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THE PROBLEMS OF JOINT USE OF WATER RESOURCES IN CENTRAL ASIA

БОРБОРДУК АЗИЯДАГЫ СУУ РЕСУРСТАРЫН БИРГЕЛЕШКЕН ПАЙДАЛАНУУ КӨЙГӨЙЛӨРҮ

ПРОБЛЕМЫ СОВМЕСТНОГО ИСПОЛЬЗОВАНИЯ ВОДНЫХ РЕСУРСОВ В ЦЕНТРАЛЬНОЙ АЗИИ

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THE PROBLEMS OF JOINT USE OF WATER RESOURCES IN CENTRAL ASIA

Abstract. This article explores the complex institutional, legal, and geopolitical dimensions of transboundary water management in Central Asia. Based on the master`s thesis, it examines how historical legacies, fragmented legal frameworks, and climate change continue to shape regional water cooperation. Special emphasis is placed on Kyrgyzstan's national strategy and its upstream geopolitical position. The study reviews the role of institutions such as the International Fund for Saving the Aral Sea (IFAS), the Interstate Commission for Water Coordination (ICWC), and international partners like the Organization for Security and Co-operation in Europe (OSCE) and the United Nations Economic Commission for Europe (UNECE). Comparative lessons from other basins, such as the Mekong and Nile, are used to illustrate effective governance models. The paper concludes with recommendations for harmonizing national legislation, enhancing data transparency, and strengthening basin-level institutions.

Keywords: transboundary water, Central Asia, cooperation, upstream-downstream conflict, legal frameworks, national interests, water resources management

Борбордук азиядагы суу ресурстарын биргелешкен пайдалануу көйгөйлөрү

Аннотация

Бул макала Борбордук Азиядагы трансчегаралык сууларды башкаруунун татаал институттук, укуктук жана геосаясий өлчөмдөрүн изилдейт. Магистрдик диссертациянын негизинде ал тарыхый мурастар, бытыранды мыйзамдык базалар жана климаттын өзгөрүүсү аймактык суу кызматташтыгын кантип калыптандырып жатканын изилдейт. Кыргызстандын улуттук стратегиясына жана анын жогорку агымына байланыштуу геосаясий абалына өзгөчө басым жасалат. Изилдөө Аралды куткаруу эл аралык фонду, Суу координациялоо боюнча мамлекеттер аралык комиссия сыяктуу институттардын жана Европадагы коопсуздук жана кызматташтык уюму (ЕККУ) жана Бириккен Улуттар Уюмунун Европалык экономикалык комиссиясы (БУУ ЕЭК) сыяктуу эл аралык өнөктөштөрдүн ролун карайт. Меконг жана Нил сыяктуу башка бассейндердин салыштырма сабактары башкаруунун эффективдүү моделдерин көрсөтүү үчүн колдонулат. Документ улуттук мыйзамдарды шайкеш келтирүү, маалыматтардын ачыктыгын жогорулатуу жана бассейндик деңгээлдеги институттарды бекемдөө боюнча сунуштар менен аяктайт.

Ачкыч сөздөр: трансчегаралык суу, Борбордук Азия, кызматташтык, агымдын өйдө-ылдый конфликти, укуктук негиздер, улуттук кызыкчылыктар, суу ресурстарын башкаруу

Проблемы совместного использования водных ресурсов в центральной азии

Аннотация

В этой статье рассматриваются сложные институциональные, правовые и геополитические аспекты управления трансграничными водами в Центральной Азии. Опираясь на магистерскую диссертацию, и интегрируя события до 2025 года, в ней рассматривается, как историческое наследие, фрагментированные правовые рамки и изменение климата продолжают формировать региональное водное сотрудничество. Особое внимание уделяется национальной стратегии Кыргызстана и его геополитическому положению вверх по течению. В исследовании рассматривается роль таких институтов, как Международный фонд спасения Арала (МФСА), Межгосударственная координационная водохозяйственная комиссия (МКВК), и международных партнеров, таких как Организация по безопасности и сотрудничеству в Европе (ОБСЕ) и Европейская Экономическая Комиссия Организации Объединённых Наций (ЕЭК ООН). Сравнительные уроки других бассейнов, таких как Меконг и Нил, используются для иллюстрации эффективных моделей управления. В заключение приводятся рекомендации по гармонизации национального законодательства, повышению прозрачности данных и укреплению институтов на уровне бассейна.

Ключевые слова: трансграничные воды, Центральная Азия, сотрудничество, конфликт между верхним и нижним течением, правовые рамки, национальные интересы, управление водными ресурсами

Introduction

Water management remains a critical issue for sustainable development and regional stability in Central Asia. The five newly independent states that emerged from the collapse of the Soviet Union inherited water infrastructure that was interconnected but poorly adapted to modern political boundaries. Serious tensions persist between upstream countries that depend on water for hydropower (Kyrgyzstan, Tajikistan) and downstream countries that need it for irrigation (Kazakhstan, Uzbekistan, Turkmenistan). This, coupled with competing national interests, inefficient use, weak institutions, and deteriorating infrastructure, contributes to recurring conflicts over shared transboundary rivers.

Efforts of ICWC and IFAS in Central Asia and the involvement of international organizations such as UNECE, OSCE, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and World Bank highlight the need for a framework for cooperation, but a sustainable and inclusive mechanism for transboundary water management remains lacking. The environmental degradation of the Aral Sea remains a clear sign of regional mismanagement, with United Nations Development Programme (UNDP) noting serious socio-environmental impacts on millions of people in rural areas. (UNDP, 2021)

While the topic has been studied by local and international scholars, significant gaps remain in formulating a unified regional water policy and implementing sustainable management mechanisms. This study seeks to address these gaps by examining the political, legal and institutional barriers to cooperation, based on theories of water diplomacy, institutionalism and environmental governance, and supported by comparative case studies and empirical evidence.

Methodology

The methodology applied for this study integrates an interdisciplinary approach, combining systemic, institutional and comparative-political methods, supported by empirical and qualitative methods of analysis and case studies. This multifaceted methodology is particularly suited to addressing the complexities associated with transboundary water management in Central Asia. In addition, it also covers political, environmental, socio-economic and technological dimensions.

The systemic approach is primarily used to analyze the water governance framework in a comprehensive manner. It recognizes the interdependencies and dynamic interactions between different stakeholders, including nation states, international organizations, regional bodies, local communities and non-governmental organizations. This systems approach highlights overarching patterns, facilitating the identification of both mechanisms of cooperation and drivers of conflict.

The institutional analysis provides an in-depth understanding of the formal and informal norms, rules, regulations and governance mechanisms that shape regional water governance. Key international frameworks are carefully examined, including the UN Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992), the UN Convention on the Law of the Non-Navigational Uses of International Watercourses (1997) and numerous bilateral and multilateral agreements concluded since the collapse of the Soviet Union. In addition, the analysis pays attention to the effectiveness and weaknesses of existing institutional structures, such as the ICWC and IFAS.

The comparative political method facilitates a critical assessment of different national strategies, policies and approaches to water resources management. In particular, the different and often contradictory strategies of Kyrgyzstan, Tajikistan, Uzbekistan, Kazakhstan and Turkmenistan are systematically assessed. Comparative analysis is used to identify similarities, divergences and the underlying geopolitical and economic motivations shaping each state's policies and actions, with a particular focus on strategies for irrigation, energy production and climate change adaptation.

The empirical basis is strengthened through a thorough content analysis of legislative documents, international agreements, official government reports, statistical data and expert assessments. This allows the research to be based on concrete and verifiable information, facilitating the development of practical and applicable policy recommendations.

The research further includes case studies from international best practice, such as Integrated Water Resources Management (IWRM) frameworks successfully implemented in various global contexts. Scenario planning elements are used to explore possible future developments and anticipate challenges and opportunities in regional water management dynamics.

The Mekong River Commission and the Senegal River Basin Organization are widely regarded as successful models of transboundary water management that offer valuable lessons for Central Asia. The Mekong River Commission, which includes Cambodia, Laos, Thailand and Vietnam, is based on a legally binding agreement (the 1995 Mekong Agreement) and promotes joint planning, data sharing and development of shared infrastructure through a permanent secretariat and inclusive stakeholder consultations. Its emphasis on consensus-building and basin-wide sustainability fits well with the complex hydropolitics of Central Asia. Similarly, the Senegal River Basin Organization, formed by Senegal, Mali, Mauritania and Guinea, is notable for establishing common ownership and joint management of major hydraulic infrastructure such as dams and reservoirs. The organization operates on the principle of equitable benefit sharing and collective responsibility, with decisions binding on all member states. Both institutions illustrate the importance of treaty-based cooperation, centralized data systems, and robust enforcement mechanisms, elements that are largely absent or underdeveloped in Central Asia. These examples demonstrate how sustained political will and legal frameworks can transform water from a source of conflict to a foundation for regional integration and development.

By integrating these complex methodological approaches, this study provides a detailed, multi-level and thorough examination of the complex dynamics associated with transboundary water management in Central Asia, making a significant contribution to both academic understanding and practical policy development.

Analyses and findings

Water management in Central Asia remains one of the most pressing and multifaceted challenges facing the region today. The interplay between environmental stressors, socio-political fragmentation, and institutional inertia has impacted the sharing of transboundary rivers, particularly the Amu Darya and Syr Darya, as both a source of tension and a potential avenue for regional cooperation. Recent years have underscored the deepening urgency of this issue. Accelerated glacier melt, more frequent and severe droughts, and growing agricultural demands,

compounded by population growth and aging infrastructure, are placing enormous strain on an already fragile hydrological system.

Although the Central Asian republics gained independence in 1991, the interdependent nature of their water systems inherited from the Soviet Union has persisted. Despite the dissolution of centralized governance structures, the rivers and canals that crisscross these countries continue to link them in complex hydropolitical relationships. Post-Soviet water management was initially characterized by attempts to replicate Soviet mechanisms of seasonal water-energy barter. However, this model quickly hesitated in the face of political fragmentation, economic instability, and civil unrest, particularly in Tajikistan and Kyrgyzstan.

In response to this systemic failure, a number of regional platforms were created, including the ICWC and IFAS. While these institutions have contributed to dialogue and technical cooperation, they have struggled to enforce binding agreements or develop comprehensive basin-level governance frameworks. Despite the nominal participation of all five republics – Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan – these platforms lack robust enforcement mechanisms and often operate with limited transparency and inconsistent political support.

One of the central issues in this regard is the divergence of national water priorities. The upstream countries, Kyrgyzstan and Tajikistan hold most of the region's water resources and seek to exploit their hydropower potential to the maximum, especially during the winter months when demand for electricity peaks. In contrast, the downstream countries, Uzbekistan, Turkmenistan, and Kazakhstan rely on stable water supplies in the spring and summer to irrigate vast agricultural areas. This fundamental asymmetry has repeatedly caused friction, especially in drought years when water shortages exacerbate competition between these different national imperatives.

Recently, this situation has been further complicated by a number of external and internal factors. The impact of climate change has intensified, with Central Asia facing prolonged droughts and abnormal weather conditions. In 2021, unprecedented drought in southern Kazakhstan and parts of Uzbekistan resulted in widespread agricultural losses and livestock deaths. (Radio Free Europe/Radio Liberty, 2021) Research by the Intergovernmental Panel on Climate Change (IPCC) predicts that water flows in the Amu Darya and Syr Darya basins could decrease by 15–25% by 2050, due to both glacier retreat and changing precipitation patterns. (Diebold, 2013) The consequences of such shifts are far-reaching, threatening not only food security and livelihoods, but also regional stability.

Deteriorating infrastructure further exacerbates these pressures. Reports from the European Bank for Reconstruction and Development (EBRD) and the World Bank indicate that more than 50% of irrigation canals in Kyrgyzstan and up to 65% in Uzbekistan are in critical condition. (World Bank, 2024) Water losses through seepage and evaporation are staggering, with some systems losing up to 40% of the water they transport before it reaches farmland. Modernization efforts are underway, but progress remains uneven and underfunded. Pilot projects, such as those funded by CAWEP (Central Asia Water and Energy Programme), have shown potential to improve efficiency, particularly through digital monitoring and localised management structures. However, they remain limited in scale and reach.

Theoretical models of IWRM offer some insight into how Central Asia can move toward more sustainable and equitable governance. Endorsed by the United Nations and several

international donors, IWRM emphasizes the coordinated development and management of water, land, and related resources. Since the late 2010s, Kazakhstan and Kyrgyzstan have made partial progress in adopting IWRM principles, although implementation is often hampered by weak cross-sectoral coordination, limited data sharing, and insufficient public participation. As of 2022, only two of the five Central Asian countries had adopted formal IWRM strategies, and even these have only been partially implemented. (UNEP – UN Water, 2024)

Another influential conceptual framework is water diplomacy, which views water as both a source of conflict and a means of cooperation. This approach has gained prominence amid ongoing disputes over water allocation and infrastructure development. A prominent example is the construction of the Kosh Tepa Canal in northern Afghanistan, which threatens to divert up to 10 billion cubic meters of water per year from the Amu Darya. (Duffy, 2023) This development has alarmed Uzbekistan and Turkmenistan, whose agricultural systems rely heavily on the river. Despite growing international concern, little progress has been made toward a multilateral agreement involving Afghanistan and its northern neighbours. The lack of a legal mechanism to address such unilateral diversions leaves the region vulnerable to hydropolitical instability.

In Central Asia, trust deficits and legacy grievances continue to undermine cooperation. Disagreements over water allocation, infrastructure ownership, and financial contributions persist. While upstream states advocate recognizing water as an economic good, demanding payments for its use, downstream countries emphasize the principle of equitable access to shared natural resources. This fundamental gap impedes efforts to institutionalize co-management regimes.

Recent national strategies provide some grounds for cautious optimism. In 2023, Kyrgyzstan adopted a National Water Strategy 2040, prioritizing sustainable use, ecosystem protection, and infrastructure renewal. That same year, a dedicated Ministry of Water Resources was created to centralize management functions. A World Bank-supported program to expand access to drinking water in rural areas, launched in 2025, is another sign of progress, aiming to reach more than 450,000 people in underserved communities. (World Bank, 2025) However, implementation faces constraints, particularly in terms of institutional capacity and financing.

Tensions remain visible in high-profile disputes, such as the 2022 dispute over the Kempir-Abad reservoir between Kyrgyzstan and Uzbekistan. A bilateral agreement to jointly manage the reservoir sparked protests in Kyrgyzstan, where critics accused the government of undermining national interests. Nonetheless, the agreement successfully formalized the sharing of water infrastructure and served as a model for similar agreements elsewhere in the region. It also marked a shift toward pragmatic diplomacy in a historically contentious sector.

Climate risks are becoming increasingly important for national and regional water strategies. The melting of glaciers in the Tien Shan and Pamir ranges, sources of the main rivers of Central Asia, is accelerating. By 2050, more than 60% of the glaciers feeding the Fergana Valley could disappear, sharply reducing water availability during critical irrigation periods. (UNESCO, 2025) Recognizing this, Kazakhstan, Kyrgyzstan and Uzbekistan have taken steps to integrate climate change adaptation into water resources planning. In 2022, the Nur-Sultan (Kazakhstan) Climate Adaptation Conference reaffirmed the urgency of transboundary action and led to commitments to enhance hydrometeorological cooperation. (OSCE, 2023)

International actors have played a significant role in supporting regional water governance. The OSCE Programme Office in Bishkek has played an important role in promoting water diplomacy and training stakeholders, particularly in the transboundary context. Likewise, the European Union's (EU) Nexus Dialogue and the World Bank's CAWEP initiative have provided funding and technical expertise for pilot projects across the region. These efforts, while important, often take place in a fragmented political environment that lacks strong domestic ownership.

There is also growing interest in digitalization and innovation as tools for water management. Pilot programs in the Fergana Valley and northern Kyrgyzstan have begun deploying supervisory control and data acquisition (SCADA) systems and remote sensing tools to monitor flows and improve water metering. (FAO, 2022) While initial results are promising, reducing both technical losses and disputes, the scalability of such technologies remains uncertain, especially in areas with weak infrastructure and limited access to electricity.

Despite these achievements, fundamental structural problems remain. Transboundary water management remains hampered by overlapping jurisdictions, politicized decision-making, and inconsistent enforcement of agreements. Local conflicts over water allocation, often between competing agricultural, municipal, and industrial users, have intensified, particularly during periods of drought. In Andijan and Surkhandarya (Uzbekistan), as well as in parts of southern Kazakhstan, farmer protests and water rationing have become more frequent, highlighting the political sensitivity of water scarcity. (Radio Free Europe/Free Liberty, 2024)

Social inequality and marginalization further complicate the picture. In rural areas of Kyrgyzstan and Tajikistan, large parts of the population still lack access to safe drinking water. Women and children bear a disproportionate burden, often spending hours collecting water or struggling with poor sanitation. These challenges highlight the need to integrate equity considerations into water policies, ensuring that reforms do not exacerbate existing vulnerabilities.

Looking ahead, there is an urgent need to strengthen institutional resilience and promote adaptive management. This means not only building physical infrastructure, but also investing in data systems, stakeholder engagement, and legal frameworks that can respond to changing conditions. Resilience theory, increasingly applied to water systems, emphasizes the importance of flexibility, learning, and multi-level coordination. In the Central Asian context, this means moving beyond rigid quotas and zero-sum negotiations to participatory, basin-wide planning that reflects environmental realities and human needs.

In conclusion, the last decade has been marked by both deepening water challenges and nascent steps towards reform. While climate change, population pressures and geopolitical uncertainty continue to put pressure on the region's fragile water systems, new strategies and partnerships have begun to emerge. Evolving national policies, reviving bilateral cooperation and engaging international actors are opening pathways towards more sustainable and inclusive water management. However, realising this potential will require not only technical solutions, but also political will, public trust and a long-term commitment to regional integration.

Conclusions and Recommendations

Water management in Central Asia has now reasserted itself not only as a technical and environmental challenge, but also as a deeply political one, inextricably linked to national

sovereignty, regional security and economic interdependence. The research finds that unresolved tensions between upstream and downstream states, institutional fragmentation and short-term political priorities continue to undermine sustainable transboundary water management. At the same time, new avenues are emerging, driven by technological modernization, regional diplomacy and international partnerships, that can help build a more cooperative and adaptive water governance regime across the region.

Kyrgyzstan, as a key upstream country and source of most of the Syr Darya flow, plays a key role in shaping this water agenda. From the glacier-fed headwaters of the Naryn River to its hydropower-dependent economy, Kyrgyzstan's water decisions have cascading effects downstream, particularly for Uzbekistan and Kazakhstan. This structural position gives Kyrgyzstan significant responsibility and potential leadership in advancing integrated water cooperation.

One of the key findings of both the original paper and the update is the inadequacy of current regional mechanisms to manage competing climate-related interests and risks. Institutional structures such as the ICWC and IFAS remain underfunded and politically constrained. Their mandates are often more symbolic than functional, and they lack enforcement powers and meaningful public participation.

Climate change and population growth are exacerbating these systemic vulnerabilities. Recent years have brought record droughts, increased evaporation, shrinking ice sheets, and disrupted irrigation schedules. For example, the 2021–2022 droughts in southern Kazakhstan and parts of the Fergana Valley resulted in significant crop losses and renewed competition for water releases. These events have transformed water from a resource management issue into a full-fledged transboundary security issue. Uncoordinated water use might be among the factors of instability in the Fergana Valley, highlighting the socio-political risks of inaction in future.

Yet despite these challenges, notable successes have been achieved. Kyrgyzstan's decision to sign a bilateral agreement with Uzbekistan in 2022 on the joint use of the Kempir-Abad reservoir marked a breakthrough in transboundary hydropolitics. Although the agreement generated internal controversy, it formalized joint management of the infrastructure and served as a model for subsequent initiatives. The OSCE Programme Office in Bishkek supported the institutionalization of local water committees and conducted regional trainings on water diplomacy, while international donors such as the World Bank, EU and GIZ invested in water-saving technologies, canal rehabilitation and digital monitoring systems.

USAID's "Safe Water for Central Asia" Initiative (2021–2024), which has invested more than $20 million, primarily in Kyrgyzstan, is a shining example of the international community's role in improving the resilience of transboundary water resources. (Cohen, Alexander Hill, & Alejandro Sanchez, 2025) The program has supported infrastructure upgrades, early warning systems, and multilateral platforms for water sharing in transboundary basins.

The integration of water into climate, economic and agricultural policies is gaining momentum. The inclusion of Sustainable Development Goal 6 (Clean water and sanitation) in national policy frameworks and the gradual adoption of IWRM principles signal a growing shift towards systems thinking. However, full implementation remains uneven and is hampered by a lack of technical capacity, data interoperability and political will.

Based on both the original dissertation work and ongoing developments, several key recommendations are proposed to strengthen regional cooperation and enhance Kyrgyzstan's leadership in water resources management:

- Adopt the National Water Security Strategy of Kyrgyzstan until 2035

The strategy should integrate climate change adaptation, energy and irrigation needs, and transboundary cooperation. It should outline risk scenarios, financing mechanisms, and institutional reforms, ensuring alignment with regional frameworks and the UN SDG6 targets.

- Modernization of critical water supply infrastructure

The rehabilitation of irrigation canals, small hydropower plants and pumping stations should be prioritised through blended financing models involving international partners such as GIZ, the Asian Development Bank (ADB) and the Green Climate Fund. Infrastructure should be climate-resilient, digitally controlled and jointly managed in transboundary areas.

- Empowering scientific and educational institutions

Institutions such as the Kyrgyz National Agrarian University should be given a formal role in policy development. Investments in training programmes on water diplomacy, climate modelling and drought management will strengthen domestic expertise and regional negotiating capacity.

- Establishment of local and transboundary water committees

Inclusive platforms comprising government officials, non-governmental organizations (NGOs), women’s groups and local water users, especially in sensitive regions such as Batken (Kyrgyzstan) and Sughd (Tajikistan), should be formalized. These bodies can serve as early warning systems, dialogue facilitators and pilot sites for collaborative water management.

- Create a Central Asian platform for monitoring and forecasting water resources

A single, open-access electronic platform supported by international partners (e.g. OSCE, World Bank, UNECE) should provide real-time data on expenditure, usage patterns and weather conditions. Standardized data exchange can reduce disputes and improve seasonal planning.

- Institutionalization of Water Diplomacy Dialogues

Regular ministerial meetings, expert exchanges and regional water diplomacy forums should be held at both the state and civil society levels. These forums can help build trust, agree on policy timelines and ensure that the voices of marginalized groups, including women and rural communities, are heard.

The article also emphasizes that any regional water governance system must be built on mutual legal obligations, shared financial responsibility, and transparent decision-making. Drawing on international examples (the Mekong River Commission or the Senegal River Basin Organization), the region should work to establish a contractual framework with arbitration clauses, fair cost sharing, and adaptive governance instruments.

A significant institutional reform proposed as a solution is to separate regulatory, monitoring and operational functions among different agencies. This helps ensure accountability, prevents political interference in technical decisions and is consistent with international best practice. Strategic infrastructure such as dams, reservoirs and key irrigation systems should remain under

public ownership or be placed under the supervision of independent agencies with clear mandates and oversight mechanisms.

Ultimately, sustainable water management in Central Asia requires more than just technical fixes. It requires political courage, social integration, and a willingness to compromise for collective gain. As I. Abdullaev argues, “sustainable water management is impossible without inclusive cooperation formats, where Kyrgyzstan can act as both a mediator and initiator of science-based dialogue.” (Abdullaev, 2004)

In conclusion, Kyrgyzstan has the potential to move beyond its role as a passive upstream player and become a proactive regional leader in water diplomacy. By aligning domestic reforms with regional cooperation, investing in knowledge-based governance, and promoting inclusive dialogue, it can help shape a future in which water is not a source of division, but an engine of shared prosperity and security in Central Asia.

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