



FROM REFORM CONVERGENCE TO DELIVERY: WATER GOVERNANCE AS A TEST OF REGIONAL COOPERATION IN CENTRAL ASIA

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ABSTRACT. *Central Asia has never been better positioned to solve its water problems on paper. Since 2016, political rapprochement among the five states has been accompanied by the adoption of strikingly similar national water reforms built around integrated water resources management, basin governance, digitalization, and cost recovery, supported by international finance. Yet the 2021 drought caused heavy agricultural losses in four of the five countries, and the region remains unprepared for the next dry cycle. This paper asks why the convergence of reform agendas has not produced water security, and what the answer implies for the regional cooperation agenda. It develops a three-stage analytical framework that follows reforms from adoption, through translation into administrative and financial practice, to performance under climatic stress, and applies it to evidence from document analysis of national strategies and legislation, longitudinal field engagement since 2005, and expert interviews across the five countries. The analysis shows that convergence is produced at the adoption stage by transnational template diffusion, regional political incentives and centralized executives, while a delivery gap opens at the translation stage, where incomplete asset ownership, politically constrained tariffs and a financing shortfall of roughly 40-45 percent of estimated needs leave reformed institutions without operational capability. Dry years then expose this gap and transmit its costs across borders through shared basins. The paper concludes that domestic delivery capability has become a regional security variable, and that the cooperation agenda should shift from declaratory alignment toward regional public goods: harmonized indicators, dry-year protocols, seasonal drought information and jointly prepared investments anchored in existing institutions.*

KEYWORDS: *Central Asia, water governance, regional cooperation, policy implementation, water financing, drought, regional public goods.*

1. INTRODUCTION

In the summer of 2021, a severe drought moved across Central Asia; soil-moisture deficits were among the most severe of the past seventy years and vegetation productivity fell across the region (Jiang & Zhou, 2023; Guo et al., 2024). In the Chuy region of the Kyrgyz Republic, river flows fell to less than half of the norm, canals ran dry, and farmers picketed the Government House in Bishkek and blocked the Bishkek-Osh highway (Thompson, 2021; Kaktus.media, 2021). In Kazakhstan, drought killed livestock in Mangystau and Kyzylorda provinces on a scale that official tallies put at more than 1,700 head and the President at 3,000 in Mangystau alone; a state of emergency was declared in Kyzylorda's Aral district, and the government banned feed exports (Kumenov, 2021; Prime Minister of the Republic of Kazakhstan, 2021;

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International Federation of Red Cross and Red Crescent Societies [IFRC], 2021, 2022). Downstream, the combined annual flow of the Amu Darya and Syr Darya reached only 84 percent of the long-term average, Turkmenistan and Uzbekistan received roughly a third less water than required in the lower Amu Darya, and winter-cereal yields fell below average in western Uzbekistan and most of Turkmenistan (Scientific Information Center of the Interstate Commission for Water Coordination [SIC ICWC], 2022; European Commission Joint Research Centre, 2021). Little about the event resembled the water crisis that three decades of scholarship had prepared the region for. It produced no interstate confrontation over allocation and no upstream-downstream standoff, and the transboundary institutions inherited from the early 1990s continued to function. The losses were produced largely inside the states, by monitoring that did not reach decisions, by irrigation systems that lose between a third and, in some cases, more than half of the water diverted into them, and by responses financed after the damage was done.

The episode is puzzling because it occurred at a moment when the formal conditions for water security in Central Asia had never looked better. Since 2016, political rapprochement among the five states has produced regular consultative meetings of the heads of state, progress on border delimitation, growing intra-regional trade and joint infrastructure initiatives such as the Kambarata-1 hydropower project, for which the energy ministries of Kyrgyzstan, Kazakhstan and Uzbekistan signed a roadmap in January 2023 and an agreement on joint preparation in June 2024, with an intergovernmental agreement under negotiation (Kaktus.media, 2023; Gazeta.uz, 2024; World Bank, 2024, 2025). In the same period, all five governments adopted remarkably similar water reform packages, centered on integrated water resources management (IWRM), basin governance, digitalization and cost recovery, despite marked differences in their political institutions, fiscal capacities and positions in the shared basins. International financial institutions stood ready to fund these agendas. Alignment of politics, policy and finance of this kind is rare in any region.

This paper asks why such convergence has not produced water security, and what the answer implies for the regional cooperation agenda. The question is strategic rather than technical. If the obstacle to water security were the absence of agreed reform models, the remedy would be more alignment, more declarations and more strategies, which is what the region has been producing. If, as this paper argues, the obstacle lies elsewhere, in the capacity of states to translate adopted reforms into administrative and financial practice and to perform under climatic stress, then the cooperation agenda needs different content.

The argument is developed in three steps that correspond to the stages of a reform's life. At the adoption stage, the paper explains the convergence itself: transnational template diffusion, regional political incentives, and centralized executive advocacy have aligned what the five states commit to on paper. At the translation stage, it locates the delivery gap: incomplete asset ownership, unenforceable maintenance obligations, politically constrained tariffs, and a financing shortfall of roughly 40–45 percent of estimated needs (Section 4.2; Abdullaev & Akhmedov, 2023; Vinokurov et al., 2023) leave reformed institutions without the operational and financial capability their mandates assume. At the response stage, it shows how recurrent drought exposes this gap and transmits its costs across borders through the shared Amu Darya and Syr Darya systems, in which Afghanistan, a riparian outside the regional allocation framework, is becoming an active user, converting national delivery failures into regional stresses. The conclusion that

follows is that domestic delivery capability has become a regional security variable, and that the most productive use of the current political window is the joint production of regional public goods that make delivery visible, comparable, and financeable.

The paper is organized as follows. Section 2 reviews the literature and identifies the gap the paper addresses. Section 3 presents the analytical framework and research methods. Section 4 traces the evidence through the three stages of the framework. Section 5 discusses the implications for regional cooperation, and Section 6 concludes.

2. LITERATURE REVIEW

Three bodies of research bear on the question, and each explains part of the picture while leaving the connection between them unexamined.

The first is the literature on Central Asian hydro-politics. Early post-Soviet scholarship treated the division of the Amu Darya and Syr Darya basins among states with opposite seasonal interests as a source of probable conflict (Weinthal, 2006; Pena-Ramos et al., 2021), and the securitization of large infrastructure kept this frame alive for two decades. A second generation examined the institutions through which the region has in practice managed its shared waters: the Interstate Commission for Water Coordination, the basin water organizations, and the International Fund for Saving the Aral Sea have operated continuously since 1992, and IWRM was promoted regionally as a survival strategy under scarcity (Dukhovny et al., 2013; Wegerich et al., 2015). Assessments of these institutions document real weaknesses in data exchange, enforcement, and financing, but also their persistence through periods of serious political tension (Ziganshina & Sehring, 2021; Zhupankhan et al., 2018). Conflict predictions failed. However, the institutional record tells us little about whether states can deliver water services within their own borders, where the 2021 losses originated.

The second body of work concerns the domestic transformation of water management. Studies of Water Users Associations documented the difficulty of transplanting participatory irrigation management into post-collective agriculture (Yalcin & Mollinga, 2007; Sehring, 2009). Research on path dependency and institutional bricolage showed that reform outcomes are shaped by Soviet administrative legacies as much as by reform design (Sehring, 2009; Amirova et al., 2022), and the concept of the hydraulic mission explains the persistence of construction-oriented bureaucracies (Molle et al., 2009; Abdullaev & Rakhmatullaev, 2013). Systems and co-evolutionary perspectives interpreted the sector as an interdependent configuration of institutions, infrastructures and discourses (Djanibekov et al., 2016; Van Assche et al., 2014). Comparative assessments spanning the whole region remain less common than single-country studies (Abdullaev & Atabaeva, 2012; Karthe et al., 2017; Sehring et al., 2024). This literature explains why implementation is hard, but it has engaged little with how implementation failures travel across borders in shared basins.

The third literature addresses water finance. International research has established the principles of investment needs assessment, tariff design, cost recovery, blended finance and private participation (Ward, 2010; Winpenny, 2015; OECD, 2018, 2019; World Bank, 2023), and economic analysis has clarified why irrigation pricing cannot be separated from service reliability and institutional credibility (Hellegers & Perry, 2006; Dinar & Tsur, 2021). Frameworks of policy change, notably the Kaleidoscope Model, explain how standardized reform packages travel across developing countries through

donors and policy champions (Resnick et al., 2015, 2018; Mahoney & Thelen, 2010). Applied to Central Asia, however, this work has mostly asked how much investment the region needs, not why three decades of reform have failed to produce the governance conditions under which investment becomes sustainable.

These three bodies of work are not sealed compartments, and several strands have already crossed the boundaries between them. Research on the water-energy-food nexus has linked upstream hydropower, downstream irrigation and food security into basin-wide accounts (Granit et al., 2012; Jalilov et al., 2016; Keskinen et al., 2016; Abdullaev & Rakhmatullaev, 2016). Work on hydro-hegemony and transboundary governance has shown how material power, ideas and donor programs shape bargaining between riparians (Wegerich, 2008; Zinzani & Menga, 2017; Menga, 2018). Multi-level and politics-of-scale analyses have traced how national reforms are reworked at district and local levels (Sehring, 2009; Zinzani & Bichsel, 2018), and studies of border regions, above all the Ferghana Valley, have shown that conflict and cooperation coexist across local, provincial and interstate levels in physically interlocked canal systems (Bichsel, 2009; Wegerich et al., 2012; Pak et al., 2014; Soliev et al., 2015). A further strand has examined the relationship between local water users and the state and regional institutions above them, from water user associations to basin organizations (Abdullaev et al., 2010; Wegerich, 2010; Hamidov et al., 2015; Zinzani, 2016).

The gap that remains is nonetheless integrative. Hydro-political research, with the exceptions just noted, has been organized around relations between states; governance research has concentrated on implementation difficulty within them; finance research has stopped at the investment gap. None of them connects the adoption of reforms, their translation into administrative and financial practice, and their performance under climatic stress into a single account across all five states, although this chain determines whether the region's current alignment produces water security or merely paper convergence. Constructing and applying such an account is this paper's contribution.

3. ANALYTICAL FRAMEWORK AND RESEARCH METHODS

3.1 Framework: adoption, translation, response

The paper follows reforms through three stages, each anchored in an established literature but connected here into one analytical chain.

The adoption stage covers agenda setting, design, and formal enactment. Following the Kaleidoscope Model of policy change, outcomes at this stage are shaped by focusing events, policy champions, prevailing knowledge paradigms, and the configuration of veto players (Resnick et al., 2015, 2018). The model was developed for developing-country settings in which international organizations and donors shape the policy process, and it treats regime type not as a scope condition but as a variable: it expects fewer veto players and faster enactment in presidential, unitary and less pluralistic systems than in parliamentary or federal ones (Resnick et al., 2018, p. 104), which is precisely the configuration found in Central Asia, and it has since been adapted for agrifood policy analysis in Central and West Asia, including Uzbekistan (Dhehibi et al., 2023). It is used here heuristically, for the adoption stage only, as a checklist of the conditions under which enactment becomes likely, not as a predictive model. Veto players were assessed following Tsebelis (2002) as the institutional and partisan actors

whose formal agreement was required to enact each instrument listed in Table 1, using three indicators: the type of instrument (presidential decree, government resolution, or parliamentary law), the partisan configuration of the legislature where a law was required, and the time elapsed between publication of a draft and enactment. By these indicators, the number of effective veto players was one or two in every country. The strategies and programs that set the reform direction were adopted by presidential decree or government resolution in all five states, and the water codes that followed passed legislatures dominated by pro-presidential parties; in the Kyrgyz Republic, the most pluralistic case, the 2025 Water Code moved from parliamentary adoption on 30 April to presidential signature on 27 June (Kyrgyz Republic, 2025a). The only overt opposition recorded in the documents and interviews concerned tariff adjustments in the Kyrgyz Republic, where veto potential at the adoption and implementation stages was rated medium; in the other four countries it was rated low. Because these variables operate similarly across the five countries, the framework predicts, and Section 4.1 confirms, convergence at this stage.

The translation stage covers what happens after enactment: whether mandates acquire budgets, whether institutions acquire capability, and whether infrastructure acquires sustainable financing. The term is taken from the policy translation literature, which holds that policies do not travel intact but are re-interpreted and re-assembled by the administrative systems that receive them, so that a reform's meaning and content change as it moves from text to practice (Lendvai & Stubbs, 2007; Peck & Theodore, 2010; Stone, 2012; Mukhtarov, 2014). In this paper, translation is defined as the process through which an enacted reform is converted into administrative routines, budget lines, organizational capabilities, and financing arrangements. It is broader than implementation, understood as the execution of a given policy by a given agency, because it includes the fiscal and institutional conditions that make execution possible; implementation capacity is an input to translation, not a synonym for it, and funding is one of its dimensions, not the whole of it. Section 4.2 examines three dimensions: institutional translation, or whether new mandates displace or merely overlay older administrative logics; operational translation, or whether data and rules enter day-to-day decisions; and financial translation, or whether services acquire credible revenues and assets acquire maintenance. To analyze the first dimension, the framework draws on institutional theories of layering and drift, in which new rules are added to older arrangements without displacing their practical logic (layering) or remain formally unchanged while the conditions they govern change (drift) (Hacker, 2004; Streeck & Thelen, 2005; Mahoney & Thelen, 2010; Van Assche et al., 2014). Both are documented in Central Asia. Water user associations in the Kyrgyz Republic and Tajikistan were layered onto district water administrations and the routines of former collective farms, which continued to govern practice (Sehring, 2009); in Uzbekistan, water user associations and hydrographic basin units were added to a hydraulic bureaucracy that retained control over allocation and continued to serve state production targets (Wegerich, 2010; Hamidov et al., 2015; Zinzani, 2016; Zinzani & Bichsel, 2018); and the basin councils created under the water codes of Kazakhstan and the Kyrgyz Republic coexist with, rather than replace, territorial administrations (Zinzani, 2015; Sehring et al., 2024). Drift is visible in irrigation tariffs that stayed fixed at a fraction, by a factor of four to fifteen, of cost-recovery levels while costs, infrastructure age, and hydrological variability changed around them (Vinokurov et al., 2023). For the financial dimension, the framework draws on the concept of financeability: investment becomes sustainable only where assets are identifiable, maintenance responsibilities enforceable,

services measurable, revenues credible and risks allocatable (OECD, 2018; World Bank, 2023). Financeability is not an independent explanatory variable. It is treated here as an outcome of translation: the condition that emerges when institutional and operational translation have gone far enough for a financier to identify an asset, a responsible party and a revenue stream. Its absence is therefore a symptom of the delivery gap rather than a cause of it, and a useful one analytically, because it is observable in investment flows. Because these conditions depend on national administrative and fiscal endowments that differ sharply across the region, the framework predicts divergence at this stage.

The response stage covers performance under stress. Drought is the natural test because it probes every link in the chain at once: monitoring, operational triggers, reservoir and canal management, advisory services, and contingency finance. The stage is analyzed through the interaction of hazard, exposure, vulnerability and response capacity that underpins contemporary drought policy frameworks (Wilhite et al., 2014; Pulwarty & Sivakumar, 2014). In shared basins, response failures become regional when national delivery gaps spill over: consequences move downstream and upstream through allocation, prices, and migration regardless of state borders. The Amu Darya adds a further riparian. Afghanistan, whose territory generates a substantial share of the basin's runoff, is party to neither the 1992 Almaty Agreement nor the Interstate Commission for Water Coordination, and its withdrawals, which are expected to rise sharply once the Qosh Tepa Canal is operating, change the baseline against which the five states' delivery capability will be tested (Kuzmits, 2006; Ilkhamov, 2023; SIC ICWC, n.d.). The framework therefore treats Afghanistan as an exogenous riparian actor: it is not included in the comparison of reform adoption and translation, because it is not part of the regional reform and institutional processes analysed here, but it enters the response stage as a determinant of exposure (Sections 4.3 and 5.3).

The framework thus generates the paper's central expectation: a region can converge at adoption, diverge at translation, and discover at the response stage that the weakest link sets the exposure of all. Section 4 organizes the evidence accordingly.

3.2 Methods and data

The research design is qualitative and interpretive; its purpose is to reconstruct mechanisms rather than to measure effects. Research on the water sector in Central Asia is constrained by limited transparency on budgets, procurement and decision-making, and a triangulated qualitative design is a realistic response to these conditions.

Three evidence streams were combined. The first is document analysis of national water strategies, water codes, laws, presidential decrees and government programs adopted between 2016 and 2025 in the five countries (listed in Table 1 and cited individually in the reference list), together with the program documents of the principal development partners in the sector. The second is longitudinal field engagement: the author has participated in policy dialogues, inter-ministerial meetings and technical missions in the region since 2005, including a 2023 mission with an international financial institution that involved on-site visits to water agencies and ministries in several of the countries, complemented by semi-structured interviews conducted in 2022–2023 with policymakers, water agency leaders and sector experts in all five countries, described in the next paragraph. The third is the author's participation in a regional drought risk and resilience assessment and the associated national drought dialogues convened in Ashgabat, Almaty, Bishkek and Tashkent in 2026 under the World Bank's Central Asia

Water and Energy Program (World Bank, forthcoming), which provided structured evidence on drought hazard, institutional readiness and priority measures. The assessment reports are being finalized for publication and are cited here as forthcoming; the paper draws only on findings that were presented and discussed at the national dialogues, and statements attributed to the assessment should be read as provisional until the reports are released.

The interviews were conducted between 2022 and 2023, in the course of policy dialogues and technical roundtables in the five countries and of the 2023 mission, whose on-site visits to water agencies and ministries provided direct observation of implementation conditions. More than 60 semi-structured interviews were held in total, in all five countries, with the smallest number in Turkmenistan; a per-country breakdown is not reported because, in the smaller national water-sector communities, it would make individual participants identifiable. Participants belonged to three categories: senior officials of ministries and national water agencies responsible for policy; managers of basin, provincial and district water organizations and of water user associations; and independent experts, including researchers and staff of development partners. They were selected purposively, starting from the professional network built up by the author since 2005 and extended by referral, and recruitment in each country stopped when additional interviews no longer yielded new themes, which was taken as the criterion of saturation. Interviews lasted between 45 and 90 minutes and were conducted in Russian or English, in person and, in a minority of cases, online. Given the sensitivity of budget and procurement matters in the region, interviews were not audio-recorded; detailed notes were taken during and immediately after each interview, and participants gave informed consent orally at the start of the interview on the understanding that neither they nor their institutions would be identifiable. The notes were coded thematically by hand, first deductively against the three stages of the framework and then inductively within each stage, and the coded material was triangulated with the documentary record and the author's field notes. Participants are anonymized: where interview evidence is used in the text, it is attributed to the participant category and country only, and where interviewees are said to have held a view consistently, the pattern of agreement and the main alternative view are reported.

Three limitations should be stated. Quantitative estimates of investment needs, subsidies and cost recovery are indicative, since national figures differ in year, coverage and definition. Public evidence on Turkmenistan is thinner than for the other four countries: the analysis of Turkmenistan rests on official documents, the regional hydrological data compiled by the Scientific Information Center of the Interstate Commission for Water Coordination and a small number of interviews, and no independent data on sector finances are available. Statements about Turkmenistan in Sections 4.2 and 4.3 should therefore be read as lower-confidence characterizations, and they are marked as such where they appear. Finally, the analysis offers an interpretive institutional explanation; its claims concern mechanisms and their strategic implications, not statistically measured effects.

4. FINDINGS

4.1 Adoption: why five different states converged on one reform template

Since 2016, all five Central Asian states have adopted new water strategies, codes or programs of a strikingly similar type. Kazakhstan approved a concept for the

development of its water resources management system for 2024-2030, with quantified targets for irrigation water savings, water reuse and conveyance-loss reduction, and followed it with a new Water Code in 2025 (Government of the Republic of Kazakhstan, 2024a, 2024b; Republic of Kazakhstan, 2025). The Kyrgyz Republic adopted a National Water Strategy to 2040 in 2023 and a new Water Code, passed by parliament on 30 April 2025 and signed into law on 27 June 2025 to replace the code of 2005 (President of the Kyrgyz Republic, 2023; Kyrgyz Republic, 2025a, 2025b), together with the strategy's program to establish basin councils, a state water cadastre, and restored water-use permitting. Tajikistan has pursued a water sector reform program for 2016-2025 built on the transition from administrative-territorial to basin management, codified in a new Water Code in 2020 and extended by a National Water Strategy to 2040 in 2024 (Government of the Republic of Tajikistan, 2015, 2024; Republic of Tajikistan, 2020). Turkmenistan adopted a Water Code in 2016 that enshrines integrated water resources management and combines territorial with basin principles, and in 2019 reorganized sector governance by creating a State Committee for Water Economy and adopting a socio-economic development program for 2019-2025 that prioritizes water saving and regional water cooperation (Turkmenistan, 2016; President of Turkmenistan, 2019a, 2019b). Uzbekistan combined a concept for the development of the water sector for 2020-2030 with a large digitalization effort and targets for public-private partnerships and phased cost recovery, subsequently reinforced by the Uzbekistan-2030 strategy and a water management program for 2025-2028 (President of the Republic of Uzbekistan, 2020, 2021, 2023a, 2023b, 2024, 2025). Table 1 summarizes these commitments. The templates are close to identical: every strategy invokes IWRM, basin governance, digitalization, water saving, and financial sustainability.

Table 1. National water sector strategies and legislation of the Central Asian states since 2016

Country	Core direction	Illustrative commitments
Kazakhstan	Integrated, climate-resilient water management with strong digitalization	Save 2,192 million m ³ of irrigation water per year and cut conveyance losses from 50 to 25 percent by 2030; expand hydrological monitoring (Concept 2024-2030, as amended in August 2024); Water Code (2025)
Kyrgyz Republic	Basin governance and legal-institutional foundations	National Water Strategy to 2040 (2023); Water Code (2025, in force 2026); basin boundaries and councils; state water cadastre; restored permitting; first economic instruments
Tajikistan	IWRM and hydrographic basin management	Water Sector Reform Programme 2016-2025; Water Code (2020); National Water Strategy to 2040 (2024); basin institutions at national and sub-basin level; separation of policy from service provision
Turkmenistan	Modernization of water economy under IWRM	Water Code (2016); State Committee for Water Economy (2019); water saving; storage expansion and Karakum canal rehabilitation

Uzbekistan	Digitalization, infrastructure reliability and market mechanisms	Concept 2020-2030; Smart Water metering on 18,576 facilities by 2030; 50 PPP projects by 2030; cost recovery of at least 15 percent by 2025 and up to 30 percent by 2030; water-saving irrigation on 2 million hectares
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Sources: Kazakhstan - Government of the Republic of Kazakhstan (2024a, 2024b), Republic of Kazakhstan (2025); Kyrgyz Republic - President of the Kyrgyz Republic (2023), Kyrgyz Republic (2025a, 2025b); Tajikistan - Government of the Republic of Tajikistan (2015, 2024), Republic of Tajikistan (2020); Turkmenistan - Turkmenistan (2016), President of Turkmenistan (2019a, 2019b); Uzbekistan - President of the Republic of Uzbekistan (2020, 2021, 2023a, 2023b, 2024, 2025). Full bibliographic details are given in the reference list.

The convergence is puzzling at first sight, because the adopting states differ substantially in political institutions, fiscal capacity, and basin position. Three mechanisms, corresponding to the framework's adoption-stage variables, explain it. The first is transnational template diffusion. The World Bank, the Asian Development Bank, GIZ, Swiss Development Cooperation and UNDP have carried a standardized reform package into the region; IWRM, basin governance, digitalization and cost recovery are the paradigms these organizations certify as fundable, and adopting them lowers the cost of access to international finance for capital-hungry water sectors. The second is regional political incentive. The post-2016 rapprochement and the consultative meetings of heads of state made it visible which governments were modernizing their water sectors, and which were falling behind; no leadership wished to appear the laggard. The third is executive centralization. In all five countries, the presidential office acted as the principal policy champion, and the small number of veto players, assessed in Section 3.1, allowed rapid enactment. Finally, the shared Soviet administrative legacy made the same instruments legible to bureaucracies across the region, so a common template could be grafted onto broadly similar inherited structures.

The common focusing event was climatic. Interviews with water experts across the five countries consistently dated the acceleration of the reform wave to the drought-related shocks of 2019-2021, which placed water scarcity at the top of political agendas in all capitals simultaneously. The pattern was not uniform, however. Interviewees in Kazakhstan, the Kyrgyz Republic and Uzbekistan, the countries hit hardest in 2021, identified the drought as the decisive trigger, whereas interviewees in Tajikistan and Turkmenistan cited it as one factor among several and gave comparable weight to the post-2016 rapprochement and to the availability of international finance, a view the framework treats as complementary rather than competing. Interviewees in all five countries described policy design as championed from the center of government and executed by sector ministries, and reported little overt opposition at adoption except over tariff adjustments in the Kyrgyz Republic. The adoption stage, in other words, worked exactly as the policy-change literature would predict: a shared shock, powerful champions, an internationally certified template, and few veto players produced convergent enactment. The question is what happened next.

4.2 Translation: where the delivery gap opens

Translation is where the five trajectories part ways and where the region's central problem lies. Following the definition in Section 3.1, the divergence has an institutional face, an operational face and a financial face, and the three reinforce each other.

The institutional face is visible in three recurring bottlenecks documented across the region: (i) a weak link between the sizable budgets allocated to reform programs and the capacity of national agencies to implement and procure; (ii) non-transparent procurement procedures; and (iii) a lag in monitoring and data exchange between the tiers of water management. Basin organizations remain in testing mode in most countries; water user associations are heterogeneous in function and capacity; and environmental objectives, though prominent in every strategy, are less operationalized than economic ones. Digitalization illustrates the operational face of the problem. Metering and information systems are being installed across the region, but their installation does not by itself change allocation or accountability; that requires reliable equipment, compatible systems, and agencies able to use data in operational decisions, conditions that develop far more slowly than hardware is procured. In the vocabulary of institutional theory, the reforms are layering new rules onto older arrangements whose practical logic-centralized allocation, politically fixed tariffs, and the expectation of state provision-remains in force (Mahoney & Thelen, 2010; Van Assche et al., 2014; see the country examples in Section 3.1). The three bottlenecks listed above were raised by interviewees in every country, most insistently by managers of basin and district organizations, and were observed directly during the 2023 mission visits to water agencies and ministries.

The financial face of the translation problem is deeper, because it decides whether reformed institutions can operate at all. The figures that follow are the author's indicative estimates, compiled from national investment programs, budget data and development-partner portfolios in the course of a regional assessment of water-sector financing for the CAREC Institute (Abdullaev & Akhmedov, 2023) and cross-checked against the Eurasian Development Bank's sector studies (Vinokurov et al., 2021, 2023); they are indicative because national data differ in year, coverage and definition. On this basis, annual water-related investment needs are about USD 5.0-6.3 billion for the region against documented flows of USD 3.0-3.7 billion, a shortfall of roughly 40-45 percent, consistent with the finding that national financing covers only about half of the investment the sector requires (Abdullaev & Akhmedov, 2023). Some 70-80 percent of irrigation infrastructure is worn out, and inter-farm and on-farm networks average about fifty years of age (Vinokurov et al., 2023), and between 30 and 60 percent of the water withdrawn for irrigation is lost before it reaches the field (Abdullaev & Akhmedov, 2023). Budget allocations cover only part of required operation and maintenance costs, approximately 65 percent in Kazakhstan, 32 percent in the Kyrgyz Republic, 43 percent in Tajikistan, 56 percent in Turkmenistan, and 57 percent in Uzbekistan, and capital coverage is lower still. Irrigation service fees recover on the order of 20-30 percent of actual costs (Dankova et al., 2022), collection rates often run at 30-40 percent, and state budgets absorb indicative annual subsidies of USD 150 million in Kazakhstan, USD 50 million in Uzbekistan, USD 45 million in Turkmenistan, USD 32 million in Tajikistan, and USD 30 million in Kyrgyzstan for water and related energy use (Abdullaev & Akhmedov, 2023).

These figures describe not a temporary funding shortage but a self-reinforcing trap. Low payments reduce maintenance funds; weak maintenance lowers reliability; poor service reduces the willingness to pay; and low collection deepens dependence on unstable public budgets and donor rehabilitation (Hellegers & Perry, 2006; Dinar &

Tsur, 2021). The exceptions prove the mechanism: collection rates of 80 percent and above are documented where service has improved, for instance by Tajikistan's Agency for Land Reclamation and Irrigation in 2021 (Abdullaev & Akhmedov, 2023), and water user association managers and sector experts interviewed in the Kyrgyz Republic and Tajikistan reported on-farm collection rates of 80-90 percent in well-functioning associations where users had seen service improve, which indicates that payment compliance is governed by credibility as much as by affordability.

The same trap explains why external capital has not filled the gap. According to the World Bank's Private Participation in Infrastructure database, private infrastructure investment in Central Asia between 1990 and 2021 totalled USD 9.1 billion across 75 projects, of which only four projects worth USD 160 million were in water and sewerage, against nearly USD 5.7 billion in energy (World Bank, 2022; Abdullaev & Akhmedov, 2023). The obstacle is not commercial disinterest but absent financeability: where asset registries are incomplete, maintenance obligations unenforceable and tariffs politically fixed, PPP legislation produces a legal framework without investable projects (OECD, 2018; World Bank, 2023). Donor finance has partly compensated, but in doing so it has reinforced a project-based rehabilitation model in which assets are restored without secure recurrent maintenance funding and project arrangements fade after closure (Chatalova et al., 2017).

Translation capability also differs by country in ways that matter later in the argument. Kazakhstan has the largest fiscal capacity and the most developed PPP framework, though irrigation applications remain limited; the Kyrgyz Republic and Tajikistan assign stronger operational roles to water user associations but depend heavily on concessional finance; Uzbekistan combines extensive state financing, above all for its energy-intensive pumping systems, with active reforms in asset management and metering; Turkmenistan remains predominantly state-led, with limited public evidence on sector finances, a characterization that carries lower confidence than the others for the reasons given in Section 3.2. The delivery gap, in short, is universal in kind but unequal in degree, and in shared basins it is the largest gap, not the average one, that sets common exposure.

4.3 Response: dry years as the audit of delivery

If translation failures remained latent, they would be a national fiscal problem. Drought makes them manifest, and it does so with increasing frequency. Under climate change, higher temperatures raise evaporative demand, alter snowmelt timing and increase the probability that a meteorological anomaly propagates into agricultural, hydrological and socio-economic drought (Lioubimtseva & Henebry, 2009; Reyer et al., 2017; IPCC, 2022). Low-water periods on the Amu Darya now recur every four to five years, and high-water periods only every six to ten (Vinokurov et al., 2023). Drought must be distinguished from the region's permanent aridity: a dry year becomes a crisis not because rain fails but because monitoring does not feed into decisions, reservoir and canal operations are not adjusted, farmers are warned too late, and response is financed after losses have occurred (Wilhite et al., 2014). Each of these failure points is a translation failure of the kind described in Section 4.2, observed under stress. The 2021 event demonstrated the mechanism. The countries affected were precisely those whose monitoring systems produced data without triggers, whose advisory services did not reach farmers in time, and whose contingency financing was assembled after the losses. National exposure differed with geography, rainfed grain and rangelands in Kazakhstan, glacier-fed headwaters and irrigated valleys in the Kyrgyz Republic and Tajikistan (Sorg et al., 2012), hydrological dependence on Amu Darya inflow in Turkmenistan,

irrigation dependence and the Aral lowlands in Uzbekistan, and in the headwater states hydropower dependence converts low-water years into energy-security problems (Jalilov et al., 2016). Yet the regional assessment in which the author participated (World Bank, forthcoming) found that the readiness gaps behind these different geographies converge: weak links between monitoring and action, fragmented mandates, absent operational triggers, insufficient last-mile advisory services and underdeveloped risk financing recur in all five national assessments, with the qualification for Turkmenistan noted in Section 3.2. The delivery gap is the common denominator of the region's drought vulnerability. The response stage is also where national gaps become regional. Because the Amu Darya and Syr Darya connect upstream snowpack and reservoirs with downstream irrigation and deltas, a poorly managed dry year in one country reappears for its neighbors as pressure on seasonal allocation, food prices, labor migration and the shared environmental legacy of the Aral Sea, whose salt and dust storms already affect Kazakhstan, Turkmenistan and Uzbekistan simultaneously (Micklin, 2007). The regional institutional architecture, meanwhile, mirrors the national pattern of functions without connective tissue. Drought-relevant capacities exist: the Interstate Commission for Water Coordination supports seasonal allocation, its Scientific Information Center compiles hydrometeorological data, the basin water organizations manage operations, the International Fund for Saving the Aral Sea provides a political umbrella, and the regional Center for Emergency Situations coordinates disaster response. But monitoring is not linked to agreed triggers, dry-year allocation practices are not codified into transparent protocols, national drought information is not comparable, and no dedicated drought coordination mechanism exists. The arrangement of 2025 for the Bahri Tojik reservoir in Tajikistan illustrates both points. On 30 May 2025, on the margins of the Dushanbe conference on glacier preservation, the water ministers of Tajikistan, Uzbekistan and Kazakhstan signed a trilateral protocol on the reservoir's operating regime for June-August 2025, under which Kazakhstan was to receive 491 million m³ through the interstate Dostyk canal at the peak of the vegetation season, in addition to the seasonal limits that the Interstate Commission for Water Coordination had set in April; comparable protocols had been negotiated in 2021, when 315 million m³ were released, and in 2023, when about 491 million m³ were, with Tajikistan compensated in machinery and fuel (Fergana News Agency, 2025; Kwan, 2025; Thompson, 2025; Prime Minister of the Republic of Kazakhstan, 2023; Khovar, 2022). The releases relieved irrigation shortages in Kazakhstan's Turkestan region at the height of the season. The arrangement shows both that regional flexibility is possible and that it is renegotiated annually at ministerial level, with volumes and compensation settled case by case, rather than embedded in a standing dry-year protocol that would make it dependable.

The Amu Darya adds a dimension that the five-state architecture does not cover. Afghanistan, whose territory generates a substantial share of the basin's runoff, is party neither to the 1992 Almaty Agreement nor to the Interstate Commission for Water Coordination, and its withdrawals, currently estimated at 3-5 km³ per year, are expected to rise to 9-11 km³ once the Qosh Tepa Canal is operating; the canal's first 108-kilometre phase was completed in October 2023 and full commissioning is projected for 2028 (SIC ICWC, n.d.; Rakhimova & Dolidudko, 2025; Ilkhamov, 2023). Estimates of the effect on downstream flows depend on the assumed withdrawal, conveyance losses, and climate scenario and are discussed in Section 5.3. For the present argument, the point is different: the exposure baseline of Turkmenistan and Uzbekistan is shifting at the same time as their delivery capability is being tested, and no institution exists in which that shift can be negotiated with the riparian causing it. Table 2 summarizes the argument of this section in terms of the framework.

Table 2. The reform chain in Central Asian water governance: convergence, divergence and regional exposure

Stage	What the evidence shows	Direction of variation	Regional implication
Adoption	Similar strategies in all five states; shared template of IWRM, basin governance, digitalization, cost recovery; common 2019-2021 focusing event	Convergent	Shared reform vocabulary lowers transaction costs of cooperation
Translation	Unequal budget execution, capacity, procurement and data systems; 40-45 percent financing shortfall; low cost recovery; marginal private capital	Divergent	Weakest implementer sets basin-wide exposure; finance gap is a governance gap
Response	Recurring drought reveals absent triggers, thin advisories and post-hoc financing; regional functions exist but are unconnected; dry-year practice is ad hoc	Convergently weak	National delivery failures propagate across borders through shared basins; Amu Darya exposure baseline shifting with Afghan withdrawals outside the allocation framework

Source: compiled by the author

5. DISCUSSION

5.1 *Delivery capability as a regional security variable*

The findings resolve the puzzle stated in the introduction. Convergence has not produced water security because it is generated at the adoption stage, by diffusion, political incentive and executive advocacy, while security is decided at the translation and response stages, where capability, finance and preparedness reside. The region has aligned what can be aligned by signature and diverged where alignment requires budgets, registries, tariffs and trained agencies. This is not a Central Asian peculiarity; it is what the policy-transfer literature would expect when standardized templates travel into unequal administrative settings (Resnick et al., 2018; Mahoney & Thelen, 2010; Mukhtarov, 2014). What is distinctive about Central Asia is that the costs of the resulting delivery gap are not contained by borders. In shared basins, an unmanaged dry year in one state arrives in the next as an allocation dispute, a food-price shock, an energy shortfall, or a wave of labor migration, without any hostile intent anywhere in the chain. This reframes the regional security question that has organized the literature since the 1990s. The relevant risk is no longer that states will fight over water; three decades of institutional persistence argue against it (Ziganshina & Sehring, 2021). The relevant risk is that states will quietly fail to deliver, and that the shared basins will distribute the consequences of that failure regionally. Domestic implementation capacity thereby

acquires the status of a regional security variable, much as fiscal discipline does within a monetary union: each member has a legitimate interest in the delivery performance of the others, because each is exposed to it. Accepting this logic changes what regional water cooperation should be about. Its object is not primarily the negotiation of allocation, which existing institutions handle adequately in normal years, but the mutual visibility and reinforcement of delivery.

5.2 Regional public goods as the cooperative consequence

What form should such cooperation take? The political culture of Central Asian regionalism after 2016 is consultative rather than supranational; proposals implying transfers of sovereignty have consistently stalled, while functional and technical cooperation has proven durable, as the survival of the Interstate Commission for Water Coordination through the 1990s demonstrates. The findings therefore point not to a new organization but to regional public goods: products from which all riparians benefit and which none can efficiently produce alone (Pahl-Wostl, 2009). Five follow directly from the identified gaps, and each attaches to an existing institution (Table 3).

Harmonized indicators respond to the finding that national drought and water information is not comparable; without comparability, no regional product can guide shared action. Dry-year protocols codify what is currently ad hoc, including the documentation, compensation, and scenario basis for exceptional reservoir releases of the kind negotiated for Bahri Tojik in 2021, 2023 and 2025, converting annual bargaining into dependable practice. A seasonal regional drought bulletin, issued before each vegetation season and updated during it, links monitoring to decisions at the regional scale, provided it is written for decision-makers rather than only for technical specialists. Transboundary scenario planning for low-flow and high-temperature combinations in the Amu Darya, Syr Darya and Chu-Talas systems pre-negotiates response options under plausible stress, which is cheaper and politically easier than negotiating during the event. Joint investment preparation, finally, converts national priorities into financeable regional packages of water accounting, irrigation efficiency, advisory services and ecosystem-based measures, including restoration of the Tugai and delta landscapes through which drought and the Aral legacy interact (Micklin, 2007).

Table 3. Existing regional mechanisms and proposed delivery-oriented functions

Mechanism	Current function	Proposed additional function
ICWC and basin water organizations	Seasonal allocation and operational basin management	Dry-year protocols; scenario-based allocation reviews; documentation of exceptional releases
Scientific Information Center of ICWC and national hydromets	Data compilation, forecasts and water availability analysis	Regional seasonal drought bulletin; harmonized indicators and trigger guidance
IFAS and Aral Sea Basin Program	High-level basin cooperation and environmental programming	Political umbrella for drought and ecosystem-resilience measures
Center for Emergency Situations and regional DRR channels	Preparedness and emergency response coordination	Early-action checklists; impact reporting; links to contingency financing

Research institutions and universities	Training, remote sensing, modelling, policy dialogue	Science-policy support and investment preparation for the regional pipeline
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Source: compiled by the author

Two design principles follow from the analysis rather than from general preference. First, the platform connecting these functions should be light, technical and product-oriented, because the adoption-stage machinery of the region is already strong; adding another declaratory layer would reproduce the very pattern the paper diagnoses. Success should be measured in delivered outputs, a published bulletin, an agreed indicator set, a signed protocol, not in meetings held. Second, the last mile must be treated as part of the regional architecture, not as a national afterthought. Early warning changes outcomes only when it changes decisions (Pulwarty & Sivakumar, 2014), and the translation-stage findings show that the link from information to farmers, water user associations, pasture users and local governments is the weakest in the chain. Regional cooperation can supply shared methodologies and peer learning for advisory services, including attention to language, trusted channels and gendered access to information, while delivery itself remains national and local.

5.3 Sequencing finance, and the closing window

The translation-stage findings carry a direct implication for how the region and its partners should finance the water agenda. Because financeability is an emergent property of governance, instruments cannot substitute for foundations: co-financing arrangements, green bonds and blended instruments cannot be built on unregistered assets, unenforceable maintenance obligations and symbolic tariffs (OECD, 2019; World Bank, 2023). The sequence that follows is asset and responsibility settlement first, then credible service standards and measurement, then legitimate funding streams combining differentiated tariffs with transparent subsidies, and only then scaled deployment of diversified instruments. Regional cooperation can accelerate this sequence without replacing it: harmonized asset data and jointly prepared project pipelines lower preparation costs and raise the sector's credibility with financiers, as the Kambarata-1 process, in which Kyrgyzstan, Kazakhstan and Uzbekistan jointly engaged donors around a shared asset through the donor coordination committee established in June 2024, has begun to show (World Bank, 2024, 2025). A second discipline concerns measurement: water-saving investments should be evaluated at basin scale and in terms of consumptive use, since reduced conveyance losses do not necessarily reduce basin-level depletion; apparent savings may irrigate additional land while return flows diminish. Without this accounting, the region could finance efficiency and still deepen scarcity.

Finally, the window in which this agenda is feasible should not be assumed permanent. The Qosh Tepa Canal, introduced in Sections 3.1 and 4.3, makes the point concrete. The Scientific Information Center of the Interstate Commission for Water Coordination estimates that Afghan withdrawals in the basin could rise to 9-11 km³ per year after the canal's projected completion in 2028, equivalent to about 15-18 percent of the mean annual flow of 62 km³ at the section above the Karakum Canal intake, and that in low-water years the supply available downstream during the vegetation season could fall to half of requirements; its water-balance modelling under a regional climate scenario to 2060 puts the basin's total deficit at 12-16 km³, more than double the present level

(SIC ICWC, n.d.; Rakhimova & Dolidudko, 2025). Other estimates range from 8 to 20 percent of annual flow, and up to 30 percent of Uzbekistan's allocation under the most likely scenario, depending on the assumed withdrawal (6-13 km³ per year), conveyance losses (about 22 percent) and total river flow (Ilkhamov, 2023; Faizi, 2024), while the Eurasian Development Bank projects a combined shortage of 5-12 km³ by 2028 from climate change, low-water cycles and the canal together (Vinokurov et al., 2023). The range itself is the point: the region does not yet possess an agreed hydrological baseline against which the effect could be measured, and Afghanistan is party to none of the institutions in which such a baseline could be negotiated. Whatever the eventual figure, a region with harmonized accounting, agreed scenarios and codified dry-year rules will face that development from a far stronger position than five separate national datasets and improvised responses. The climatology of the region, meanwhile, suggests that the next severe drought is a matter of years rather than decades. Political rapprochement, a shared reform vocabulary, and available international finance currently coincide; the analysis in this paper indicates precisely what that coincidence should be spent on.

6. CONCLUSION

This paper asked why the convergence of water reform agendas in Central Asia since 2016 has not produced water security. Following reforms through adoption, translation, and response, it showed that the convergence is real but confined to the adoption stage, where transnational template diffusion, regional political incentives, and centralized executives align what states enact. The delivery gap opens at translation, where unequal administrative capability and a financing shortfall of roughly 40-45 percent, itself rooted in incomplete asset ownership, politically constrained tariffs and the low-price-low-service trap, leave reformed institutions without operational capability. Recurrent drought then audits the whole chain, and in shared basins it distributes the cost of national failures regionally.

The central conclusion is that domestic delivery capability has become a regional security variable in Central Asia. The strategic water risk facing the region is not interstate conflict, against which its institutions have proven resilient, but delivery failure, against which they are largely undesigned. The cooperation agenda that follows is specific: harmonized indicators, dry-year protocols, a seasonal drought bulletin, transboundary stress scenarios, jointly prepared investment pipelines and an agreed hydrological baseline from which to engage Afghanistan, produced through existing institutions and judged by delivered outputs. Financing strategy at both levels should respect sequencing, building the governance foundations on which diversified instruments depend.

The analysis also identifies what research should measure next: implementation outcomes rather than reform adoption, including cost-recovery performance, basin-scale consumptive-use effects of water-saving investments, scheme-level asset ownership and lifecycle costs; the propagation of drought impacts through the water-energy-food system of the shared basins; and scenarios for engaging Afghanistan in basin governance. The region's water future will be decided less by the texts of its strategies than by the machinery of budgets, registries, triggers and protocols examined here, and the present political moment is the best opportunity in three decades to build that machinery before the next dry cycle tests it.

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CONFLICTS OF INTEREST

The author declares no conflict of interest.

AUTHORS' CONTRIBUTIONS

IA: conceptualization, methodology, investigation, formal analysis, writing – original draft, writing – review and editing.

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