



Lex Aqua in the Anthropocene: Jurisprudential responses to global water bankruptcy and the climate emergency

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Abstract

This paper examines the contemporary intersection of global water scarcity—characterized as "Global Water Bankruptcy"—and the escalating climate emergency. As anthropogenic warming exceeds 1.1°C , the systemic disruption of the hydrological cycle has rendered traditional legal stationarity obsolete and pushed freshwater systems beyond planetary boundaries. Through a critical analysis of international instruments, including the 1997 UN Watercourses Convention and the 2004 Berlin Rules, this study evaluates the evolving tension between "Equitable and Reasonable Utilization" and the "No Significant Harm" rule in an era of decreasing supply. The research utilizes the 2025 Indus Waters Treaty abeyance crisis and the Grand Ethiopian Renaissance Dam (GERD) dispute to illustrate the fragility of transboundary agreements under hydro-climatic stress and shifting hydro-hegemony. Furthermore, it analyzes the landmark 2025 Advisory Opinions from the Inter-American Court of Human Rights and the International Court of Justice, which elevated environmental protection to jus cogens status and affirmed the existential legal duties of states to mitigate climate harm. Finally, the paper addresses the "legal void" surrounding climate-induced migration and the disproportionate impacts of water insecurity on women and girls, ultimately advocating for a transition toward adaptive, rights-based Integrated Water Resources Management (IWRM).

Keywords: Water bankruptcy, climate emergency, transboundary water law, human right to water, IWRM

Introduction

The global hydrological cycle has transitioned into a state of "Global Water Bankruptcy," a persistent post-crisis failure state where the cumulative impact of anthropogenic depletion and climate-driven volatility has fundamentally exceeded the regenerative capacity of the planet's freshwater systems. As the world approaches the mid-2020s, the paradigm of "water stress" has become an inadequate descriptor for a reality where the planetary boundaries for freshwater have been breached. For the legal scholar and practitioner, this era necessitates a radical re-evaluation of established doctrines, ranging from the sovereign rights of riparian states to the burgeoning jurisprudence of human rights and climate mobility. The current global condition is not merely a temporary scarcity but a structural failure of governance and physical supply, where past hydrological baselines can no longer be restored.

The Physical and Economic Architecture of Global Water Bankruptcy

Global Water Bankruptcy is defined as a state where long-term water use and pollution have surpassed renewable inflows and safe depletion limits. This condition is reflected in the massive degradation of surface waters and aquifers

worldwide. Since the early 1990s, more than 50% of the world's large lakes have lost significant volume, directly affecting 25% of the human population that relies on these bodies for survival. The loss of natural wetlands has been equally catastrophic, with 410 million hectares—an area nearly the size of the European Union—erased over the past five decades. The economic valuation of the ecosystem services lost through this wetland destruction is estimated at US\$5.1 trillion annually, a figure comparable to the combined GDP of 135 of the world's poorest nations. This systemic collapse is further evidenced by the decline of groundwater, which now provides approximately 50% of global domestic water and supports 40% of all irrigation. Currently, 70% of the world's major aquifers exhibit long-term decline, leading to land subsidence that affects 2 billion people and causes some urban centers to sink by as much as 25 cm per year. The legal implications of this subsidence and depletion are profound, challenging the stability of property rights, infrastructure liability, and the duty of states to protect the "commons."

Global Water Scarcity and Bankruptcy Indicators (2025-2026)

Indicator	Metric / Statistical Impact	Source
Global Population Water Insecure	75%	
People Facing Severe Scarcity (Monthly)	4 Billion	
People Lacking Safe Drinking Water	2.2 Billion	
People Lacking Managed Sanitation	3.5 Billion	
Annual Global Cost of Drought	US\$307 Billion	
Daily Deaths (Children under 5) due to unsafe WASH	~1,000	
Global Wetland Loss (Last 50 Years)	410 Million Hectares	
Groundwater Contribution to Irrigation	40%+	
Major Aquifers in Long-term Decline	70%	

The acceleration of these trends is inextricably linked to the intensification of the global water cycle driven by greenhouse gas emissions. Human activities have contributed approximately \$1.1^{circ}\text{C}\$ of warming since the 1850-1900 period, with projections suggesting the \$1.5^{circ}\text{C}\$ threshold will be exceeded within the next two decades. This warming disrupts precipitation patterns, reduces snowpack, and accelerates glacier melt, which in turn reduces the predictability of river flows—the very foundation upon which transboundary water treaties are built. Limiting global warming to \$1.5^{circ}\text{C}\$ compared to \$2^{circ}\text{C}\$ would approximately halve the proportion of the world population expected to suffer water scarcity, yet the current trajectory suggests more severe outcomes.

Scientific Foundations: The Hydro-Climatic Nexus

Climate change acts as a "threat multiplier" in the context of water security, exacerbating existing vulnerabilities and disrupting the stationarity of hydrological cycles. Rising global temperatures increase the moisture-holding capacity of the atmosphere, leading to a paradox where storm intensity and heavy rains increase in some regions while evaporation rates trigger more intense dry spells in others. Terrestrial water storage, which includes soil moisture, snow, and ice, has dropped at a rate of 1 cm per year over the past two decades.

The IPCC Sixth Assessment Report (AR6) confirms that water-related disasters have dominated the list of global hazards over the past 50 years, accounting for 70% of all deaths related to natural disasters. Flood-related disasters have risen by 134% since 2000, while the frequency and duration of droughts increased by 29% in the same period. For the legal scholar, this volatility renders "fixed-share"

allocation models—where treaties promise a specific volume of water to a downstream state—obsolete and prone to breach.

Furthermore, climate change impacts water quality as higher temperatures and frequent flooding exacerbate pollution from sediments, pathogens, and pesticides. This deterioration of quality directly impairs the ability of states to fulfill the "Human Right to Water and Sanitation" (HRWS), as polluted sources require more intensive and expensive treatment processes. The degradation of freshwater ecosystems also threatens food security, as 70% of freshwater use is dedicated to agriculture.

The Doctrinal Framework of International Water Law

The governance of transboundary water resources—those shared by two or more states—is governed by a hierarchy of international legal instruments and customary principles. These frameworks seek to balance the sovereign rights of riparian states with the collective necessity of resource preservation and equitable sharing.

Primary Instruments and the Evolution of Norms

The three primary milestones in the development of international water law are the 1966 Helsinki Rules, the 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses (UNWC), and the 2004 Berlin Rules. While the Helsinki Rules and the UNWC focus heavily on the rights of states to utilize shared resources, the Berlin Rules represent a shift toward the "obligation" to manage resources sustainably and holistically.

Feature	1966 Helsinki Rules	1997 UN Watercourses Convention	2004 Berlin Rules
Scope	International Drainage Basin	International Watercourse	All Water Resources (inc. Groundwater)
Primary Principle	Equitable Utilization	Equitable and Reasonable Utilization	Integrated Water Resources Management
Status	Non-binding / Customary basis	Legally Binding (Entered force 2014)	Scholarly / Best Practice
Key Focus	State rights to shares	Rights and duties of riparians	Sustainability and Human Rights
Conflict Rule	No inherent priority	Vital human needs prioritized	Human needs and ecosystems

The principle of "Equitable and Reasonable Utilization" (ERU) is the foundational norm of customary international water law. It rejects the "Harmon Doctrine" of absolute territorial sovereignty—which claimed a state could do whatever it wished with water on its territory—in favor of a "community of interest" model. ERU requires states to consider a range of factors to determine their share of a resource, including geographic and hydrological factors, the social and economic needs of the population, the effects of use on other states, and the availability of alternatives.

The Conflict between ERU and the "No Significant Harm" Rule

A central tension in international water law exists between the principle of ERU and the "Duty to Prevent Significant Harm". Under the UNWC, states must take all appropriate measures to prevent significant harm to other watercourse states. If harm occurs, the state must consult with the affected party to eliminate or mitigate the harm, having due regard for the principles of equitable utilization.

Scholars disagree on the hierarchy of these principles. One view, often favored by upstream states, argues that ERU is the primary principle and that some harm may be permissible if the utilization is otherwise equitable. Conversely, downstream states often argue that the "no-harm" rule is a preemptory obligation of due diligence that

should guide dispute resolution. In the era of Global Water Bankruptcy, the "no-harm" rule is increasingly framed through an environmental lens, focusing on the prevention of irreversible ecological damage to the "basin as a whole".

The Crisis of Treaty Stability: The 2025 Indus Waters Case Study

The most vivid contemporary example of the fragility of transboundary water agreements is the 2025 crisis regarding the Indus Waters Treaty (IWT). Signed in 1960 under the mediation of the World Bank, the IWT partitions the Indus system between India and Pakistan, allocating the "Eastern Rivers" (Sutlej, Beas, and Ravi) to India and the "Western Rivers" (Indus, Jhelum, Chenab) primarily to Pakistan. Despite enduring three wars and decades of hostility, the treaty faced a structural collapse in April 2025 following the Pahalgam terror attack, leading India to place the treaty in "abeyance".

Legal Arguments for Suspension: Pacta Sunt Servanda vs. Rebus Sic Stantibus

India's decision to suspend the treaty unilaterally sparked a profound legal debate centered on the Vienna Convention on the Law of Treaties (VCLT). India invoked two primary justifications:

1. Material Breach (Article 60 VCLT): India claimed that Pakistan’s alleged support for cross-border terrorism constitutes a material breach of the treaty's object and purpose—framed in the preamble as a "cooperative spirit" of "goodwill and friendship".

2. Fundamental Change of Circumstances (Article 62 VCLT): India argued that "fundamental changes" over 65 years—including demographic shifts, increased energy needs, and climate change—render the original allocation untenable.

VCLT Clause	Doctrine	Legal Threshold for the Indus Dispute
Article 26	Pacta Sunt Servanda	Agreements must be kept; unilateral exit is generally prohibited.
Article 60	Material Breach	Requires violation of an "essential provision" of the treaty itself.
Article 62	Rebus Sic Stantibus	Change must be unforeseen and radically transform obligations.
Article XII (IWT)	Termination Rule	Treaty can only be terminated by a new, mutually ratified agreement.

Legal experts have noted that the IWT contains no provision for "abeyance" or unilateral suspension. The Permanent Court of Arbitration (PCA), in verdicts delivered in June 2025 and February 2026, affirmed that the treaty remains in force and that demographic shifts do not meet the stringent criteria of Article 62. The PCA's ruling highlights the ICJ's precedent in the *Gabčíkovo-Nagymaros* case, which established that even significant political changes do not automatically justify treaty termination if the underlying technical obligations (water sharing) remain possible.

The Role of Climate as a Threat Multiplier in the Indus Basin

Climate change has introduced sharp intra-seasonal fluctuations in the Indus basin, with accelerated glacial retreat and erratic monsoons undermining the predictability of flows. For India, where per capita water availability has fallen below $\$1,500\text{m}^3$, the rigid allocations of the 1960s are perceived as a constraint on its energy and food security. Pakistan, which relies on the Western Rivers for 80% of its irrigated agriculture and a quarter of its GDP, views any upstream diversion as an existential threat. This highlights the need for the IWT to evolve from a "partition" model to a "cooperative management" model that accounts for the "Climate Imperative".

The Grand Ethiopian Renaissance Dam (GERD) and the Nile Basin

The Nile River Basin exemplifies the shift in "hydro-hegemony" from downstream Egypt to upstream Ethiopia. The 1929 and 1959 Nile Waters Agreements, which allocated nearly the entire flow of the river to Egypt and Sudan, were concluded without the participation of Ethiopia, where 85% of the Nile's flow originates. Ethiopia’s construction of the Grand Ethiopian Renaissance Dam (GERD) challenges this status quo, asserting its right to development through hydropower.

The legal dispute centers on the filling and operation of the dam during multi-year droughts. Egypt, dependent on the Nile for over 90% of its water, argues that the GERD represents a "significant harm" that threatens its national security. Ethiopia contends that it is making "equitable and reasonable use" of its resources and that any harm is not "significant" in the context of its own energy needs. The absence of a binding agreement on drought mitigation, exacerbated by climate change's "more rain, but less water" projections, remains a flashpoint for regional stability.

Institutional Gaps and Adaptation in the Mekong River Basin

The Mekong River, flowing from China through Myanmar, Laos, Thailand, Cambodia, and Vietnam, is governed by the 1995 Mekong Agreement and the Mekong River Commission (MRC). While the MRC is praised for its comprehensive approach, it faces significant legal and institutional gaps:

- 1. Non-Inclusive Governance:** China and Myanmar are not members of the MRC, limiting the commission's ability to regulate upstream dam operations.
- 2. Lack of Binding Clauses:** The current legal regime lacks basin-wide, legally binding agreements on climate change adaptation and dispute resolution.
- 3. Procedural Limitations:** While the MRC has established procedures for "Notification, Prior Consultation, and Agreement" (PNPCA), these mechanisms are often bypassed or ignored in the pursuit of national hydropower goals.

The MRC has developed the "Mekong Climate Change Adaptation Strategy and Action Plan" (MASAP) to harmonize monitoring and reporting. However, the reality of "saltwater intrusion" in the Mekong Delta and disrupted fisheries underscores the urgency of integrating human rights and the needs of vulnerable populations into the basin's governance.

The Human Right to Water and Sanitation (HRWS): Jurisprudential Evolution

The recognition of water and sanitation as human rights is a cornerstone of modern international law, essential for the realization of all other rights, including the rights to life, health, and dignity. The Human Right to Water and Sanitation (HRWS) is defined as the right of everyone to sufficient, safe, acceptable, physically accessible, and affordable water for personal and domestic use.

Normative Criteria and Climate Threats

Under General Comment No. 15, the HRWS imposes specific legal obligations on states. Climate change complicates the fulfillment of these duties across five key dimensions:

Criterion	Normative Definition	Climate Change Threat / Impact
Availability	Continuous and sufficient quantity.	Droughts reduce supply; evaporation increases.
Quality	Safe, free from contaminants.	Floods carry pathogens; heat increases algal blooms.
Accessibility	Physically accessible within reach.	Infrastructure damage from extreme weather events.
Affordability	Available at a price all can afford.	Scarcity drives up costs of provision and treatment.
Acceptability	Culturally acceptable; ensures privacy.	Displacement forces reliance on informal settlements.

The HRWS creates a "human face" for the abstract problem of water scarcity. Crucially, it dictates the "prioritization" of access: in a challenge of managing competing demands, human rights instruments require states to prioritize water for essential domestic purposes over industrial or agricultural use. However, data from 2025 indicates that while 80% of countries address climate risks in their WASH policies, only 20% have specific measures to finance actions for populations disproportionately affected by climate change.

The 2025 Inter-American Court Breakthrough: The Right to a Healthy Climate

In a landmark decision on July 3, 2025, the Inter-American Court of Human Rights (IACtHR) issued Advisory Opinion OC-32/25, recognizing the Right to a Healthy Climate as an enforceable human right. This decision is considered the most progressive document yet released by an international court on the climate crisis.

Key jurisprudential advancements from OC-32/25 include:

- 1. Jus Cogens Status:** The obligation to prevent irreversible harm to the environment and climate was recognized as a *jus cogens* norm—a peremptory principle of international law that is universally binding and non-negotiable. This places environmental protection in the same supreme legal category as the prohibition of genocide and slavery.
- 2. Enhanced Due Diligence:** The court established an "enhanced due diligence" standard for states, requiring them to affirmatively prevent and respond to the climate emergency. This includes regulating private corporations to disclose and reduce emissions and cracking down on "greenwashing".
- 3. Inter-generational Equity:** The court recognized future generations as rights holders, emphasizing the

duty of states to preserve the ecological balance for those not yet born.

- 4. Legal Personality of Nature:** By a 4-3 majority, the court recognized the legal personality of nature as a subject of rights under the American Convention on Human Rights.

This opinion provides a powerful legal framework for advocates seeking to translate climate impacts on water (such as the 2024 Amazon fires) into concrete state accountability.

Climate-Induced Migration and the "Legal Void"

One of the most catastrophic results of Global Water Bankruptcy is the displacement of human populations. It is estimated that by 2050, at least 1.2 billion people will be displaced by climate-related disasters. However, these "climate refugees" currently lack international legal recognition, falling into a "legal void".

The 1951 Convention and the Problem of "Persecution"

The 1951 Refugee Convention defines a refugee as someone fleeing "persecution" based on race, religion, nationality, membership in a social group, or political opinion. Climate change and water scarcity are typically viewed as "indiscriminate" forces rather than "persecutory". To qualify for protection under this framework, an individual would need to prove "human agency"—for example, that a state is using a drought as a pretext to withhold water or aid from a marginalized group.

Regional Frameworks as Potential Solutions

In the absence of a global treaty for climate displacement, regional agreements offer more expansive protections that could serve as models for international reform:

Framework	Legal Status	Provisions for Climate Displacement
Cartagena Declaration (1984)	Non-binding (Regionally binding)	Protects those fleeing "circumstances which have seriously disturbed public order."
Kampala Convention (2009)	Legally Binding (African Union)	Explicitly obligates states to protect and assist those displaced by natural disasters.
Guiding Principles (1998)	Non-binding	Addresses internal displacement caused by natural or human-made disasters.
Teitiota v. NZ (2020)	Human Rights Precedent	Acknowledges that climate change may trigger <i>non-refoulement</i> if life is at imminent risk.

The IACtHR Advisory Opinion 32/25 further supports these protections by emphasizing that climate-related adaptation must reflect due diligence and respect the rights of vulnerable groups, including Indigenous peoples and children.

The global water crisis disproportionately affects women and girls, who shoulder the primary responsibility for water collection and household management in many cultures. This inequality is not merely social but has profound legal and economic consequences.

The Gendered Dimensions of Global Water Governance

Statistical Reality of Gender Disparity (2025-2026)

Impact Area	Metric	Source
Water Collection Burden	Women and girls spend 250 million hours per day fetching water.	
Rural Collection	Women are responsible for water in >70% of unserved rural households.	
Income Impact	\$1 [^] rise reduces income of female-headed households by 34% more than male.	
Time Poverty	Women's weekly labor hours increase by 55 minutes relative to men due to climate change.	
Education	10 million adolescent girls missed school (2016-2022) due to lack of WASH facilities.	
Governance	Fewer than 1 in 5 water workers are women in 64 surveyed utilities.	

Gender inequalities in land and property ownership directly impact women's access to water, as water rights are often

legally tied to land tenure. Despite the "Dublin Principles" recognizing women's central role in water management,

they remain systematically under-represented in water governance, financing, and technical roles. Integrating a "gender-responsive" approach into operational plans is now considered a legal imperative for achieving Sustainable Development Goal 6.

Integrating the Paris Agreement and Water Governance

The 2015 Paris Agreement is a legally binding international treaty aimed at limiting global warming to well below 2°C , and preferably 1.5°C . While the agreement focuses on greenhouse gas mitigation, its implementation is essential for water security.

Nationally Determined Contributions (NDCs) and Adaptation

Countries communicate their climate actions through NDCs, which are updated every five years. While there is no specific requirement to include water-related adaptation, a significant number of NDCs from Least Developed Countries (LDCs) include it voluntarily. The 2023 "Global Stocktake" and the UAE Framework for Global Climate Resilience have established thematic targets to bolster resilience against water scarcity and food insecurity by 2030.

However, there is a persistent "adaptation gap." High-level assessments in 2025 and 2026 indicate that current WASH systems are "thin" and constrained by fragmentation and financing that does not translate into results. A funding gap of 46% exists between identified needs and available funding to reach national targets, with "non-revenue water" (water lost through leaks or theft) averaging 39% in many countries.

Conclusion: The Path toward Adaptive Water Governance

The global condition of Water Bankruptcy and the climate emergency necessitate a transformation of "Lex Aqua"—the law of water. The traditional reliance on fixed, state-centric treaties must yield to more flexible, rights-based, and integrated governance models. The 2026 UN Water Conference represents a pivotal moment for states to move beyond "techno-fix" short-sightedness and top-down decision-making toward Integrated Water Resources Management (IWRM) that prioritizes the "Human Right to Water" and the rights of future generations.

The jurisprudential breakthroughs of 2025, including the IACtHR's recognition of the right to a healthy climate as *jus cogens* and the PCA's upholding of treaty stability in the Indus dispute, offer a roadmap for the future. These rulings signal that in the Anthropocene, the preservation of the water cycle is no longer merely a matter of sovereign discretion but a fundamental prerequisite for the enjoyment of all human rights. For the 3rd-year law student, the challenge lies in harmonizing the fragmented regimes of environmental law, human rights law, and transboundary water law into a coherent framework capable of governing a planet that has exceeded its hydrological means. Access to safe and sufficient water is now a universal interest, and its governance must be resilient, equitable, and universally binding.

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