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## Legal regulation of ensuring environmental security in Central Asian countries

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### Abstract

The aim of the study was to examine the legal mechanisms for ensuring environmental security in Central Asian countries. A phased analysis of the regulatory framework was conducted, starting at the constitutional level and extending to sectoral legislation and institutional support. The study addressed transboundary environmental threats in Central Asia, particularly the degradation of water resources in the Syr Darya and Amu

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Darya basins, as well as transboundary air pollution in the Fergana Valley. The low effectiveness of existing agreements was attributed to the absence of joint monitoring mechanisms, inconsistency of standards, and limited legal liability among the parties. The activities of the International Fund for Saving the Aral Sea were assessed as fragmented and insufficiently integrated into national policies. Structural barriers and conditions for effective environmental coordination among the countries of the region were identified. A comparative analysis of legislative frameworks revealed that only Kazakhstan has a fully codified and updated body of environmental law, while other states continue to rely on frameworks established in the 1990s, which have not been adapted to contemporary challenges such as climate change or the digitalisation of environmental governance. Institutional models also differ significantly: Kazakhstan and Uzbekistan are moving towards consolidation and digitalisation of environmental policy bodies, whereas Tajikistan and Turkmenistan maintain rigidly centralised and less effective structures. A major threat to regional security is posed by over 90 radiation-hazardous facilities in Kyrgyzstan, which could affect neighbouring ecosystems in the event of a man-made accident. The study found that cross-border cooperation remains largely declarative, with international conventions implemented only in fragmented form. The findings confirmed the need for a comprehensive overhaul of the legal framework for environmental security, enhanced interstate coordination, and the development of effective mechanisms to implement environmental rights and obligations at the regional level. The practical significance of the study lies in its potential application to improving national environmental legislation in Central Asian countries, drafting joint intergovernmental agreements on environmental protection, and providing recommendations to international organisations involved in environmental assistance and integration of environmental policy into regional development strategies

**Keywords:** institutional interaction; transnational challenges; institutional efficiency; cross-border cooperation; technogenic risks; constitutional guarantees of the environment

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## **Introduction**

The issue of environmental security remains one of the most pressing concerns in both global and regional contexts. Contemporary challenges – including climate change, the degradation of natural resources, increasing anthropogenic pressures, and global ecological instability – necessitate a re-evaluation of the effectiveness of existing approaches to environmental protection. In Central Asia, this issue is particularly acute due to a combination of interconnected natural, anthropogenic, socio-economic, and political factors. These include shared water resources, ecosystem vulnerability to climate change, the legacy of post-Soviet institutional frameworks, fragmented

legislation, the absence of sustainable environmental management practices, and a generally insufficient level of interstate coordination in the field of environmental protection. The impact of external environmental pressures – such as global warming, desertification, and disruption of the hydrological balance – only serves to intensify the region's systemic challenges.

The ecosystems of Central Asia are highly interdependent and form a unified transboundary natural complex. Consequently, land degradation, water scarcity, or industrial pollution in one country rapidly evolve into potential threats to neighbouring states, laying the groundwork

for interstate tensions or conflict (Orazaliev et al., 2024). This highlights the critical need for coordinated efforts at both the legal and institutional levels. Legal frameworks for environmental security in Central Asian countries remain fragmented, inconsistent, and often ineffective. As demonstrated by Z.B. Umbetbayeva et al. (2024), existing air protection legislation in the region is largely declarative: while it formally aligns with basic international standards, it lacks effective mechanisms for enforcement, monitoring, and sanctions. The absence of internal regulatory coherence, harmonised technical standards, and interoperable environmental monitoring systems across the region significantly hampers comparative data assessment and renders the development of joint solutions to transboundary environmental problems virtually impossible.

These problems are particularly pronounced in Kyrgyzstan, where, according to B. Zhusupov et al. (2024), the legislative framework is outdated, and state institutions – particularly the Ministry of Natural Resources, Ecology and Technical Supervision – lack the financial, technical, and human resource capacity necessary for the effective implementation of environmental policy. Similar systemic difficulties are also observed in Tajikistan and Uzbekistan. In these countries, the centralised model of public administration restricts not only institutional flexibility but also public participation, horizontal coordination between departments, and the implementation of transparent environmental control mechanisms.

The work of J. Gupta et al. (2024) highlights that, unlike in EU member states, environmental governance in Central Asia does not integrate contemporary principles of sustainable development and lacks a systematic application of Environmental, Social and Governance (ESG) approaches. In most cases, strategic documents are largely formalistic, and public access to environmental information remains limited. The absence

of independent monitoring, public consultations, and mechanisms for appealing environmental decisions contributes to an administratively closed system (Mukhamediyarova et al., 2025).

According to the findings of R. Urinboyev (2020), the legal systems in the region are characterised by hybridity: formal regulatory acts coexist with informal customary practices, which diminishes the effectiveness of environmental legislation. The interaction between traditional and statutory law often results in regulatory conflicts, complicates law enforcement, and undermines public trust in institutions. A particularly important area within the region's legal architecture is transboundary water resource management (Narzullaeva et al., 2025). An analysis by J. Sehring et al. (2024) shows that existing bilateral and multilateral agreements are largely framework-based and lack clearly defined mechanisms for conflict resolution, arbitration procedures, or sanctions in the event of non-compliance. The absence of legally binding obligations renders water cooperation vulnerable to political fluctuations and unilateral actions.

A.B. Gulimov (2023) highlights another critical issue – the lack of institutional sustainability in the implementation of environmental programmes. In most cases, environmental initiatives are funded by external donors such as the UNDP, World Bank, and IAEA. However, once this funding ceases, the programmes often lose relevance due to the absence of mechanisms for their long-term operation. This underscores the need to establish a permanent regional coordination body capable of ensuring continuity, monitoring, and legal support for environmental policy. The issue of legal liability for environmental damage also remains insufficiently addressed. As S.T. Tuli-bayev (2024) notes, there is no unified definition of environmental crime within the criminal legislation of Central Asian countries. Consequently, ecocide – as a distinct and severe form of

environmental harm – rarely results in legal prosecution. In complex environmental cases, the inability to establish a clear causal link between the actions of a subject and the resulting damage significantly complicates the attribution of guilt.

In the area of recreational use of natural resources, A. Sopykhanova (2017) demonstrates that current regulatory and legal acts fail to consider the interests of local communities and fall short of modern standards for the protection of natural heritage. This results in the overuse of protected areas, ecosystem degradation, and heightened social tension due to restricted access to natural resources. S. Brunelli *et al.* (2022) underscore the acute shortage of legal mechanisms for independent environmental monitoring, particularly in rural areas. The absence of a mandatory legal response to the outcomes of environmental audits renders these procedures largely bureaucratic and devoid of practical significance. I. Gulomov and R. Rasulova (2024) conclude that national environmental policy in Central Asian countries is largely declarative in nature. While strategic documents are formally adopted, they often lack adequate financing, implementation mechanisms, and effective institutional oversight. This highlights the urgent need to establish a coherent, harmonised, and accountable legal system in the field of environmental security – one that not only fulfils formal international obligations but also addresses the practical needs of the region.

A review of recent literature reveals significant gaps in legal doctrine, regulatory frameworks, and institutional practice related to environmental security in the region. The effectiveness of legal regulation across constitutional, sectoral, and international levels remains unresolved, particularly in terms of the capacity of Central Asian states to fulfil environmental obligations and develop coordinated mechanisms for addressing shared environmental challenges. In this context, a systematic study that integrates

legal comparative analysis, institutional evaluation, and consideration of transboundary threats is of particular importance.

The purpose of this study was to assess the capacity of the legal systems of Central Asian countries to effectively respond to contemporary environmental challenges and to identify barriers to the development of a coordinated regional legal model of environmental security. To achieve this aim, the study formulated the following objectives: to analyse the regulatory and legal frameworks governing environmental security in Central Asian countries, with particular attention to key differences and regulatory gaps; to evaluate the effectiveness of national environmental institutions and the extent of their integration with international legal mechanisms; and to identify both the potential and the constraints in developing a harmonised regional legal model capable of facilitating joint responses to environmental challenges and fulfilling international obligations.

### **Materials and Methods**

The study was focused on examining the legal mechanisms for ensuring environmental security in the Central Asian states. The object of the study comprised five countries in the region: the Kyrgyz Republic, the Republic of Kazakhstan, the Republic of Tajikistan, the Republic of Uzbekistan, and Turkmenistan. The selection of these states is justified by their geographical proximity, shared ecosystems and transboundary natural resources, as well as their common historical and legal heritage, shaped within the Soviet legal space. All five countries are united by a high degree of water dependency, with the major river basins – the Syr Darya and the Amu Darya – supplying water to millions of residents and playing a pivotal role in agriculture, energy, and industry. Simultaneously, these states face similar environmental challenges, including soil degradation, glacier retreat, radiation pollution, deteriorating infrastructure,

and insufficient funding for environmental programmes. The study involved the collection and analysis of key regulatory legal acts defining the principles of environmental protection and environmental security in the countries of Central Asia. Specifically, in Kazakhstan, the Environmental Code of the Republic of Kazakhstan (2021) was reviewed as the foundational document in national environmental legislation.

The study was carried out in four main stages. At the first stage, the collection and systematisation of regulatory legal acts and strategic documents were conducted using the legal-dogmatic method, allowing for an in-depth analysis of the structure of legal texts and the content of legal concepts. At the second stage, comparative legal analysis was applied to identify characteristic models of legal regulation of environmental security in each of the five countries and to determine both commonalities and distinctions in regulatory frameworks and law enforcement practices. At the third stage, a system-structural approach was employed to explore the interrelations between sectoral legal acts, the distribution of competencies among state authorities, and the effectiveness of control mechanisms and public participation. At the fourth stage, a study was conducted on the frequency, context, and meaning of key terms related to environmental security, such as 'environmental security', 'environmental risks', 'sustainable development', 'prevention of environmental damage', 'environmental rights of citizens', and 'transboundary cooperation' in strategic and regulatory documents, including the Article 31 of the Constitution of the Republic of Kazakhstan (1995), Constitution of the Kyrgyz Republic (2021), Article 50 of the Constitution of the Republic of Uzbekistan (2023), Constitution of the Republic of Tajikistan (1994), and Constitution of Turkmenistan (2016). The purpose was to assess how environmental security is reflected at the constitutional level, determine the extent to

which environmental rights and responsibilities are recognised in national legal systems, and evaluate the consistency and coherence of these provisions in supporting sustainable and cooperative environmental governance in the region.

## Results

At the initial stage of analysis, a comparative examination was conducted of the constitutional recognition of environmental human rights, as well as the principles and mechanisms for ensuring environmental security in the five Central Asian states – Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, and Turkmenistan. A common feature across all these countries is the constitutional recognition of the human right to a favourable environment as a fundamental legal principle. However, the degree of detail, level of legal certainty, and the scope of state obligations associated with this right vary significantly between countries.

In the Constitution of the Republic of Kazakhstan (1995), Article 31 states that "the state shall aim to protect the environment favourable to human life and health". This provision not only proclaims the right to a clean environment but also places a direct obligation on the state to undertake active measures in the field of environmental protection. Notably, environmental safety is integrated into the broader framework of state policy and is explicitly enshrined in the country's highest legal instrument. As a result, legal regulation in Kazakhstan enjoys strong institutional support grounded in constitutional authority.

The Constitution of the Kyrgyz Republic (2021) also offers comprehensive regulation of environmental issues. Article 49 guarantees the right of every individual to an environment favourable to life and health. Furthermore, it affirms the right to compensation for damage to health or property resulting from violations of environmental legislation. The Article also imposes a duty on all citizens to treat nature with care and to protect

flora and fauna. This dual focus – on individual rights and civic responsibilities – demonstrates that the Kyrgyz Constitution goes beyond merely declaring environmental rights; it also establishes a normative foundation for environmental responsibility across society. This contributes to the formation of a more sustainable and participatory legal framework for environmental protection.

In Uzbekistan, constitutional regulation of environmental issues takes a somewhat different form. Article 50 of the Constitution of the Republic of Uzbekistan (2023) establishes the principle of careful treatment of nature as a civic duty. Although the right to environmental safety is not explicitly stated, it can be inferred from the broader provisions of the Basic Law that the state bears responsibility for environmental protection as a core element in ensuring adequate living conditions for the population. However, in practice, this model remains largely declarative. Constitutional provisions are rarely translated into concrete legal mechanisms for the realisation of environmental rights or into a system of enforceable regulatory guarantees.

In the Constitution of the Republic of Tajikistan (1994), constitutional provisions related to environmental protection are articulated in Article 38, which sets out the general duty of every citizen to preserve nature. However, the right to environmental safety is neither defined as a distinct nor as an explicit constitutional right. While the constitutional approach implies a commitment to basic principles of environmental responsibility, it lacks the specificity and legal precision required for effective implementation. The Constitution provides broad guidance for the development of environmental legislation but does not contain sufficient detail to support practical law enforcement.

The Constitution of Turkmenistan (2016), in Article 53, identifies the protection of nature as one of the state's priority goals. It also outlines

the responsibility of every citizen to participate in environmental protection. Nonetheless, as in the case of Tajikistan, these provisions function largely as political declarations and are not supported by corresponding institutional or legal mechanisms for implementation. As a result, the actual level of protection of citizens' environmental rights remains limited, despite the formal presence of relevant constitutional language.

In general, it can be concluded that the Central Asian states acknowledge the importance of environmental security and environmental protection at the level of their constitutions. However, only Kazakhstan and Kyrgyzstan demonstrate a more systematic approach – one that includes not only the proclamation of environmental rights but also the articulation of state and citizen responsibilities, alongside the presence of certain legal mechanisms for implementation. In contrast, the relevant provisions in Uzbekistan, Tajikistan, and Turkmenistan are predominantly formal and declarative, with environmental policy implementation often falling outside the scope of effective legal practice. It should also be emphasised that in none of the five countries is environmental security recognised as a distinct structural component of national security. This omission significantly undermines the efficacy of the regional legal framework for preventing environmental threats and establishing a sustainable, coordinated environmental policy at the interstate level.

The second stage of the analysis focused on an in-depth examination of national environmental legislation governing environmental protection in Central Asian countries. The primary aim of this stage was to identify similarities and differences in regulatory approaches and to evaluate the effectiveness of current legislation in terms of its modernity, internal consistency, level of codification, and alignment with international standards. The analysis revealed considerable divergence among the countries in both the structure

and substantive content of their environmental legislation, reflecting historical legacies and varying levels of political commitment to legal reform.

The most comprehensive, coherent, and up-to-date system of environmental law was found in the Republic of Kazakhstan (2021). The key regulatory instrument is the Environmental Code of the Republic of Kazakhstan (2021). This document represents the outcome of a large-scale overhaul of the legal framework, incorporating European approaches to environmental regulation. The Code systematises essential environmental institutions and integrates key principles of sustainable development, including the precautionary principle, the “polluter pays” principle, and the principle of public access to environmental information. The Code also regulates mechanisms such as environmental expertise, strategic environmental assessment, environmental audit, and environmental monitoring. Furthermore, it provides for the integration of digital technologies into the system of environmental impact assessment. These innovations contribute to making the environmental governance framework in Kazakhstan more transparent, accountable, and effective.

In the Kyrgyz Republic, the principal legal instrument governing environmental protection is the Law of the Kyrgyz Republic No. 53 “On Environmental Protection” (1999), which, despite its age, remains in force. The law recognises environmental protection as an essential component of national security and clearly outlines the rights and obligations of citizens, enterprises, organisations, and state bodies in this domain. It provides for the implementation of environmental expertise, environmental impact assessment, and a system of environmental licensing. In addition to this foundational law, Kyrgyzstan has adopted a number of specialised legal acts, including the Law of the Kyrgyz Republic No. 48 “On Biosphere Territories” (1999), the Law of the Kyrgyz Republic No. 49 “On Subsoil” (2021), the Law of the

Kyrgyz Republic No. 93 “On Industrial Safety of Hazardous Production Facilities” (2001), and the Law of the Kyrgyz Republic No. 89 “On Production and Consumption Waste” (2001). However, the legislative system remains fragmented, posing challenges for integrated natural resource management. Efforts are underway to gradually update environmental legislation and align it with international standards. Environmental Code of the Republic of Kazakhstan (2021) reflecting European approaches, particularly through the adoption of best available technologies and the digitalisation of permitting procedures. Uzbekistan has undertaken substantial reforms between 2020 and 2024, introducing new laws on environmental impact assessment, waste management, and air protection, and updating key regulatory acts. These include the foundational Law of the Republic of Uzbekistan No. 754XII (1992), the Law of the Republic of Uzbekistan No. 837-XII (1993), Law No. 353-I “On Protection of Atmospheric Air” (1996), and the new Law No. ZRU 1036 “On Environmental Expertise, Environmental Impact Assessment and Strategic Environmental Assessment” (2025). The legal framework is being restructured to improve coherence and ensure compliance with modern environmental governance standards. In Kyrgyzstan, the development of a new Environmental Code is currently underway. This code aims to systematise existing legislation and bring it in line with international commitments. A similar process is taking place in Tajikistan, where a new version of the Environmental Code is in preparation to modernise the country’s approach to environmental protection. Turkmenistan has also revised several key legal acts, including updated versions of laws on air quality, waste, and land use. Furthermore, in 2023, a dedicated ministry for environmental affairs was established, reflecting a more structured approach to environmental governance. These legislative

developments indicate a growing commitment across the region to integrate environmental policy into the broader context of sustainable development and international cooperation.

In Uzbekistan, while the environmental regulatory framework is still based on the Law of the Republic of Uzbekistan No. 754 XII (1992), the law has undergone multiple amendments over the years. Nevertheless, its structural and conceptual framework remains outdated. Although it defines the basic principles of environmental protection, outlines liability mechanisms for environmental violations, and assigns responsibilities to public authorities, its fragmented structure, overlapping provisions, and lack of a unified terminological base hinder effective implementation. To address these issues, a new Law of the Republic of Uzbekistan No. LPU-1036 (2025) with the aim of consolidating existing norms into a coherent, modern, and unified system of environmental regulation.

In Tajikistan, environmental legislation consists of a large number of separate laws, the most notable of which include the Law of Tajikistan No. 905 (1996), the Law of Tajikistan No. 915 "On Protection of the Atmospheric Air" (2012). While the legal framework is relatively extensive, its practical application remains limited. The key obstacles to the effective implementation of environmental law include weak institutional capacity, an insufficient level of independent environmental oversight, and the absence of effective enforcement mechanisms. Moreover, a significant proportion of legal provisions fail to address current challenges such as climate change, soil degradation, and water scarcity.

In Turkmenistan, environmental legislation follows a centralised model and is primarily based on the Law of Turkmenistan No. 40-V "On Nature Protection" (2014). The country has also adopted several specialised laws, including the Law of Turkmenistan No. 182-I "On Atmospheric Air Protection" (2016), the

Law of Turkmenistan "On Waste" (2015), and the Land Code of Turkmenistan (2004). However, the existing legal framework remains largely declarative, establishing general principles without providing sufficient procedural detail or effective instruments for implementation and enforcement. Additionally, the legislative process lacks transparency, and public participation in environmental decision-making and monitoring is severely restricted.

Thus, at the present stage, only the Republic of Kazakhstan has developed a codified, coherent, and modernised environmental legal system aligned with European standards and offering a high level of regulatory clarity and certainty. In the other Central Asian states, the regulatory and legal frameworks for environmental protection remain either fragmented or outdated, necessitating comprehensive reform, codification, and alignment with international commitments. This disparity hinders not only the effectiveness of domestic environmental policy but also poses significant challenges to interstate coordination. The lack of harmonised legal frameworks creates barriers to the joint management of shared natural resources, effective responses to transboundary environmental threats, and the implementation of regional sustainable development initiatives.

The next stage of the analysis focused in particular on the institutional mechanisms of environmental security in the countries of Central Asia, namely Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, and Turkmenistan. The study revealed that, although all states formally declare their commitment to environmental protection, there is significant variation in the actual institutional capacity, the functionality of environmental governance bodies, and the level of public participation.

In the Republic of Kazakhstan, responsibilities for environmental governance are vested in the Ministry of Ecology and Natural Resources (Environmental Code of the Republic of

Kazakhstan, 2021), which is the most structurally developed and well-resourced institution among the countries analysed. The Ministry plays an active role in the digitalisation of environmental processes, particularly through the operation of an electronic environmental platform that publishes data on environmental monitoring, environmental impact assessments (EIA), and environmental audits. It also ensures interdepartmental coordination, implements a distinct climate policy, and facilitates the international integration of environmental standards, positioning it as a leading institutional model in the region.

In the Kyrgyz Republic, environmental regulatory functions are carried out by the Ministry of Natural Resources, Ecology and Technical Supervision (2025), which was established through the consolidation of several previously independent bodies. Despite this attempt at centralisation, the division of powers between central and local authorities remains inconsistent, leading to inefficiencies in the implementation of environmental policy at the local level. A persistent problem is the underfunding of the sector and the shortage of highly qualified specialists in environmental control bodies, which severely limits their operational capacity.

In Uzbekistan, the Ministry of Ecology, Environmental Protection and Climate Change was established in 2023 (Constitution of the Republic of Uzbekistan, 2023), succeeding several previous institutions and now playing a central role in the development and implementation of environmental policy. The Ministry's structural divisions encompass biodiversity management, climate change, waste management, protection of water resources, and environmental monitoring. A positive development has been the establishment of a specialised environmental inspection body; however, procedural transparency remains limited, public participation is weak, and there is informal executive influence over oversight processes.

In Tajikistan, environmental protection is managed by the Committee for Nature Protection under the Government of the Republic of Tajikistan (Law of Tajikistan No. 905, 1996), which has limited institutional capacity. The Committee's activities are primarily focused on the fulfilment of formal obligations, while the practical implementation of environmental policy encounters multiple challenges, including inadequate technical equipment, low remuneration for staff, and a lack of incentives for initiative. The institutional structure remains rigid and poorly equipped to respond promptly to emerging environmental challenges, particularly those related to climate change and the degradation of natural resources.

In Turkmenistan, environmental policy is implemented by the Ministry of Environmental Protection (Decree on the establishment..., 2023), which functions within a narrowly centralised and opaque institutional framework. Although it is formally responsible for a broad range of powers – including issuing environmental permits and monitoring nature use – in practice, the Ministry's operations are marked by formalism, low transparency, restricted access to environmental information, and an almost complete absence of mechanisms for public oversight. This creates a situation in which environmental policy is carried out without adequate feedback or external scrutiny.

The next stage involved a comprehensive analysis of the institutional mechanisms of environmental security operating in the five Central Asian countries: Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, and Turkmenistan. The analysis included an assessment of institutional structure, functional competencies, degree of centralisation, resource allocation, and levels of public engagement. It was found that the institutional architecture of these countries exhibits substantial variation, reflecting differences in political commitment, available resources, and foreign policy

orientations. To systematise the results of this comparative analysis, a summary table (Table 1) is presented, highlighting the key similarities and differences in the institutional mechanisms of

environmental security across the region. The data are drawn from official government documents, reports by international organisations, and the findings of secondary analysis.

**Table 1.** Comparative characteristics of environmental security institutions in Central Asian countries

Country	Central authority	Level of centralisation	Availability of digital tools	Public participation	Key issues
Kazakhstan	Ministry of Ecology	High	Available (electronic ATS platform)	Average	Institutional complexity
Kyrgyzstan	Ministry of Natural Resources and Ecology	Average	Limited	Low	Lack of personnel, fragmentation of powers
Uzbekistan	Ministry of Ecology, Environmental Protection and Climate Change	Increasing	Partial	Limited	Independence of control, formality
Tajikistan	Nature Protection Committee	Low	Missing	Very low	Weak capacity, lack of resources
Turkmenistan	Ministry of Environmental Protection	High (hard)	Missing	Missing	Closedness, declarativeness

**Source:** Constitution of the Republic of Tajikistan (1994), Constitution of the Republic of Kazakhstan (1995), Constitution of the Kyrgyz Republic (2021), Constitution of the Republic of Uzbekistan (2023), Decree on the Establishment of Ministry of Environmental Protection of Turkmenistan (2023)

Public involvement in environmental governance processes in Central Asian countries remains uneven. Although all five countries are signatories to the Aarhus Convention (1998), the actual implementation of its provisions concerning access to environmental information, public participation in decision-making, and access to justice varies considerably.

In Kazakhstan, public participation is regulated under "Articles 13-15" of the Environmental Code of the Republic of Kazakhstan (2021), which enshrine the right of citizens to submit comments on draft environmental regulations and to take part in state environmental assessments. However, according to environmental organisations, such participation is largely consultative in nature, with no legal obligation for the authorities to incorporate public input into final decisions. A similar situation is observed in Uzbekistan, where the Law "On Environmental Control" (2014)

formally provides for the participation of non-governmental organisations in environmental monitoring, but lacks clear procedural mechanisms for exercising this right.

In Kyrgyzstan and Tajikistan, public participation mechanisms are included only as general provisions within environmental legislation (for example, in the Law of the Kyrgyz Republic "On Protection of Atmospheric Air" and "On Environmental Expertise" (1999), the Law No. 48 "On Biosphere Territories" (1999), and the Law of the Republic of Tajikistan "On Environmental Protection" (2011)). However, effective tools for the implementation of these provisions are absent. Specifically, there are no electronic platforms facilitating access to environmental information, nor are there mechanisms holding authorities legally accountable for disregarding citizens' requests.

In Turkmenistan, the level of public participation is assessed as very low. Although the right

to participate is formally guaranteed under “Article 50” of the Law “On Environmental Protection” (2014), in practice, access to environmental information is highly restricted, and civil society organisations face substantial administrative barriers in engaging in environmental advocacy.

The main barriers to the implementation of public participation in all Central Asian countries remain legal, procedural, and technical in nature. From a legal perspective, current regulations are often declarative or insufficiently defined, with mechanisms for the mandatory consideration of public opinion in environmentally significant decision-making either absent or lacking enforceability. Procedurally, challenges persist in accessing environmental impact assessment processes, public hearings, and the submission of comments – these mechanisms are frequently opaque, complex, and fail to provide meaningful feedback.

The technical dimension also acts as a limiting factor: in most countries of the region, access to environmental information is restricted, electronic registers are either non-existent or only partially operational, and the level of digitalisation of state environmental services remains low. The convergence of these factors results in a situation where, although citizen participation in environmental policy is formally guaranteed, it is implemented in practice to a very limited extent and does not meet the requirements of the Aarhus Convention.

Thus, despite formal accession to the Aarhus Convention, public participation in the domain of environmental security in the Central Asian countries remains constrained – both in terms of regulatory support and the actual implementation of international environmental law provisions. To ensure compliance with Aarhus standards, it is essential to improve procedures for access to information, guarantee legal certainty, and enhance the institutional capacity of authorities to engage with the public.

The highest level of institutional capacity is demonstrated by Kazakhstan, where digital monitoring tools are being actively deployed and a functioning system of state environmental control is in place. A similar trend, albeit with certain limitations, is observable in Uzbekistan, where environmental reform and administrative centralisation are underway. In the remaining countries, institutional models remain fragmented and under-resourced, which adversely affects the effective implementation of environmental policy.

The analysis of the transboundary dimension of environmental security in Central Asia is crucial in the context of regional stability, as most environmental threats transcend political boundaries and are supranational in nature. The geographical configuration of the region – particularly the reliance of lowland states on water resources originating in mountainous areas – necessitates continuous coordination in the management of natural resources. Transboundary environmental security in Central Asia encompasses several interconnected domains: water use, radiation and chemical safety, air pollution, waste management, and climate change.

Among these, one of the most pressing challenges is the management of shared water resources, particularly those of the Syr Darya and Amu Darya rivers. The primary water catchment areas are located in Kyrgyzstan and Tajikistan, while Uzbekistan, Kazakhstan, and Turkmenistan are the major consumers, primarily for irrigation and industrial purposes. This asymmetry generates significant tensions, especially during periods of drought. Water use is currently governed by agreements concluded in the 1990s, notably the Agreement Between Central Asian Republics on Cooperation in the Field of Joint Water Resources Management and Conservation of Interstate Sources (1992). However, these documents are not legally binding and lack concrete mechanisms for enforcement,

implementation monitoring, or dispute resolution, thereby limiting their effectiveness under present-day conditions.

A separate and serious threat is posed by the legacy of the Soviet era, namely numerous storage facilities for radioactive and chemical waste. Kyrgyzstan alone hosts more than 90 such facilities, some of which are situated close to the sources of transboundary rivers (International Atomic Energy Agency, 2012). Given the region's seismic activity, climate variability, and deteriorating infrastructure, there is a high risk of toxic leaks, which could trigger large-scale environmental disasters with cross-border repercussions. Similar facilities are also present in Tajikistan and Uzbekistan. Although measures to neutralise or contain these hazards are largely financed by international donors – including the UNDP, IAEA, and World Bank (2021) – a sustainable, regionally coordinated response mechanism has yet to be established.

Although Kazakhstan, Kyrgyzstan, and Tajikistan have acceded to key international environmental treaties – including the Aarhus Convention (1998), the Espoo Convention on the Transboundary Impact of Industrial Accidents (1991), and the Convention on the Protection of Transboundary Watercourses (1992) – their practical implementation remains partial and is characterised by systemic shortcomings.

In particular, the provisions concerning access to environmental information are inadequately implemented due to the underdevelopment of electronic platforms. While Kazakhstan has developed an environmental portal, data updates are infrequent and information requests often go unanswered. Kyrgyzstan does not regularly publish national reports under the Aarhus Convention (for instance, for the years 2021–2024), which reflects a lack of transparency and incomplete adherence to access requirements. With regard to public participation guarantees,

although legislation formally permits public hearings and the submission of comments, these procedures are often applied selectively or their outcomes disregarded. In Kazakhstan, roundtables and discussions involving environmental non-governmental organisations (NGOs) are advisory in nature and rarely influence final decision-making. The implementation of the right to access justice in environmental matters remains weak across the region, primarily due to the absence of specialised judicial procedures and insufficient funding.

At the national level, meaningful adaptation of international norms is observed only in Kazakhstan, where the 2021 Environmental Code formally incorporates the principles of the Aarhus Convention, including electronic access to information, environmental audits, and public hearings via an ecological portal. In contrast, Kyrgyzstan and Tajikistan have limited adaptation to declarative provisions within their basic environmental laws, without establishing specific procedures or digital platforms. Therefore, although the legal norms exist, their implementation remains incomplete, inconsistent, and largely ineffective, falling short of the Aarhus Convention's standards (Zaharchenko, 2007).

Among institutional initiatives, the activities of the Regional Environmental Centre for Central Asia (CAREC) (2025) are noteworthy. CAREC facilitates coordination and information exchange among countries and implements joint programmes on water resource monitoring, climate change, and the promotion of green technologies. However, CAREC lacks formal legal authority, its activities are confined to grant-based projects, and it does not benefit from stable financial contributions from participating states. A summary of key international agreements, organisations, and programmes regulating transboundary environmental cooperation in Central Asia is presented in Table 2.

**Table 2.** Principal transboundary environmental threats in Central Asia

Threat category	Countries involved	Nature of the problem	Legal framework / Initiatives	Implementation problems
Water use (Syr Darya, Amu Darya)	Kyrgyzstan, Tajikistan, Uzbekistan, Kazakhstan, Turkmenistan	Uneven distribution of water, conflicts in water intake, seasonal conflicts	Agreement on cooperation in the field of joint use of water resources (Almaty, 1992)	Lack of binding agreement, weak implementation
Melting glaciers and climate risks	Kyrgyzstan, Tajikistan → all countries in the region	Reduced river flow, a threat to water security in low-lying states	Aarhus Convention, UNECE Water Convention	Lack of joint climate monitoring
Air pollution and dust storms	Kazakhstan, Uzbekistan, Turkmenistan	Dust spread from the Aral Sea zone, transboundary air pollution	Aarhus Convention, CAREC	Insufficient monitoring coverage
Hazardous waste and industrial pollution	All countries	Cross-border flow of industrial waste, soil and water pollution	Espoo Convention, national strategies	Lack of environmental responsibility mechanisms
Regional cooperation	All countries	Formal cooperation through CAREC, donor projects	CAREC, UNECE, UNDP, CA SDDP	No binding authority in CAREC

**Note:** UNECE – United Nations Economic Commission for Europe; UN – United Nations UNDP – United Nations Development Programme; CAREC – Regional Environmental Centre for Central Asia; JECCA – Joint Environmental Initiative for Central Asia; UNECE- United Nations Economic Commission for Europe

**Source:** United Nations Economic Commission for Europe (UNECE)(1991), United Nations Economic Commission for Europe (UNECE) (1992), United Nations Economic Commission for Europe (UNECE) (1998), H. Monken-Fernandes and P. O’Sullivan (2015), Regional Environmental Centre for Central Asia (CAREC) (2023), D. Ziganshina (2023), W. Ali and U. Kang (2024), Regional Environmental Centre for Central Asia (2025)

An additional challenge is the absence of a unified approach to environmental information – access to environmental data is often restricted or irregular, rendering comprehensive cross-border analysis unfeasible. Although the Aarhus Convention guarantees citizens the right to access environmental information, its implementation is frequently inadequate due to internal limitations within public administration systems.

Accordingly, transboundary environmental security in Central Asia remains structurally unstable. The region is confronted with multiple environmental threats, fragmented and often declarative regulatory frameworks, uncoordinated policies, and weak institutional mechanisms – all of which pose systemic risks to both the population and natural ecosystems. In the long term, several key objectives must be pursued: the development of binding intergovernmental

agreements with clearly defined procedures and enforcement mechanisms; the establishment of a joint regional centre for environmental monitoring; the harmonisation of national environmental standards in line with international norms; the institutional strengthening of the Regional Environmental Centre for Central Asia (CAREC), including the assignment of executive powers; and the expansion of public and scientific participation in decision-making processes. These steps are essential to reducing the conflict potential of transboundary environmental issues and ensuring the balanced development of Central Asian states in the context of escalating ecological challenges.

The findings of the study have revealed a number of systemic issues and contradictions that hinder the effective legal regulation of environmental security in Central Asia. These challenges relate to both internal legal and

institutional frameworks, as well as to mechanisms of interstate cooperation.

Much of the environmental legislation in the region remains largely declarative. Although environmental rights are formally enshrined in constitutions and statutory law, the mechanisms for their practical enforcement are either weak or entirely absent. In many cases, there are no effective procedures enabling citizens to seek judicial redress for violations of environmental rights, claim compensation for environmental damage, or require mandatory environmental impact assessments for all categories of economic activity.

The majority of regulatory legal acts are either outdated or fragmented. For instance, in Uzbekistan and Tajikistan, the core environmental laws were enacted in the 1990s and have not been adequately updated to address contemporary challenges such as climate change, digitalisation of governance, biosafety, or the adoption of green technologies. The absence of consistent terminology, harmonised standards, and objective criteria for assessing environmental harm significantly hampers the effective application of these laws in judicial and administrative practice.

Another major issue is the limited implementation of international environmental obligations. While Kazakhstan and Kyrgyzstan have ratified key environmental conventions – including the Aarhus, Espoo, and Basel Conventions – their practical application remains constrained by insufficient financial resources, limited technical infrastructure, and a lack of specialised personnel. Turkmenistan and Tajikistan exhibit even lower levels of engagement with international environmental law, further weakening the region's capacity for coordinated and effective environmental governance.

Institutional weakness is evident in the absence of a clear delineation of powers among authorities, duplication of functions, insufficient inter-ministerial coordination, and a shortage of

personnel with appropriate qualifications. In several countries, environmental control bodies are subordinated to the executive branch without elements of independent oversight, thereby limiting their effectiveness.

There is an almost complete absence of regional coordination mechanisms. No binding legal framework exists for the management of transboundary water resources, radiation monitoring, or coordination during environmental emergencies. Existing agreements remain framework-based and lack enforcement provisions such as sanctioning or arbitration mechanisms. This situation fosters mutual distrust among countries – an especially critical issue given the competition for shared water resources.

Finally, the level of public participation in the development and implementation of environmental policy remains low. In most countries, transparent mechanisms for access to environmental information, public consultation procedures, and independent environmental expertise are lacking. This contravenes both the principles of the Aarhus Convention and the pan-European standards of environmental democracy, as outlined by the United Nations Economic Commission for Europe (UNECE) (2023). Overall, the countries of Central Asia are at varying stages in the development of their environmental legal systems. However, all exhibit structural dysfunctions that necessitate not only comprehensive domestic reform but also deeper regional integration underpinned by international legal frameworks.

## **Discussion**

The study revealed significant differences in national approaches to the legal regulation of environmental security across Central Asian countries. There is marked divergence in the content of constitutional provisions defining the core principles of environmental policy – ranging from largely declarative formulations in the constitutions of

Tajikistan and Turkmenistan to more structured norms incorporating elements of implementation mechanisms, as observed in the Constitution of Kazakhstan. This trend reflects the uneven evolution of national legal systems in the field of environmental protection, a conclusion supported by the findings of B. Libert (2017) and S. Sayapin (2022), who also highlight varying degrees of institutionalisation of environmental policy across the region.

The results of this study align with the conclusions of N. Zambrana-Tévar (2022), who provides a detailed analysis of environmental legislation reform in Kazakhstan. Her research underscores that Kazakhstan remains the only country in the region with a systematically constructed Environmental Code, structured in accordance with European regulatory principles. This confirms the finding that Kazakhstan stands out in terms of regulatory comprehensiveness, legal clarity, and alignment with international environmental standards. In contrast, other Central Asian states – notably Kyrgyzstan, Tajikistan, and Turkmenistan – maintain fragmented and outdated regulatory frameworks, a pattern also noted in the works of J. Allen (2018) and H. Buck *et al.* (2023).

A similar level of consistency is observed in relation to the legal implementation of international treaties. B. Libert (2017) and S. Brunelli *et al.* (2022) note that, although countries in the region have formally acceded to key conventions (such as Aarhus, Espoo, and Basel), these commitments are not accompanied by effective implementation mechanisms. The present analysis corroborates this finding: across all five countries, there exists a gap between declarative commitments and the actual administrative and legal tools required for the practical enforcement of international environmental obligations. The implementation of procedures concerning access to environmental information and public

participation in environmental decision-making remains particularly weak, undermining the core principles of the Aarhus Convention. These deficiencies highlight both institutional and legal constraints, particularly related to the limited mandates of competent authorities and insufficient financial and technical resources.

At the same time, the results of this study significantly complement, expand upon, and clarify the conclusions of V. Krepl *et al.* (2013), who outlined general trends in the functioning of environmental monitoring systems in Central Asian countries. The analysis identified a range of technical and institutional problems that remain unresolved, particularly in Tajikistan, Uzbekistan, and Kyrgyzstan. In these countries, environmental monitoring systems exhibit a fragmented structure, characterised by periodic disruptions in the collection and processing of environmental data, the absence of a unified digital state register of emissions and pollution, and the lack of standardised methodological approaches for determining baseline indicators.

These deficiencies hinder the timely identification of environmental risks and prevent objective assessments based on technical parameters and quantitative metrics. Furthermore, the integration of environmental monitoring data into national-level decision-making processes remains minimal, which significantly undermines the effectiveness of monitoring activities. In many cases, agencies responsible for collecting environmental information operate with outdated equipment and do not utilise modern digital tools, such as satellite remote sensing, automated air quality sensors, or integrated Geographic Information Systems (GIS).

In the context of implementing international environmental agreements and formulating climate policy, it is essential to consider both global frameworks and local specificities. J. Wisznowski (2024) notes that climate policy frequently encounters contradictions between national ob-

jectives and local realities, complicating its effective implementation. Similarly, J.A. Basseches *et al.* (2022), in their critical assessment of climate conflicts at the US state level, highlight the complexities of coordinating policy decisions within multi-level governance systems – insights that offer a useful comparative perspective for understanding similar challenges in Central Asia. Both studies underscore the importance of enhanced transparency, public engagement, and the development of robust monitoring mechanisms – factors that strongly align with the deficiencies identified in the implementation of environmental agreements across the region.

These findings are consistent with the observations of L. Jalling (2003), who emphasises the institutional inertia rooted in the Soviet period, which continues to shape the structural barriers hindering the modernisation of the regulatory framework for environmental monitoring. In particular, a substantial portion of environmental legislation in Central Asian countries relies on outdated technical standards that do not align with current international practices for the collection, processing, and verification of environmental data. The absence of political will to digitalise this sector, coupled with insufficient funding and a lack of technical expertise, exacerbates the region's technogenic vulnerability and reduces its capacity for early response to environmental threats (Buribayev *et al.*, 2020).

Regarding the legal regulation of water use – an issue of critical importance in the context of the Aral Sea crisis – the findings align with the analyses of D. Ziganshina (2022) and H. Nashoonga (2022). The study demonstrates that, despite the existence of international water agreements, the legal framework for the joint management of transboundary resources remains weak and lacks binding dispute resolution mechanisms. This deficiency poses a serious risk to environmental and social security, particularly in border areas

such as the Fergana Valley, Karakalpakstan, and Surkhandarya. Moreover, the lack of effective inter-state mechanisms for compensation for environmental damage remains a persistent challenge, as also noted in the work of T. Goeschl (2008).

Issues concerning property rights to natural resources revealed further significant disparities. The study by S. Robinson *et al.* (2017) highlighted that legal uncertainty surrounding pastoral land use undermines both environmental and social stability in Kyrgyzstan and Tajikistan. The present analysis confirms these findings, additionally revealing that legal conflicts between traditional practices and modern land legislation continue to persist in Uzbekistan following recent land use reforms.

In addition, the results of the analysis expand the existing analytical base required for a comprehensive assessment of climate policy in Central Asian countries, taking into account legal, institutional, and managerial dimensions. As noted by D.Y. Park and O. Parviz (2016), most climate strategies in the region are characterised by a declarative nature – that is, formal adoption without the corresponding implementation and monitoring mechanisms. The present findings confirm and elaborate on this thesis, revealing the absence of legally binding regulatory frameworks related to climate change adaptation at the national level, particularly in Tajikistan and Turkmenistan. This legislative gap impedes the establishment of effective climate risk management systems, constrains the development of adaptive measures, and creates significant barriers to fulfilling international obligations, especially within the framework of the UN Framework Convention on Climate Change. Consequently, the effectiveness of financial and technical support provided through multilateral climate mechanisms, such as the Green Climate Fund, is substantially diminished. The discrepancy between formal international commitments and actual enforcement practices

points to a structural instability in climate governance across the region (Kovach *et al.*, 2024).

In the broader context of environmental policy under authoritarian political regimes, the study's findings align with the conclusions of C. Buranelli (2023), who argues that weak legal institutions, coupled with the absence of political competition, severely hinder the institutionalisation of environmental agendas. This analysis develops that concept further by examining specific institutional mechanisms, demonstrating that in states with centralised models of public administration – particularly Turkmenistan and Uzbekistan – environmental institutions are largely limited to a nominal existence. These bodies lack autonomy, financial independence, and decision-making authority, resulting in the effective marginalisation of environmental concerns within the national governance architecture.

In their study, A. Pfeiffer *et al.* (2016) examine the environmental challenges facing Central Asia, particularly the consequences of the Soviet legacy and the impacts of climate change. The authors highlight that large-scale irrigation projects implemented during the Soviet era have led to the significant depletion of water resources, especially in the Syr Darya and Amu Darya River basins, contributing to the desiccation of the Aral Sea and widespread environmental degradation. Furthermore, they draw attention to the inefficiencies in managing industrial and domestic waste in the region's expanding urban centres, which further exacerbate environmental issues. These factors, combined with the growing impact of climate change, pose serious threats to environmental security in Central Asia. A. Pfeiffer and C. Hepburn (2016) stress the need for both national and regional measures to secure a sustainable future for the region by 2050. These conclusions align with the present study's findings, which likewise identify substantial problems in water resource management and

weaknesses in environmental legislation across Central Asian states.

Thus, the findings of this study are largely consistent with previous scholarly work, confirming the key challenges and further clarifying them from a legal perspective. At the same time, the study contributes to the existing body of literature by providing specific examples of regulatory frameworks and highlighting gaps in enforcement practice. The data collected represent a valuable addition to the theoretical development of environmental law in post-Soviet states and offer prospects for advancing models of legal integration and interstate environmental governance in Central Asia.

### **Conclusions**

The study found that the legal regulation of environmental safety in the countries of Central Asia demonstrates significant differences, both in terms of the level of detail in regulatory legal acts and the effectiveness of their implementation in practice. The analysis revealed that the basic constitutional provisions establishing the foundations of environmental policy range from declarative formulations to structured and specified norms, indicating uneven development of legal systems in the field of environmental protection. This creates substantial challenges for the implementation of effective technical and administrative mechanisms for monitoring and managing natural resources.

According to qualitative indicators, notable gaps were identified in the implementation of international environmental agreements, particularly the Aarhus Convention. These include limited access to environmental information due to the absence of open and user-friendly electronic platforms; insufficient transparency in decision-making procedures, with limited and formal public consultations; and a declarative or absent system of independent environmental expertise.

Furthermore, the weak role of civil society organisations, coupled with legal and procedural barriers that do not fully comply with international obligations – as well as limited funding and technical support – result in uneven implementation of norms, diminished public trust, and a heightened risk of social conflicts, especially in cross-border contexts.

The technical analysis of environmental monitoring systems revealed unstable operation and a low level of digital integration, as well as the absence of unified standards for data processing and exchange, all of which reduce the effectiveness of environmental control. It was found that outdated technologies and infrastructure constrain the ability to respond promptly to environmental threats and hinder the formation of a comprehensive environmental risk management system.

The situation regarding the regulation of transboundary water use is particularly critical, with a significant impact on the region's ecological security. The lack of effective legal and technical regulatory mechanisms creates risks of conflict and environmental disasters. In this context, the inadequacy of water resource monitoring systems and joint management mechanisms limits the potential for sustainable development and adaptation to climate change. The practical results of the study confirm the necessity of modernising the regulatory framework, taking into account the latest technical solutions in environmental

monitoring, particularly the implementation of digital platforms, satellite observation systems, and automated data collection technologies.

It is recommended to strengthen the institutional capacity of authorised bodies and to develop unified data standards and reporting procedures, which will enhance the transparency and efficiency of natural resource management. A key area of focus should be the creation of mechanisms for interstate coordination and information exchange, to optimise the management of transboundary ecosystems.

The limitation of the study was the insufficient openness of data in the technical field of environmental control, as well as restricted access to domestic protocols and technological regulations. This has led to partial incompleteness of the technical analysis and highlights the need to expand the empirical base in future research. To improve outcomes, a more in-depth examination of the implementation of specific technological solutions in environmental monitoring is required, along with an assessment of their impact on the effectiveness of regulatory compliance.

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## Правове регулювання забезпечення екологічної безпеки в країнах Центральної Азії

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### Анотація

Метою дослідження було вивчення правових механізмів забезпечення екологічної безпеки в країнах Центральної Азії. Було проведено поетапний аналіз нормативно-правової бази, починаючи з конституційного рівня та поширюючись на галузеве законодавство та інституційну підтримку. У дослідженні розглядалися транскордонні екологічні загрози в Центральній Азії, зокрема деградація водних ресурсів у басейнах Сирдар'ї та Амудар'ї, а також транскордонне забруднення повітря у Ферганській долині. Низька ефективність існуючих угод пояснювалася відсутністю спільних механізмів моніторингу, невідповідністю стандартів та обмеженою юридичною відповідальністю сторін. Діяльність Міжнародного фонду порятунку Аральського моря була оцінена як фрагментована та недостатньо інтегрована в національну політику. Були визначені структурні бар'єри та умови для ефективної координації екологічних питань між країнами регіону. Порівняльний аналіз законодавчих баз показав, що лише Казахстан має повністю кодифікований та оновлений корпус екологічного законодавства, тоді як інші держави продовжують спиратися на бази, створені в 1990-х роках, які не адаптовані до сучасних викликів, таких як зміна клімату чи цифровізація екологічного управління. Інституційні моделі також суттєво відрізняються: Казахстан та Узбекистан рухаються до консолідації та цифровізації органів екологічної політики, тоді як Таджикистан і Туркменістан зберігають жорстко централізовані та менш ефективні структури. Серйозну загрозу регіональній безпеці становлять понад 90 радіаційно небезпечних об'єктів у Киргизстані, які можуть вплинути на сусідні екосистеми у разі техногенної аварії. Дослідження показало, що транскордонне співробітництво залишається значною мірою декларативним, а міжнародні конвенції впроваджуються лише у фрагментарній формі. Результати дослідження підтвердили

необхідність комплексного перегляду правової бази екологічної безпеки, посилення міждержавної координації та розробки ефективних механізмів реалізації екологічних прав та зобов'язань на регіональному рівні. Практичне значення дослідження полягає в його потенційному застосуванні для вдосконалення національного екологічного законодавства країн Центральної Азії, розробки спільних міжурядових угод з охорони навколишнього середовища та надання рекомендацій міжнародним організаціям, що займаються наданням екологічної допомоги та інтеграцією екологічної політики в регіональні стратегії розвитку

**Ключові слова:** інституційна взаємодія; транснаціональні виклики; інституційна ефективність; транскордонне співробітництво; техногенні ризики; конституційні гарантії навколишнього середовища