have documented, China's transboundary water governance approach consistently prioritizes upstream sovereign prerogatives over legally binding basin-wide rules, with the result that weaker, more consultative arrangements tend to characterize its relationships with southern riparian states such as India and Bangladesh.[50]

The MoU expired on June 5, 2023. In a statement to India's Parliament on August 22, 2025, Minister of State for External Affairs Kirti Vardhan Singh confirmed that "the hydrological data of Brahmaputra river has been suspended with effect from June 2023."[51] Following Chinese Foreign Minister Wang Yi's visit to New Delhi in August 2025, Beijing agreed in principle to share data on a limited, emergency and humanitarian basis—a provisional and conditional arrangement that falls well short of the comprehensive data-sharing framework that operated before 2023.[52] The formal MoU itself has not been renewed. None of the four Brahmaputra riparians—China, India, Bangladesh, and Bhutan—are parties to the UN Watercourses Convention (1997), meaning no enforceable water-sharing rights exist.[53] In June 2025, Bangladesh became the first South Asian state to accede to the separate 1992 UN Water Convention (Helsinki), though none of the four Brahmaputra riparians remain party to the 1997 instrument.

The fragility of even this minimal framework was demonstrated during China's 2017 Doklam standoff with India, when China withheld hydrological data on both the Brahmaputra and Sutlej rivers simultaneously for the entire flood season. Beijing's official explanation was that data-gathering stations required technical upgrades; however, China continued to provide Brahmaputra data to Bangladesh during the same period, a discrepancy that has led most independent analysts to conclude the suspension was discretionary rather than purely technical.[54]

When data sharing resumed in 2018 following an Expert Level Mechanism meeting in Hangzhou, it illustrated that the framework rests substantially on goodwill and the prevailing state of bilateral relations rather than enforceable obligation.[55] Once Mêdog is operational, the need for reliable, real-time data will intensify considerably. The current MoU framework, even if fully renewed, was designed for flood warning from three stations; it was never designed for governing a five-dam cascade with 60 GW of generating capacity at a seismically active site near a contested international border. The goal should not be an immediate leap to a basin-wide treaty—a politically unrealistic objective in the current bilateral environment—but a staged process: first restoring the technical data-sharing relationships that existed before June 2023, then building progressively toward a more legally secure framework as trust is established.

China's Bilateral Water Governance: A North-South Asymmetry

The governance deficit on the Brahmaputra is not an inherent feature of China's transboundary water policy—it reflects the geopolitical texture of specific bilateral relationships. Table 1 summarizes the governance strength of China's key transboundary water arrangements, illustrating a clear north-south gradient. The China–Kazakhstan framework has produced verified water allocation negotiations, water quality agreements, joint hydraulic facilities with automated equal-flow distribution, and as recently as March 2025, a new memorandum of cooperation covering water-saving technologies and joint training of water management personnel.[56]

The China–Russia framework includes dedicated monitoring working groups, water quality protection protocols, and emergency liaison mechanisms—all formally institutionalized under a Joint Commission of which China's Ministry of Foreign Affairs is the official custodian.[57] Even the China–Mongolia 1994 agreement establishes binding legal principles on equitable use, ecological conservation, and the duty not to cause harm to reasonable water uses by the other party.[58]

The contrast with China's southern riparian relationships is striking and not accidental.

Table 1: China's Transboundary Water Governance Arrangements — Selected Comparisons

Arrangement	Key Instruments	Governance Strength
China–Kazakhstan	2001 Cooperation Agreement on the Use and Protection of Transboundary Rivers; 2003 Joint River Commission; 2011 Water Quality Protection Agreement; 2025 MoU on water resources cooperation and water-saving technologies (first government-level water MoU)	Strongest bilateral institutional framework; joint commission, water quality monitoring, ongoing water allocation draft negotiations, joint hydraulic facilities on Khorgos and Sumbay rivers
China–Russia	2008 Agreement on Reasonable Utilization and Protection of Transboundary Waters; Joint Commission	Broad framework with substantial monitoring, water quality, and emergency cooperation; institutionalized under a formal Joint Commission
China–Mongolia	1994 Agreement on Protection and Utilization of Transboundary Waters (covers specific border rivers: Halaha, Kerules, Bor Nor Lake, and Bulgan River)	Broad legal principles on equitable use, ecological protection, and avoiding harm; binding duty not to cause harm to reasonable uses; applies to border rivers only, not major international watercourses
Lancang–Mekong	1995 MRC Agreement (China as Dialogue Partner only); 2016 LMC mechanism; full-year data sharing since 2020	Broad regional political and development framework; not a binding basin-management treaty; China not legally bound to notify or consult
China–India (Brahmaputra)	ELM established 2006; data-sharing MoU 2002, renewed 2008, 2013, 2018; expired June 2023; data sharing suspended	Formal but mainly consultative; no joint commission; no water allocation agreement; data sharing currently suspended
China–Bangladesh	MoU on Provision of Hydrological Information of the Yarlung Zangbo/ Brahmaputra River in Flood Season (flood data provision since 2006, per China Ministry of Water Resources); implementation plan renewed and flood reporting period extended in 2025	Narrowest operational arrangement; flood-season data only; no ELM equivalent; no formal mechanism to raise concerns about upstream projects; 2025 renewal extended reporting period but did not broaden governance scope

Compiled by Authors, from sources cited in endnotes (see page 19).

China's transboundary water treaties consistently place a strong emphasis on procedural rules and information sharing, but leave questions as to how prescriptive these requirements are regarding hydropower construction and operation—a structural tendency that becomes more pronounced in its most geopolitically contested river relationships.[59] The north-south asymmetry in governance quality thus reflects not the limits of what China can build institutionally, but the limits of what it has so far judged strategically worthwhile to build with its southern riparian neighbors. Closing that gap—through the kind of staged, confidence-building process that the China–Kazakhstan precedent illustrates—is the central governance challenge the Brahmaputra now faces.

The compounding effect of accelerating glacier retreat makes this urgency greater still. As glaciers shrink and river base flows become more variable, downstream states will increasingly struggle to distinguish between flow reductions caused by dam operations, glacial retreat, and rainfall variability—exactly the attribution problem that the Lancang–Mekong experience shows is difficult to resolve even with a developed institutional architecture. Without independent, verifiable data, every dry year on the Brahmaputra risks becoming a diplomatic flashpoint, an outcome that harms downstream communities, creates political friction, and weakens China's stated commitment to being a responsible upstream neighbor. Building transparent data-sharing architecture before the cascade is fully operational is in the interests of all parties, including China.

Policy Recommendations

For European governments and the EU:
Incorporate transboundary water governance explicitly into Indo-Pacific engagement frameworks. The EU's Indo-Pacific Strategy addresses infrastructure as a dimension of geopolitical competition; water infrastructure deserves equivalent attention alongside digital and physical connectivity concerns. European development finance should support independent satellite-based river monitoring in downstream states—modeled on the Stimson Center's Mekong Dam Monitor approach—that reduces dependence on unilateral data provision and creates a shared information base for all riparians. The EU should engage the UN Watercourses Convention Implementation Support Unit to advocate for universalization, with specific reference to China and India as key non-parties.

For multilateral institutions:
The World Meteorological Organization and UN-Water should pursue formal dialogue with Chinese authorities on extending real-time hydrological data sharing on Tibetan Plateau rivers as a regional public good, analogous to meteorological data-sharing norms already in place. The MRC's technical and scientific capacity in hydropower assessment, sediment tracking, and fisheries management offers a model for the kind of basin-level knowledge infrastructure the Brahmaputra currently lacks entirely. Independent technical assessments of the Red Flag River proposal—involving researchers from China and downstream nations—should be actively facilitated and funded.

For India, Bangladesh, and downstream states:
A staged approach to rebuilding the Brahmaputra governance framework is both more politically realistic and more durable than seeking a comprehensive legal instrument before the basic technical relationship has been restored. The immediate priority is reinstating the technical data-sharing arrangements that existed before June 2023—resuming the hydrological MoU, expanding its coverage beyond three monitoring stations to include the Mêdog construction zone, and convening a dedicated Expert Level Mechanism meeting on trans-border river cooperation, as specifically

proposed during the August 2025 Wang Yi visit to New Delhi.[60] These technical steps should be treated not as an endpoint but as a transitional foundation: the China–Kazakhstan Joint River Commission, established following the 2001 Cooperation Agreement, offers an instructive model of how routine technical engagement can be progressively institutionalized into a more substantive bilateral framework over time.[61] The medium-term objective should be upgrading the Brahmaputra relationship toward a more legally secure framework—whether through enforceable data-sharing obligations, a joint technical commission, or a multilateral basin dialogue that brings Bangladesh and Bhutan into a formal role alongside India and China.

Bangladesh's structural vulnerability—no bilateral MoU, no formal governance representation, and delta morphology critically dependent on Brahmaputra sediment—makes its inclusion not merely equitable but analytically necessary for any framework to function with legitimacy. All downstream states should invest in independent satellite-based flood early-warning infrastructure as a complement to, not a substitute for, negotiated data-sharing arrangements.

For the research community:
Interdisciplinary research integrating glaciology, hydrology, dam operations, and governance analysis is urgently needed for the Yarlung Tsangpo–Brahmaputra system. The interaction between dam operations and accelerating glacier retreat—and what this means for attribution of downstream flow variability—is a research gap with direct policy consequences for all downstream states. The Red Flag River proposal requires independent hydrological modeling of intercepted volumes from the Brahmaputra, Mekong, and Salween, conducted transparently and with downstream nation participation.

Conclusion

China's water and energy infrastructure program on the Tibetan Plateau reflects structural domestic imperatives—a northern water deficit, groundwater depletion, food and energy security pressures, and artificial intelligence-driven electricity demand—that are real, long-standing, and that would challenge any government in Beijing's position. The Mêdog Hydropower Station, the Red Flag River proposal, and the operational Lancang-Mekong cascade are, in their different ways, responses to those imperatives, and understanding them as such is the starting point for credible policy analysis rather than a conclusion that excuses the governance gap that accompanies them.

What the governance record reveals, most clearly through the Lancang–Mekong precedent, is a persistent gap between the scale of infrastructure being built and the institutional architecture through which its transboundary effects are managed. The Brahmaputra MoU expired in June 2023, and although a limited, conditional data-sharing arrangement has emerged following 2025 diplomatic engagement, the comprehensive framework that previously operated has not been restored.

Even the Mekong's more developed governance architecture has proved insufficient to prevent attribution disputes and diplomatic friction when large-scale dam operations intersect with downstream drought. The Brahmaputra is following a similar trajectory, at greater scale, with less institutional coverage, and against a backdrop of accelerating glacier loss that will progressively complicate the hydrological baseline against which dam impacts are assessed for decades to come.

The governance architecture—data-sharing, transparency, basin-level dialogue—needs to be built before Mêdog is fully operational,

not negotiated under the pressure of the first downstream drought year. This is not a call to constrain China's legitimate infrastructure development, nor does it rest on an assumption that Beijing intends harm to its neighbors. It is a call to ensure that development of this scale and consequence is matched by institutional frameworks through which all affected parties—including China—can manage its effects cooperatively, transparently, and in a manner consistent with the regional stability that Beijing, alongside its neighbors, has a clear and shared stake in preserving.

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