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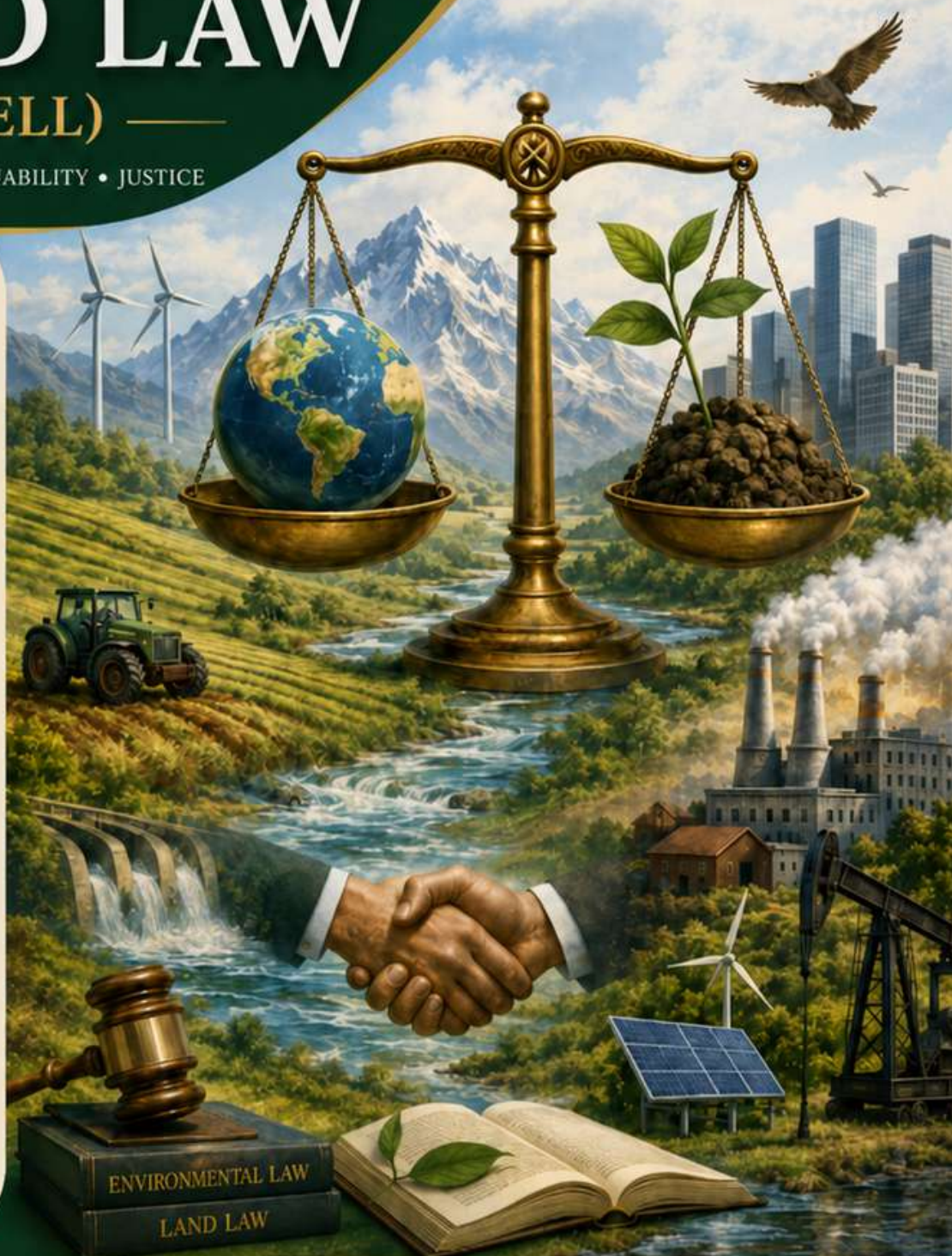
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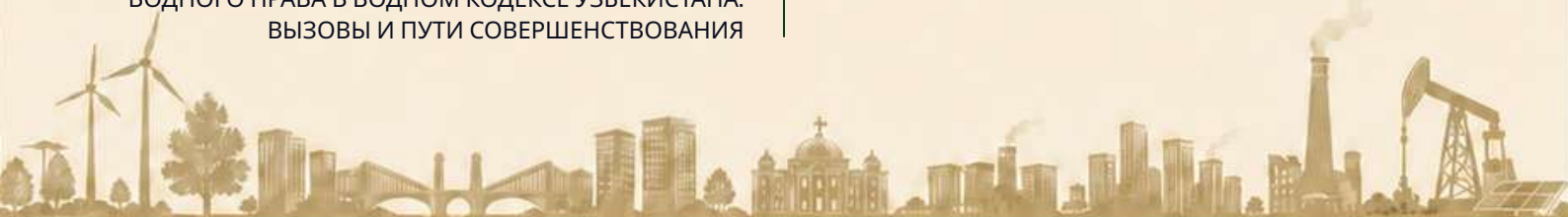
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CURRENT ISSUES IN THE LEGAL GOVERNANCE OF
WATER RESOURCES IN CENTRAL ASIA UNDER
CLIMATE CHANGE



Original research article

CURRENT ISSUES IN THE LEGAL GOVERNANCE OF WATER RESOURCES IN CENTRAL ASIA UNDER CLIMATE CHANGE

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the Aral Sea (IFAS),
Interstate Commission for Water
Coordination (ICWC)

ABSTRACT

This article examines the current challenges of legal governance of water resources in Central Asia under climate change, the existing institutional framework for transboundary water cooperation, and recent regional initiatives. The study comprehensively analyzes the existing legal mechanisms based on international conventions, regional agreements, and the Water Code of the Republic of Uzbekistan. It further explores the impacts of climate change, the Qoshtepa Canal project, and regional water security issues, while proposing practical and scientific recommendations for improving legal regulation in accordance with the principles of international water law.

АКТУАЛЬНЫЕ ВОПРОСЫ ПРАВОВОГО РЕГУЛИРОВАНИЯ ВОДНЫХ РЕСУРСОВ В ЦЕНТРАЛЬНОЙ АЗИИ В УСЛОВИЯХ ИЗМЕНЕНИЯ КЛИМАТА

ИНФОРМАЦИЯ СТАТЬИ

Ключевые слова:

изменение климата,
трансграничные водные
ресурсы, международное водное
право, Центральная Азия,
Амударья, Сырдарья,
канал Коштенпа,
водная дипломатия,
Хельсинкская конвенция,
Международный фонд спасения
Арала (МФСА),
Межгосударственная
координационная
водохозяйственная комиссия
(МКВК).

АННОТАЦИЯ

В данной статье рассматриваются современные проблемы правового регулирования водных ресурсов в Центральной Азии в условиях изменения климата, действующая институциональная система сотрудничества в сфере трансграничных водных ресурсов, а также последние региональные инициативы. В исследовании проведён комплексный анализ существующих правовых механизмов, основанных на международных конвенциях, региональных соглашениях и Водном кодексе Республики Узбекистан. Кроме того, исследуются правовые аспекты изменения климата, проекта канала Коштенпа и вопросов региональной водной безопасности, а также предлагаются практические и научно обоснованные рекомендации по совершенствованию правового регулирования в соответствии с принципами международного водного права.

IQLIM O'ZGARISHI SHAROITIDA MARKAZIY OSIYODA SUV RESURLARINI HUQUQIY BOSHQARISHNING DOLZARB MASALALARI

MAQOLA MA'LUMOTI

Kalit so'zlari:

iqlim o'zgarishi,
transchegaraviy suv resurslari,
xalqaro suv huquqi, Markaziy
Osiyo, Amudaryo, Sirdaryo,
Qoshtepa kanali,
suv diplomatiyasi,
Helsinki konvensiyasi,
Orolni qutqarish xalqaro
jamg'armasi (OQXJ),
Suv xo'jaligini muvofiqlashtiruvchi
davlatlararo komissiya (SXMDK)

ANNOTATSIYA

Mazkur maqolada iqlim o'zgarishi sharoitida Markaziy Osiyoda suv resurslarini huquqiy boshqarishning dolzarb muammolari, transchegaraviy suv hamkorligining amaldagi institutsional tizimi hamda so'nggi mintaqaviy tashabbuslar tahlil qilinadi. Tadqiqotda xalqaro konvensiyalar, mintaqaviy bitimlar va O'zbekiston Respublikasi Suv kodeksi asosida mavjud huquqiy mexanizmlar kompleks o'rganilgan. Shuningdek, iqlim o'zgarishi, Qoshtepa kanali loyihasi va mintaqaviy suv xavfsizligi bilan bog'liq masalalarning huquqiy jihatlarini yoritilib, xalqaro suv huquqi prinsiplari asosida huquqiy tartibga solishni takomillashtirishga qaratilgan amaliy hamda ilmiy tavsiyalar ishlab chiqilgan.

INTRODUCTION

Water resources constitute one of the most important strategic natural resources ensuring sustainable socio-economic development, environmental security, food security, and energy sustainability. In the twenty-first century, climate change has significantly affected the hydrological cycle, resulting in glacier retreat, declining river flows, prolonged droughts, an increasing frequency of extreme weather events, and intensified competition for freshwater resources. According to the United Nations and the Intergovernmental Panel on Climate Change (IPCC), approximately 40% of the world's population currently lives in water-stressed regions, and by 2050 billions of people are expected to experience shortages of safe drinking water [1]. Consequently, the governance of transboundary water resources has become not only an environmental issue but also a priority of international law and international security.

One of the regions where these challenges are most evident is Central Asia. The region's economic development and environmental sustainability are directly dependent on the transboundary water resources of the Amu Darya and Syr Darya river basins. These rivers originate primarily from glaciers located in the Pamir and Tien Shan mountain systems. Over recent decades, the accelerated retreat of these glaciers has raised serious concerns regarding future reductions in river discharge, increasing seasonal water shortages during the vegetation period, and growing environmental risks throughout the region [2]. Consequently, water resources have become not only an environmental concern but also a key factor affecting economic development, food security, energy sustainability, and regional geopolitical stability.

Statistical data further confirm the region's high dependence on transboundary water resources. The annual water allocation assigned to the Republic of Uzbekistan within the Aral Sea Basin amounts to 63.02 km³, including 53.59 km³ derived from the flows of the Amu Darya and Syr Darya, 2.59 km³ from groundwater resources, and 6.84 km³ from return (drainage) waters. [3] Within the river flow component, 33.90 km³ originates from the Amu Darya Basin and 19.69 km³ from the Syr Darya Basin. These figures clearly demonstrate that the majority of Uzbekistan's water resources originate from transboundary rivers and that the country's water security largely depends on water flows generated in neighboring states.

Furthermore, the total annual water use within the Aral Sea Basin amounts to 114.4 km³, of which 56.19 km³ is utilized by Uzbekistan, 21.73 km³ by Turkmenistan, 12.34 km³

by Tajikistan, 12.29 km³ by Kazakhstan, 7.44 km³ by Afghanistan, and 4.41 km³ by Kyrgyzstan. Uzbekistan (17.28 km³) and Kazakhstan (12.29 km³) are the principal water users within the Syr Darya Basin, whereas Uzbekistan (38.91 km³) and Turkmenistan (21.73 km³) account for the largest water consumption in the Amu Darya Basin. [4] These statistics indicate that any decision concerning the management of transboundary water resources inevitably affects the economic development, environmental sustainability, and food security of the entire region.

The complexity of water governance in Central Asia is primarily explained by the differing economic interests of upstream and downstream countries. While Kyrgyzstan and Tajikistan primarily utilize water resources for hydropower generation, Uzbekistan, Kazakhstan, and Turkmenistan depend on water mainly for irrigated agriculture and food production. During the Soviet period, upstream countries released water during the irrigation season, whereas downstream countries supplied them with fuel and energy resources during winter. Following the dissolution of the Soviet Union, this centralized water-energy exchange mechanism collapsed, and each state began managing water resources according to its own national interests.

The legal framework governing water allocation in Central Asia is mainly based on the 1992 Almaty Agreement and the Integrated Water Resources Management Schemes for the Syr Darya Basin (1983) and the Amu Darya Basin (1984) developed during the Soviet period. Although these legal arrangements contributed significantly to regional stability during the early years of independence, they no longer adequately address contemporary challenges associated with climate change, demographic growth, environmental flow protection, digital water monitoring systems, and newly emerging transboundary water infrastructure projects. Consequently, the modernization of the existing regional legal framework in accordance with contemporary principles of international water law has become increasingly necessary [5].

In recent years, the construction of the Qoshtepa Canal in Afghanistan has emerged as a new geopolitical factor influencing water allocation within the Amu Darya Basin. Once fully operational, the canal is expected to divert a significant portion of the Amu Darya's flow to irrigate agricultural lands in Afghanistan. Since Afghanistan is not a party to the principal regional water agreements of Central Asia, the project has generated new legal and institutional challenges regarding the governance of transboundary water resources and has highlighted the need for new regional legal mechanisms [6].

These issues have received considerable attention from international scholars. In her study *Water Infrastructure in Central Asia: Legal and Institutional Frameworks*, Dinara Ziganshina argues that effective water infrastructure management in Central Asia requires strengthening the legal authority of regional institutions and establishing binding mechanisms for implementing their decisions [7]. Issakov, in *Climate-Induced Transboundary Water Insecurity in Central Asia: Institutional Challenges, Adaptation Responses, and Future Research Directions*, emphasizes that climate-induced water insecurity is caused not only by declining water availability but also by weak governance institutions and the absence of adaptive legal mechanisms [8]. Likewise, Prniyazova, in *Sustainable Transboundary Water Governance in Central Asia: Challenges, Conflicts, and Regional Cooperation*, concludes that sustainable transboundary water management depends on strengthening legal integration among states, promoting water diplomacy, and harmonizing international water law with national legislation [9]. Furthermore, Orazaliev, in *Current Regulation of Water Relations in Central Asia*, argues that the existing legal framework governing water relations in the region is no longer adequate to address current environmental and geopolitical realities and therefore requires modernization in response to climate change [10].

METHODS

To comprehensively examine the current issues of the legal governance of water resources in Central Asia under climate change from the perspective of international water law, this study employed an integrated combination of general scientific and specialized legal research methods.

Using the normative legal analysis method, international, regional, and national legal instruments governing transboundary water resources were systematically examined. In particular, the study analyzed the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses, the Convention on the Protection and Use of Transboundary Watercourses and International Lakes, the 1992 Almaty Agreement, the legal documents regulating the activities of the International Fund for Saving the Aral Sea (IFAS) and the Interstate Commission for Water Coordination of Central Asia (ICWC), as well as the Constitution of the Republic of Uzbekistan, the Water Code of the Republic of Uzbekistan, and other effective legislative and regulatory acts governing the management, protection, and rational use of water resources in Uzbekistan. [11, 12, 13, 14] Based on these legal sources, the study evaluated the legal content and practical implementation of the

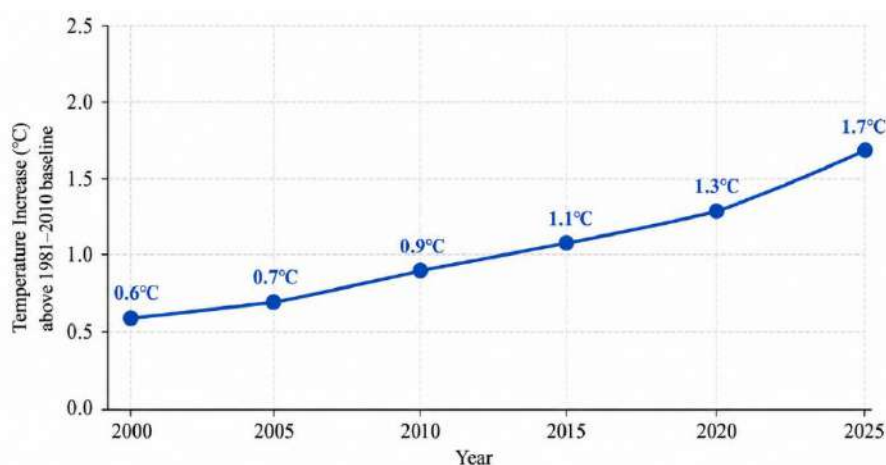
fundamental principles of international water law, including equitable and reasonable utilization of transboundary water resources, the obligation not to cause significant harm, the duty of cooperation among states, prior notification, and information exchange.

The theoretical analysis method was applied to examine the scholarly views of foreign researchers in the fields of international water law, environmental law, and transboundary water resources governance. In particular, the scientific works of Dinara Ziganshina, Issakov, Prniyazova, Orazaliev, and other scholars on water security, water diplomacy, climate change, regional cooperation, and the legal governance of water resources in Central Asia were analyzed.

RESULTS

The results of the study indicate that climate change has become one of the principal factors affecting the legal governance of transboundary water resources in Central Asia. The conducted normative-legal, comparative-legal, doctrinal, and systematic analyses demonstrate that the existing regional legal framework is no longer fully capable of responding to contemporary environmental, political, and socio-economic challenges. In particular, increasing air temperatures, accelerated glacier retreat, growing water demand, and the emergence of new geopolitical factors have significantly complicated the implementation of the fundamental principles of international water law, including equitable and reasonable utilization, the obligation not to cause significant harm, cooperation, and information exchange.

Figure 1. Increase in Average Air Temperature in Central Asia (2000–2025)



Source: Intergovernmental Panel on Climate Change (IPCC). (2021). *Climate Change 2021: The Physical Science Basis (AR6 Working Group I Report)*. [15]

As illustrated in Figure 1, the average annual temperature anomaly in Central Asia has shown a continuous upward trend over the past twenty-five years. Compared with the 1981–2010 climatic baseline, the regional temperature anomaly increased from approximately 0.6°C in 2000 to nearly 1.7°C in 2025. This trend confirms that climate change is intensifying across the region and is expected to substantially influence the hydrological regime of major transboundary river basins. Rising temperatures accelerate glacier melting, alter seasonal river runoff, increase evapotranspiration, and reduce long-term freshwater availability. Consequently, climate change has become not only an environmental issue but also an important legal and institutional challenge requiring adaptive transboundary water governance.

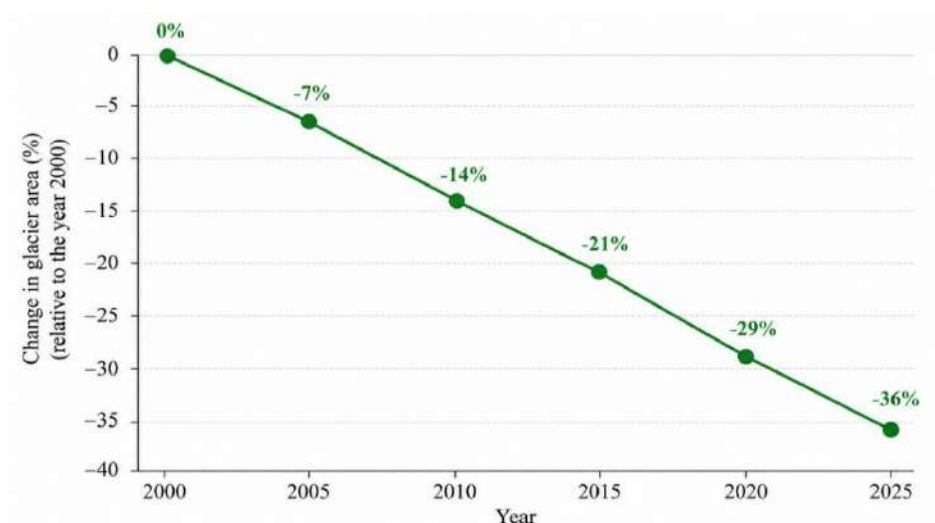


Figure 2. Reduction of Glacier Area in the Pamir and Tien Shan Mountains (2000–2025)

Source: UNESCO. (2022). *United Nations World Water Development Report 2022: Groundwater – Making the Invisible Visible*. [16]

The analysis presented in Figure 2 demonstrates a steady reduction in glacier area within the Pamir and Tien Shan mountain systems, which constitute the primary sources of the Amu Darya and Syr Darya rivers. During the study period, glacier coverage decreased from the 2000 baseline to approximately 36% below its initial extent by 2025. Although glacier melting may temporarily increase river discharge, continued glacier retreat is projected to reduce long-term water availability and intensify seasonal water shortages throughout Central Asia. These findings confirm that glacier degradation represents one of the most significant climate-related

risks affecting regional water security and necessitates the modernization of existing legal and institutional mechanisms governing shared water resources.

The results of the comparative legal and institutional analyses further indicate that many of the current governance challenges originate not only from climate change but also from the limited adaptability of the regional legal framework established during the early post-Soviet period. While the 1992 Almaty Agreement, the Interstate Commission for Water Coordination (ICWC), and the International Fund for Saving the Aral Sea (IFAS) have contributed significantly to maintaining regional cooperation, these mechanisms were developed under substantially different climatic, demographic, and political conditions. As a result, they provide only limited legal instruments for addressing contemporary challenges associated with climate adaptation, environmental flow protection, digital water monitoring, and newly emerging transboundary water infrastructure.

Table 1. Major Legal Challenges to Water Resources Governance in Central Asia under Climate Change

No.	Major Challenge	Current Situation	Legal Implications	Proposed Legal Solutions
1	Climate Change	Accelerated glacier retreat in the Pamir and Tien Shan mountain systems has resulted in a gradual decline in the flow of the Amu Darya and Syr Darya rivers, accompanied by increasing droughts and seasonal water shortages.	Regional water security is weakened, the risk of interstate disputes over water allocation increases, and the effectiveness of existing transboundary water agreements is diminished.	Introduce climate-adaptive regional water governance mechanisms, legally safeguard environmental flows, and develop new regional protocols on adaptive transboundary water management.
2	Outdated Legal Framework	Regional water allocation continues to rely primarily on the 1992 Almaty Agreement and the Soviet-era basin allocation schemes developed in 1983–1984.	Existing legal mechanisms are unable to adequately address contemporary challenges arising from climate change, population growth, new hydraulic infrastructure projects, and modern environmental requirements.	Revise regional water agreements in accordance with the contemporary principles of international water law and establish new convention-based legal mechanisms supported by effective implementation and compliance procedures.

3	The Qoshtepa Canal (Afghanistan)	The Qoshtepa Canal, currently under construction in Afghanistan, is designed to divert part of the Amu Darya's flow to newly irrigated agricultural areas. However, Afghanistan is not a party to the principal regional water agreements.	Legal uncertainty regarding water allocation within the Amu Darya basin increases, downstream water security is placed at risk, and the likelihood of transboundary disputes becomes greater.	Promote Afghanistan's participation in regional water diplomacy and international water governance institutions, and establish multilateral legal agreements and information-sharing mechanisms for the Amu Darya basin.
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The findings summarized in Table 1 identify three priority legal challenges currently affecting regional water governance. First, climate change significantly increases water scarcity, seasonal instability, and environmental risks while existing legal instruments remain largely reactive rather than adaptive. Second, the construction of the Qoshtepa Canal introduces a fundamentally new geopolitical dimension into the Amu Darya basin because Afghanistan is not a party to the principal regional water agreements, thereby creating legal uncertainty regarding future water allocation and interstate cooperation. Third, the regional legal framework continues to rely primarily on the 1992 Almaty Agreement and Soviet-era basin allocation schemes, which no longer adequately address modern environmental, technological, and institutional realities.

Overall, the results of this study demonstrate that ensuring sustainable transboundary water governance in Central Asia requires comprehensive legal modernization based on international water law principles and climate adaptation strategies. Priority directions include strengthening regional institutional cooperation, developing adaptive legal mechanisms capable of responding to climate-induced hydrological changes, improving data-sharing and digital monitoring systems, and expanding multilateral legal dialogue to incorporate emerging stakeholders, including Afghanistan. Such measures would significantly enhance the implementation of equitable and reasonable utilization principles while contributing to long-term regional water security and environmental sustainability.

DISCUSSION

The results of the present study demonstrate that, under conditions of climate change, the management of transboundary water resources in Central Asia has evolved beyond being

merely an environmental or technical issue and has become an essential component of international law, regional security, and interstate cooperation. The normative-legal, comparative-legal, and doctrinal analyses conducted during the research indicate that the existing legal mechanisms are insufficiently adapted to contemporary climatic challenges and emerging geopolitical realities. In particular, the absence of adaptive legal mechanisms significantly complicates the effective regulation of transboundary water relations and reduces the capacity of regional institutions to respond to rapidly changing hydrological conditions.

The normative legal analysis confirms that the 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses and the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki Convention) establish the fundamental principles of modern international water law, including equitable and reasonable utilization, the obligation not to cause significant harm, cooperation, prior notification, and regular exchange of information. The findings of this research demonstrate that although these principles remain fully applicable to Central Asia, their practical implementation at the regional level has not yet been adequately institutionalized. Consequently, the effectiveness of regional water governance largely depends on strengthening the legal mechanisms capable of ensuring the practical realization of these internationally recognized principles.

The analysis of the 1992 Almaty Agreement, together with the institutional activities of the Interstate Commission for Water Coordination (ICWC) and the International Fund for Saving the Aral Sea (IFAS), demonstrates that these institutions have played an important role in maintaining interstate dialogue and cooperation regarding shared water resources since the independence of the Central Asian states. Nevertheless, the research findings reveal that both the institutional framework and the regional legal mechanisms continue to rely primarily on the Soviet-era water allocation model. As a result, they do not sufficiently address contemporary challenges arising from climate change, glacier retreat, environmental flow protection, digital water monitoring, groundwater management, and newly emerging transboundary hydraulic infrastructure. These findings therefore support the necessity of modernizing the regional legal framework in accordance with contemporary principles of international water law.

The comparative legal analysis also indicates that the conclusions reached in this study are consistent with the views expressed in contemporary international legal scholarship. In

particular, Dinara Ziganshina, in *Water Infrastructure in Central Asia: Legal and Institutional Frameworks*, argues that effective governance of water infrastructure in Central Asia requires strengthening the legal authority of regional institutions and establishing more effective mechanisms of interstate cooperation. The results of the present study support this conclusion by demonstrating that expanding the legal competences of IFAS and ICWC, together with improving compliance mechanisms for their decisions, would significantly enhance regional water governance.

Similarly, the findings correspond with the conclusions presented by Issakov in *Climate-Induced Transboundary Water Insecurity in Central Asia: Institutional Challenges, Adaptation Responses, and Future Research Directions*. The author emphasizes that the principal threat to regional water security is not merely the physical reduction of water resources caused by climate change but also the limited adaptive capacity of existing governance institutions. The present research confirms this assessment by identifying the lack of adaptive legal mechanisms as one of the major institutional weaknesses affecting transboundary water management in Central Asia.

The results are likewise consistent with the research conducted by Prniyazova in *Sustainable Transboundary Water Governance in Central Asia: Challenges, Conflicts, and Regional Cooperation*. According to the author, sustainable governance of transboundary water resources can only be achieved through integrated regional cooperation, strengthened water diplomacy, and harmonization between international water law and national legislation. The findings of this study further demonstrate that long-term regional water security requires the development of multilateral basin-wide legal mechanisms rather than relying exclusively on bilateral agreements.

Comparable conclusions were reached by Orazaliev in *Current Regulation of Water Relations in Central Asia*, where it is argued that the current legal framework governing water relations in Central Asia no longer corresponds to present-day environmental and geopolitical realities. The findings of the present study reinforce this position by demonstrating that the 1992 Almaty Agreement and the existing regional water allocation mechanisms should be comprehensively revised in light of climate change, demographic growth, increasing water demand, and the emergence of new transboundary water infrastructure projects.

The normative legal analysis further demonstrates that the Constitution of the Republic of Uzbekistan and the Water Code of the Republic of Uzbekistan establish important legal

guarantees concerning the protection of water resources, rational water use, and environmental sustainability. However, the research findings indicate that national legislation should be further harmonized with contemporary principles of international water law, particularly regarding climate adaptation, ecological flow protection, transboundary environmental monitoring, integrated basin management, and systematic information exchange among riparian states.

Another important outcome of the study concerns the legal implications of the Qoshtepa Canal project in Afghanistan. The research identifies the canal as a new geopolitical factor capable of significantly influencing future water allocation within the Amu Darya basin. Since Afghanistan is not a participant in the principal regional agreements governing transboundary water resources, the study concludes that the project may increase legal uncertainty concerning future water distribution and intensify the risk of interstate disputes. Consequently, the findings support the necessity of involving Afghanistan in multilateral negotiations and regional water diplomacy based upon the universally recognized principles of international water law, thereby promoting inclusive and sustainable governance of the Amu Darya basin.

CONCLUSION

In conclusion, climate change has transformed transboundary water governance in Central Asia into one of the most pressing issues of international water law, regional security, and sustainable development. The findings of this study demonstrate that the existing regional legal framework, primarily based on the 1992 Almaty Agreement and Soviet-era water allocation mechanisms, no longer fully corresponds to contemporary challenges arising from climate change, glacier retreat, increasing water demand, and new transboundary infrastructure projects.

The conducted normative, comparative, and doctrinal analyses confirm that the fundamental principles of international water law—including equitable and reasonable utilization, the obligation not to cause significant harm, cooperation, and information exchange—should serve as the primary legal basis for strengthening regional water governance. Furthermore, the study highlights the necessity of modernizing regional legal institutions, introducing adaptive legal mechanisms for climate change, and enhancing multilateral cooperation, particularly in light of the legal implications of the Qoshtepa Canal project. Implementing these measures will contribute to improving regional water security,

promoting sustainable transboundary water management, and strengthening long-term cooperation among the Central Asian states.

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