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The Legal Status of the Amu Darya and Syr Darya Rivers under International Law within the Context of Central Asia's Unresolved Water-Sharing Dispute

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Abstract

This research examines the legal status of the Amu Darya and Syr Darya rivers, the principal Transboundary watercourses of Central Asia, and the ongoing disputes among five riparian states regarding their equitable allocation. Drawing on international water law, treaty analysis, and institutional review, the study identifies critical gaps in existing governance frameworks and evaluates why decades of negotiations have failed to produce a binding comprehensive agreement. The findings reveal that the post-Soviet institutional architecture, while providing a procedural forum, lacks enforcement capacity and substantive legal clarity. The study concludes that effective water governance in Central Asia requires harmonization with international law, strengthened dispute resolution mechanisms, and a legally binding multilateral treaty that balances upstream development interests with downstream ecological and humanitarian needs.

Keywords: Amu Darya, Syr Darya, Transboundary Water Law, Central Asia, Water Sharing, International Law, ICWC, Riparian States

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I. Introduction

Water has long been the lifeblood of Central Asian civilizations, yet it has simultaneously emerged as the region's most intractable geopolitical challenge. The Amu Darya and Syr Darya rivers, the two largest rivers of Central Asia, sustain the agriculture, energy, and livelihoods of more than 70 million people across five sovereign states: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan (Dukhovny & de Schutter, 2011). These rivers originate in the glaciated mountain systems of the Tian Shan and Pamir ranges and flow westward and northward into the increasingly diminished Aral Sea basin. The physical hydrology of the rivers creates an inherent tension between upstream states, which seek to exploit water resources for hydroelectric energy production, and downstream states, which depend on river flows for irrigation-based agriculture and domestic water supply. This hydrological asymmetry is compounded by divergent national legal frameworks, disputed Soviet-era water allocations, and the absence of a comprehensive international legal agreement. The result is a multi-dimensional dispute that tests the limits of international water law and regional governance.

The collapse of the Soviet Union in 1991 transformed what had been an internal water management problem into an international one virtually overnight. Under Soviet central planning, water from the Aral Sea basin was allocated through a command-and-control system that prioritized cotton monoculture in Uzbekistan and Turkmenistan, while Kyrgyzstan and Tajikistan were compensated with subsidized energy supplies for releasing water downstream in summer irrigation seasons (Sehring, 2009). With independence, these exchange arrangements collapsed, and the upstream states, Kyrgyzstan and Tajikistan began asserting sovereign rights over water resources originating within their territories, particularly as they sought to develop large hydroelectric dams such as the Rogun Dam on the Vakhsh River and the Kambarata cascade on the Naryn River. Simultaneously, downstream states insisted on the continuation of Soviet-era allocation quotas, claiming these constituted acquired rights under customary international law. The legal character of Soviet water agreements, whether they constitute binding obligations on successor states, remains contested and unresolved in the scholarship and in practice.

International water law provides a framework for addressing transboundary river disputes, but its application to Central Asia is far from straightforward. The 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses (UN Watercourses Convention), which codified principles of equitable and reasonable utilization, the no-harm rule, and the duty to cooperate, has not been ratified by any of the five Central Asian states (McCaffrey, 2019). Similarly, the 1992 Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes has only been partially engaged with by regional actors. The absence of ratification of these foundational instruments leaves the region operating in a normative vacuum, relying instead on a patchwork of bilateral and multilateral

agreements of varying legal force. Scholars have noted that this institutional fragmentation, combined with power asymmetries among the riparian states, has systematically impeded progress toward a durable cooperative framework (Rieu-Clarke & Loures, 2009). The primary objective of this research is therefore to systematically analyse the legal architecture governing the Amu Darya and Syr Darya Rivers, identify its structural deficiencies, and propose pathways toward a more effective and legally coherent governance regime.

The literature on Central Asian water disputes is extensive but fragmented across disciplines. Scholars in international relations have focused on the security implications of water scarcity and the potential for conflict (Bernauer & Siegfried, 2012). Legal scholars have analysed the applicability of international water law principles to the region, often noting the mismatch between universal legal norms and the specific political economy of post-Soviet Central Asia (Salman, 2007). Environmental scientists have documented the catastrophic ecological consequences of over-abstraction, most visibly in the near-total desiccation of the Aral Sea (Micklin, 2016). Development economists have examined how water insecurity constrains economic growth, particularly in downstream agricultural economics (Droogers et al., 2012). However, there remains a significant gap in the literature regarding a comprehensive legal analysis that integrates treaty law, customary international law, and institutional performance assessments within a single analytical framework. This study seeks to fill that gap by conducting a systematic doctrinal and comparative legal analysis of the Amu Darya and Syr Darya governance regime.

The research question guiding this study is: To what extent does the existing legal and institutional framework governing the Amu Darya and Syr Darya rivers comply with the principles of international water law, and what reforms are necessary to achieve equitable, sustainable, and enforceable water governance in Central Asia? This question is significant for several reasons. First, it has direct humanitarian implications, as water insecurity in Central Asia is linked to food insecurity, rural poverty, and social instability. Second, it raises fundamental questions about the relationship between state sovereignty and international environmental obligations in the context of shared natural resources. Third, the Central Asian case offers a cautionary tale for other transboundary river systems in regions undergoing political transformation. Fourth, the study contributes to the broader academic debate about the effectiveness of international environmental institutions and the conditions under which states comply with or defect from cooperative agreements. Finally, by examining the specific legal architecture of the Amu Darya and Syr Darya, the study identifies lessons that may inform future treaty-making and institutional design in comparable contexts worldwide.

II. Methodology

This study employs a qualitative research design based on doctrinal legal

analysis and comparative institutional review. Doctrinal legal analysis, also known as black-letter law research, involves systematic examination of primary legal sources treaties, conventions, domestic legislation, and institutional decisions to determine the content and scope of applicable legal norms (McConville & Chui, 2017). This methodology is appropriate for the present study because the central research question requires precise interpretation of legal texts and their application to a factual context. The comparative dimension of the research involves examining how legal principles and institutional arrangements in the Amu Darya and Syr Darya basin compare with those in other transboundary river systems, including the Nile, the Mekong, and the Rhine. This comparative approach enables identification of best practices that may be applicable to the Central Asian context and allows evaluation of whether the regional framework meets internationally recognized standards of governance quality.

The primary sources analysed in this study include the 1992 Almaty Agreement on cooperation in the management and protection of interstate water resources, the 1993 Agreement on joint activities in addressing the Aral Sea crisis, the 1998 Framework Convention on the Status of the Syr Darya Basin, bilateral water allocation agreements between specific riparian states, and decisions and resolutions of the Interstate Commission for Water Coordination (ICWC) and the International Fund for Saving the Aral Sea (IFAS). International legal instruments examined include the 1997 UN Watercourses Convention, the 1992 Helsinki Convention, the 1966 Helsinki Rules of the International Law Association, the 2004 Berlin Rules on Water Resources, and relevant decisions of international judicial and arbitral bodies on transboundary water disputes. Secondary sources include peer-reviewed articles in journals of international law, environmental law, political science, and water resources management, as well as reports by international organizations including the United Nations Environment Programme, the World Bank, and the Organisation for Security and Co-operation in Europe.

Data collection followed purposive sampling criteria, focusing on sources that are directly relevant to the legal status of the Amu Darya and Syr Darya rivers and that were published or adopted within the past three decades to ensure contemporaneous relevance. Academic sources were retrieved from Scopus, HeinOnline, JSTOR, and Google Scholar databases. Legal texts were obtained from official treaty repositories including the United Nations Treaty Collection, official government portals, and the ICWC documentation archives available through the Scientific Information Center of ICWC. The inclusion criteria required that all materials be directly relevant to the research question, be produced by credible institutional or scholarly sources, and be accessible in English, Russian, or Uzbek. The analysis was conducted through iterative reading and coding of primary texts, identification of thematic clusters, and synthesis of findings across sources. Triangulation was achieved by cross-referencing legal texts with scholarly interpretations and institutional performance data to ensure the reliability and validity of interpretive claims.

The study operates within defined delimitations. It focuses exclusively on the surface water governance of the Amu Darya and Syr Darya rivers and does not address groundwater resources or water quality regulation in any comprehensive manner. The geographic scope is limited to the five Central Asian riparian states and excludes consideration of Afghanistan's legal status as a co-riparian of the Amu Darya, except where directly relevant to the main analysis. The temporal scope extends from 1991 to the present, covering the post-independence period during which the current legal and institutional framework has evolved. The study assumes that publicly available treaty texts and ICWC decisions accurately represent the legal commitments undertaken by the riparian states, acknowledging that informal arrangements and unrecorded negotiations may also shape state behavior in ways not fully captured by the documentary record. These limitations are acknowledged as inherent to doctrinal research methodologies and are addressed by integrating multiple sources of evidence wherever possible.

III. Results

The systematic analysis of primary and secondary sources reveals a legal and institutional framework that is structurally fragile, normatively ambiguous, and inadequate to resolve the substantive disputes between riparian states. The central finding of this research is that the governance regime for the Amu Darya and Syr Darya rivers is characterized by three interrelated deficiencies: the absence of a binding comprehensive water-sharing agreement, the operational weakness of the ICWC and IFAS institutions, and the non-ratification of universal international water law instruments by all five riparian states. These deficiencies are mutually reinforcing and collectively explain why, despite three decades of negotiations and numerous bilateral and multilateral agreements; the water-sharing dispute remains fundamentally unresolved. The results further reveal significant divergence between the legal positions of upstream and downstream states regarding the interpretation of key treaties and the content of applicable customary international law, which has prevented the emergence of a shared normative framework capable of supporting durable cooperation.

A secondary but significant finding concerns the inadequacy of existing data-sharing arrangements as a foundation for equitable water governance. Effective implementation of any allocation framework requires reliable, independently verified hydrological data covering river flows, groundwater levels, water quality parameters, and glacial mass balance. The current system relies primarily on national hydrological monitoring networks operated by individual states, with data shared voluntarily through ICWC channels. Upstream states have at times withheld or delayed the provision of flow data to downstream states, and the quality and completeness of shared data varies considerably across the basin. The absence of an independent basin-wide hydrological monitoring system, with data verified by a neutral technical body, creates conditions in which factual disputes about actual water availability compound

the legal disputes about entitlement. This finding underscores the importance of investing in the technical infrastructure of water governance monitoring networks, data management systems, and scientific assessment capacity as a prerequisite for the effective functioning of any legal framework, however well-designed its substantive provisions may be.

Analysis of the 1992 Almaty Agreement reveals that while it established the ICWC as the primary water management institution and affirmed existing water allocation norms, it is a framework agreement that lacks specific enforcement mechanisms, compliance monitoring systems, or dispute resolution procedures capable of producing binding outcomes. The ICWC operates by consensus, which means that any state can effectively veto collective action, and its decisions are recommendations rather than binding obligations under international law (Weinthal, 2002). The 1998 Framework Convention on the Syr Darya Basin attempted to establish a more comprehensive regime for that river system, including provisions for energy-water exchanges between upstream and downstream states, but its implementation has been consistently frustrated by the inability of states to agree on the valuation and terms of these exchanges. The Rogun Dam project in Tajikistan and the Kambarata project in Kyrgyzstan have generated particular controversy, with downstream Uzbekistan and Kazakhstan raising objections under principles of prior notification and environmental impact assessment that are not clearly codified in any binding regional instrument. The legal character of these objections under existing regional agreements is therefore uncertain, which has fuelled political tensions without providing a clear pathway to legal resolution.

Comparative analysis with other international river regimes reveals significant shortcomings in the Central Asian framework. The Mekong River Commission, established by the 1995 Mekong Agreement, provides substantive rules on minimum flows, notification procedures, and data-sharing obligations, backed by a dedicated secretariat with technical capacity (Hirsch, 2016). The Rhine River regime, built around the 1999 Convention on the Protection of the Rhine, provides a model of progressive standard-setting with binding ecological flow requirements and integrated basin management planning. The Nile Basin Initiative, while also beset by significant political challenges, has produced the 2010 Cooperative Framework Agreement, which explicitly addresses the conflict between upstream development aspirations and downstream historical use claims through negotiated compromise formulas. In contrast, the Central Asian framework provides no comparable substantive standards, no binding minimum flow obligations, no mandatory environmental impact assessment procedures for major hydraulic infrastructure, and no independent adjudicatory mechanism capable of resolving disputes when negotiation fails. These comparative findings underscore the structural inadequacy of the existing regime and support the conclusion that fundamental reform is necessary.

The results of the institutional analysis indicate that ICWC has achieved some

successes in technical coordination and data sharing, but these achievements have not translated into resolution of substantive disputes. ICWC meetings continue to take place regularly, and the organization maintains a network of basin water organizations responsible for operational management of water delivery to irrigation systems. However, annual water allocation decisions by ICWC remain contested when inflows are below-average, and compliance with ICWC decisions is inconsistent, with upstream diversions frequently exceeding agreed limits during dry years without effective sanction (Dukhovny et al., 2013). IFAS, which was established to coordinate efforts to address the Aral Sea ecological crisis, has also been criticized for institutional weakness, lack of financial resources, and inability to compel state action on ecological restoration. The rotating chairmanship of IFAS, which passes among the five states every three years, has resulted in inconsistent institutional priorities and strategic fragmentation. The overall picture that emerges from the institutional analysis is one of procedural continuity combined with substantive stagnation, in which the appearance of cooperation masks a deeper failure to resolve the fundamental questions of water rights, allocation principles, and accountability.

IV. Discussion

A. Historical and Hydrological Development

The Amu Darya, historically known as the Oxus, is the longest river in Central Asia, with a total length of approximately 2,540 kilometers and a drainage basin covering about 534,739 square kilometers. It originates at the confluence of the Panj and Vakhsh rivers on the border of Tajikistan and Afghanistan and flows in a generally westward direction before emptying into the South Aral Sea (Micklin, 2016). The Syr Darya, historically known as the Jaxartes, originates in Kyrgyzstan as the Naryn River and flows westward through Uzbekistan and Kazakhstan to reach the North Aral Sea, covering a total length of approximately 3,018 kilometers. Together, these rivers constitute the hydrological backbone of Central Asia's Aral Sea basin, which has been the site of intensive irrigation-based agriculture since antiquity. The rivers support massive irrigation networks, primarily developed during the Soviet period, that cover approximately 8.5 million hectares of cropland across the region, making Central Asia one of the most irrigation-dependent agricultural regions in the world (Droogers et al., 2012). The combination of high water demand, variable precipitation, and glacial melt dynamics makes the hydrology of both rivers particularly sensitive to both climate variability and upstream infrastructure development.

The Soviet period fundamentally reshaped the hydrology of the Amu Darya and Syr Darya through massive infrastructure investments, including the Karakum Canal one of the longest irrigation canals in the world and hundreds of reservoirs and diversion structures. Soviet central planning allocated water among the five republics through administrative quotas managed by the Ministry of Land Reclamation and

Water Resources, which effectively subordinated hydrological management to agricultural production targets set by Moscow. When the Soviet Union dissolved, these administrative quotas became the baseline for interstate water negotiations, even though they had been designed for a centrally planned economy rather than for sovereign states with divergent economic and developmental interests (Sehring, 2009). The institutional inheritance of Soviet water management the physical infrastructure, the operational protocols, and the administrative expertise was distributed unevenly among the successor states in ways that reflected their Soviet-era functions rather than their post-independence interests. Upstream states that had been net energy producers found themselves seeking to convert water resources into economic leverage, while downstream states that had been net water users sought to preserve their allocation entitlements. This structural mismatch between inherited institutions and post-independence interests created the foundational conditions for the water disputes that persist to this day.

B. International Legal Framework and Its Application

International water law has evolved considerably over the past century, producing a body of principles and rules that, while not comprehensively codified in a universally ratified treaty, are widely recognized as reflecting customary international law obligations. The principle of equitable and reasonable utilization, articulated in Article 5 of the 1997 UN Watercourses Convention, requires that watercourse states use an international watercourse in an equitable and reasonable manner, having due regard for other watercourse states. The principle encompasses a non-exhaustive list of relevant factors, including geographic, hydrological, and climatic conditions; social and economic needs of each state; the population dependent on the watercourse; existing and potential uses; conservation, protection, development and economy of use; and the availability of alternatives (McCaffrey, 2019). The principle of no significant harm, codified in Article 7, establishes an obligation not to cause significant harm to other watercourse states and to take appropriate measures where harm does occur. These two principles exist in a state of tension that international jurisprudence has not fully resolved: equitable utilization permits new uses that may reduce flows to downstream states, while the no-harm rule ostensibly protects existing uses from upstream interference.

The application of these principles to the Central Asian context is complicated by several factors. First, the upstream states Kyrgyzstan and Tajikistan argue that the no-harm rule cannot perpetually freeze existing uses that were established under a now-defunct Soviet planning system, and that equitable utilization entitles them to develop their water resources for hydroelectric generation, which does not consume water but alters its temporal distribution. Downstream states, particularly Uzbekistan, counter that the equitable utilization principle must take into account the massive existing populations and agricultural systems that depend on predictable river flows, and that upstream reservoir operations that retain water in winter and release it in

summer rather than spring cause harm to downstream irrigation systems calibrated to natural flow regimes (Bernauer & Siegfried, 2012). Second, the specific circumstances of the Central Asian rivers large glaciated headwaters, extensive existing irrigation infrastructure, acute downstream water stress, and a recent history of centralized allocation do not map neatly onto the general factors enumerated in international water law instruments. Third, the absence of ratification of the 1997 Convention by all five states means that its provisions are not directly binding on the parties, requiring reliance on its status as a codification of customary international law, which itself remains contested in the region.

C. The Rogun Dam Controversy as a Legal Case Study

The Rogun Dam project on the Vakhsh River tributary of the Amu Darya illustrates with particular clarity the legal and political dimensions of the Central Asian water dispute. Tajikistan, one of the poorest countries in the world and heavily dependent on hydroelectric power for energy security, has been pursuing construction of the Rogun Dam since the Soviet period, when the project was partially begun but never completed (Varis et al., 2012). The dam, when completed, will be the world's tallest, creating a reservoir with a capacity of approximately 13.3 cubic kilometers. Uzbekistan has consistently opposed the project on grounds that the filling of the reservoir will significantly reduce flows to downstream irrigators during a multi-year filling period and that the dam's operation will alter seasonal flow patterns in ways detrimental to Uzbek agriculture. Uzbekistan has also raised concerns about the risk of catastrophic dam failure in a seismically active zone, which would threaten downstream populations. These objections correspond to recognized principles of international water law prior notification, environmental impact assessment, and the no-harm rule but their precise legal force in the context of existing regional agreements is unclear.

A 2014 independent expert panel commissioned by the World Bank assessed the technical feasibility and potential impacts of the Rogun Dam project but was careful to avoid adjudicating the legal questions regarding water rights (World Bank, 2014). The panel's report confirmed that the dam's filling would have measurable impacts on downstream flows and recommended mitigation measures, but it did not establish a framework for determining whether Tajikistan's right to proceed with construction outweighs Uzbekistan's interest in maintaining existing water uses. This absence of an authoritative legal determination reflects the broader institutional gap in Central Asian water governance: there is no court, arbitral tribunal, or institutional mechanism with clear jurisdiction and legitimacy to resolve the dispute definitively. The International Court of Justice could potentially exercise jurisdiction if both states consented, but no such consent has been forthcoming. The ICWC lacks adjudicatory authority. And the UN Watercourses Convention's dispute resolution procedures are not available to states that have not ratified the Convention. The Rogun controversy thus serves as a microcosm of the systemic legal failure that characterizes the entire

Amu Darya governance regime.

D. The Aral Sea Ecological Catastrophe as a Legal Imperative

The near-complete desiccation of the Aral Sea represents one of the most severe man-made ecological disasters in recorded history and provides the most compelling empirical argument for fundamental reform of water governance in Central Asia. Once the world's fourth-largest inland lake by surface area, the Aral Sea had shrunk to approximately ten percent of its original volume by 2010 as a result of irrigation diversions from the Amu Darya and Syr Darya that had been accelerating since the 1960s (Micklin, 2016). The ecological consequences have been catastrophic: the extinction of the lake's commercial fishing industry, the desertification of the exposed seabed, the formation of massive salt and dust storms that deposit toxic residues across the surrounding agricultural lands, and the degradation of drinking water quality for millions of people in the Karakalpakstan region of Uzbekistan and surrounding areas. Public health indicators in the affected regions reflect elevated rates of respiratory illness, infant mortality, anaemia, and kidney disease, all of which have been linked to environmental contamination resulting from the lake's regression. The International Fund for Saving the Aral Sea was established precisely to coordinate responses to this ecological crisis, but its institutional weakness has limited the scale and effectiveness of remediation efforts. From a legal perspective, the Aral Sea catastrophe raises fundamental questions about the responsibility of riparian states for cumulative environmental harm caused by collective over-abstraction from shared watercourses, a question that existing international environmental law has not definitively resolved.

The legal dimensions of the Aral Sea crisis are complex and involve questions of state responsibility, the right to a healthy environment, and the obligations of states to protect shared environmental resources from degradation. Under the principle of equitable and reasonable utilization as codified in the 1997 UN Watercourses Convention, states are required to take into account the protection, preservation, and management of the watercourse in the utilization of an international watercourse in an equitable and reasonable manner. This environmental dimension of equitable utilization, sometimes referred to as the principle of sustainable use, suggests that the historical irrigation practices that led to the Aral Sea's regression were not legally sustainable under contemporary international water law standards, even if they were administratively authorized under the Soviet system (Salman, 2007). The ecological flow requirements necessary to maintain minimum lake levels and preserve the environmental integrity of the basin system were systematically ignored in favor of agricultural production targets. Future governance frameworks for the Amu Darya and Syr Darya must explicitly incorporate minimum environmental flow requirements as a legally binding obligation rather than an aspirational guideline, recognizing that the long-term viability of the agricultural systems that depend on the rivers ultimately depends on the ecological health of the basin as a whole.

E. Energy-Water Nexus and the Syr Darya Regime

The Syr Darya basin presents a distinct but related set of legal challenges, centered on the energy-water nexus between Kyrgyzstan and the downstream states of Kazakhstan and Uzbekistan. During the Soviet period, Kyrgyzstan released water from the Toktogul Reservoir on the Naryn River during the summer irrigation season, receiving in return supplies of coal, gas, and electricity during winter months. Following independence, Kyrgyzstan increasingly operated Toktogul according to its own energy needs, releasing more water in winter when electricity demand peaks and retaining more in summer when downstream irrigation demand peaks (Siegfried et al., 2012). This operational shift created significant problems for downstream irrigators while simultaneously reducing the effectiveness of the energy subsidy arrangement. The 1998 Syr Darya Framework Convention attempted to institutionalize compensation mechanisms for these competing temporal demands, but its implementation has been erratic, as the states have frequently been unable to agree on the terms of energy compensation. The legal status of the compensation obligation under the Convention remains disputed, with Kyrgyzstan arguing that it is conditional on the receipt of agreed energy supplies and downstream states arguing that water release obligations exist independently of energy compensation.

The construction of the Kambarata hydroelectric cascade on the Naryn River by Kyrgyzstan would significantly increase the country's capacity to regulate downstream flows and has been opposed by Kazakhstan and Uzbekistan on similar grounds to those advanced against Rogun. The Kambarata controversy reveals a recurring pattern in the Central Asian water dispute: upstream states assert sovereign rights to develop their water resources for economic benefit, while downstream states invoke international law principles to resist unilateral upstream development. The legal resolution of this pattern depends critically on how international water law balances the right to development against the no-harm principle and the obligation to cooperate in good faith. International jurisprudence, including the Gabčíkovo-Nagymaros case before the International Court of Justice, suggests that sustainable development requires integrating environmental protection with economic development, and that unilateral action in international watercourses is generally impermissible without prior consultation and negotiation (ICJ, 1997). However, the application of this jurisprudence to the Central Asian context requires states to accept the authority of these international legal norms, which they have been reluctant to do in an explicit and legally binding form.

F. Afghanistan as an Absent Co-Riparian

One of the most significant structural gaps in the current governance framework for the Amu Darya is the exclusion of Afghanistan, which shares approximately 1,200 kilometers of river boundary along the Panj River with Tajikistan and forms part of the upper Amu Darya system. Afghanistan currently abstracts a relatively small proportion of Amu Darya flows for irrigation, primarily in its northern provinces of Kunduz, Balkh, and Faryab, but has expressed aspirations to expand irrigation

development substantially as part of its post-conflict agricultural reconstruction agenda (Varis et al., 2012). The realization of these development aspirations would reduce flows reaching downstream Uzbekistan and Turkmenistan. The exclusion of Afghanistan from the ICWC framework means that there is currently no institutional mechanism through which the five Central Asian states and Afghanistan could collectively plan for and adapt to this scenario. Any reformed governance framework that fails to account for Afghanistan's co-riparian status will contain a structural vulnerability that growing Afghan water use will eventually expose. The United Nations and international development organizations could play a constructive role in facilitating engagement with Afghan counterparts on transboundary water management, building institutional capacity and creating the conditions for eventual formal participation in a reformed basin governance framework.

G. Climate Change and Future Legal Challenges

Climate change is introducing new dimensions of uncertainty and vulnerability into an already strained water governance system. Scientific projections indicate that the glaciers feeding both the Amu Darya and Syr Darya will continue to shrink through the twenty-first century; with initial increases in river flow followed by long-term decline as glacial mass diminishes (Siegfried et al., 2012). These changes will intensify competition for water resources, reduce the predictability of seasonal flows that current water management systems depend upon, and increase the frequency and severity of drought events in the lower basin. Climate change thus threatens to render the existing allocation quotas, which were calibrated to historical flow conditions, increasingly inadequate as a basis for water governance. International water law does not yet provide a comprehensive framework for addressing climate-related modifications to transboundary watercourse regimes, and the existing Central Asian agreements contain no adaptation provisions or mechanisms for adjusting allocation entitlements in response to altered hydrological conditions. The absence of such provisions means that the legal framework may become increasingly irrelevant as climate change progressively reshapes the hydrological basis on which it was constructed.

The intersection of climate change with the existing water dispute creates both risks and opportunities for governance reform. On the risk side, growing water scarcity may harden political positions and reduce the space for compromise, as each state becomes more defensive of its existing allocation entitlements in a context of declining total availability. On the opportunity side, the shared vulnerability of all five states to climate change impacts on river flows may create incentives for more serious engagement with multilateral treaty-making, as unilateral strategies become increasingly insufficient to address a challenge that transcends national boundaries. International climate frameworks, including the Paris Agreement and associated adaptation planning processes, provide a potential platform for integrating water governance reform into broader climate adaptation strategies (Gleick, 2014). Several

international initiatives, including the Green Climate Fund and the Global Environment Facility, provide financing mechanisms that could support institutional capacity development and infrastructure adaptation in the Central Asian water sector. Leveraging these frameworks to support governance reform offers one pathway for moving beyond the current institutional impasse.

H. Recommendations for Legal and Institutional Reform

On the basis of the foregoing analysis, this study advances several recommendations for legal and institutional reform aimed at establishing a more effective and equitable governance regime for the Amu Darya and Syr Darya rivers. The first and most fundamental recommendation is that the five riparian states negotiate and adopt a comprehensive, legally binding multilateral treaty on the allocation, management, and protection of shared water resources in the Aral Sea basin. Such a treaty should move beyond the procedural framework established by the 1992 Almaty Agreement and address the substantive questions of allocation principles, minimum environmental flows, notification and consultation procedures for major hydraulic infrastructure, dispute resolution mechanisms, and compliance monitoring. The treaty should explicitly incorporate the principles of equitable and reasonable utilization and the no-harm rule as they have been developed in international water law, while adapting their application to the specific hydrological and socioeconomic conditions of Central Asia. It should also include provisions for periodic review and adaptation in response to changing hydrological conditions, including those driven by climate change.

The second recommendation concerns institutional reform. The ICWC should be transformed from a coordinative body operating by consensus into a genuine international institution with legal personality, a stable permanent secretariat with adequate financial and human resources, and decision-making authority that goes beyond non-binding recommendations. Critically, the reformed institution should include an independent compliance mechanism with authority to investigate alleged violations, make findings of non-compliance, and recommend remedial measures. A binding dispute resolution mechanism should be established, providing access to mandatory conciliation, mediation, and ultimately arbitral or judicial adjudication for disputes that cannot be resolved through negotiation. The model of the Rhine River Commission or the Permanent Indus Commission may provide useful institutional templates, adapted to the specific political and financial constraints of the Central Asian context. Regional engagement with international financial institutions, including the World Bank and the Asian Development Bank, should be pursued to provide funding for institutional capacity development and for the technical studies necessary to support evidence-based water allocation decisions.

The third recommendation concerns the relationship between the regional framework and universal international water law. The five Central Asian states should be encouraged, through diplomatic engagement by the United Nations and through

incentives offered by international development partners, to ratify the 1997 UN Watercourses Convention and the 1992 Helsinki Convention. Ratification of these instruments would not resolve the substantive water disputes but would significantly clarify the normative framework within which they must be addressed, providing clearer standards for assessing the legality of unilateral upstream actions and a stronger legal basis for the no-harm obligations of downstream states. Afghanistan, as a co-riparian of the Amu Darya currently excluded from the regional governance framework, should also be engaged in a process of gradual integration into basin management discussions, recognizing that sustainable governance of the Amu Darya cannot be achieved without the participation of all riparian states. The engagement of Afghanistan presents significant political and practical challenges, but ignoring this dimension of the governance problem will create a long-term structural vulnerability in any reformed framework.

The fourth recommendation concerns environmental governance and the integration of ecological flow requirements into the legal framework. The reformed treaty should establish binding minimum environmental flow obligations for both the Amu Darya and the Syr Darya, calculated on the basis of scientific assessments of the flows necessary to maintain ecosystem health in the lower reaches of both rivers and to prevent further regression of the Aral Sea. These obligations should take precedence over new upstream consumptive uses while being balanced equitably against existing downstream irrigation demands. A joint scientific commission should be established to conduct ongoing monitoring of river flows, water quality, and ecological indicators, with authority to recommend adjustments to minimum flow requirements as conditions change. The results of monitoring should be made publicly available in a timely manner, promoting transparency and enabling civil society engagement in water governance processes. Insurance mechanisms, potentially funded through contributions from all riparian states and supplemented by international development finance, should be established to compensate downstream users in drought years when minimum ecological flow requirements absorb a larger share of available water. These environmental governance measures are not merely aspirational but are legally grounded in the emerging body of international environmental law relating to the right to water, biodiversity conservation, and the prevention of transboundary environmental harm.

Conclusion

This study has examined the legal status of the Amu Darya and Syr Darya rivers and the conditions under which the water-sharing dispute among the five Central Asian riparian states might be effectively resolved under international law. The central conclusion of the research is that the existing legal and institutional framework is inadequate to the governance challenges posed by the rivers, and that fundamental reform is necessary to achieve equitable, sustainable, and legally secure water governance. The framework's deficiencies are structural: the absence of a

comprehensive binding treaty, the weakness of the ICWC and IFAS institutions, the non-ratification of universal international water law instruments, and the absence of an effective dispute resolution mechanism collectively prevent the resolution of substantive disputes about water rights, allocation principles, and the legality of upstream hydraulic infrastructure development. These deficiencies reflect not merely political unwillingness to cooperate but also genuine legal uncertainty about the content and application of applicable norms in a context that does not map neatly onto the general principles of international water law.

The study has also highlighted the role of historical factors, particularly the Soviet legacy, in shaping both the substance of the dispute and the institutional path dependencies that constrain reform. The continuation of Soviet-era allocation quotas as the baseline for post-independence negotiations has perpetuated an arrangement that was designed for a centrally planned economy and that does not reflect the legitimate developmental aspirations of upstream states or the ecological requirements of the broader basin ecosystem. Any sustainable reform must engage with this historical dimension, finding ways to acknowledge past uses while creating space for new ones within a framework that is responsive to both the economic needs of upstream states and the humanitarian needs of downstream populations. The principle of equitable and reasonable utilization, properly applied, provides the conceptual tools for such a reconciliation, but its operationalization requires political commitment and institutional capacity that have thus far been lacking.

The broader implications of this research extend beyond Central Asia. The Amu Darya and Syr Darya case illustrates the challenges that arise when the political transition of riparian states fundamentally alters the conditions under which existing water arrangements were established, and when the inherited institutional framework is insufficient to manage the resulting disputes. Similar dynamics have emerged in other post-Soviet transboundary water systems and in river basins where newly empowered upstream states seek to exercise developmental prerogatives that conflict with established downstream uses. The lessons of the Central Asian experience, the importance of legally binding treaties over framework agreements, the need for institutions with genuine authority and resources, the value of integrating international legal norms into regional frameworks, and the necessity of adaptation mechanisms in the face of climate change are broadly applicable across the global landscape of transboundary water governance. This research therefore contributes not only to the scholarly understanding of Central Asian water politics but also to the wider body of knowledge about how the international community can more effectively govern shared freshwater resources in an era of increasing scarcity and competition.

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