

Manuscript ID:
IJRSEAS-2025-020521



Quick Response Code:



Website: <https://eesrd.us>



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DOI: 10.5281/zenodo.17708028

DOI Link:
<https://doi.org/10.5281/zenodo.17708028>

Volume: 2

Issue: 5

Pp. 118-122

Month: October

Year: 2025

E-ISSN: 3066-0637

Submitted: 10 Sept. 2025

Revised: 15 Sept. 2025

Accepted: 10 Oct. 2025

Published: 31 Oct. 2025

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How to cite this article:

Kumar, R. (2025). National
Environmental Policies of Central
Asian States: A Comparative Study.
*International Journal of Research
Studies on Environment, Earth, and
Allied Sciences*, 2(5), 118–122.
<https://doi.org/10.5281/zenodo.17708028>

National Environmental Policies of Central Asian States: A Comparative Study

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Abstract

The Central Asian states of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan face formidable environmental problems, namely the scarcity of water, desertification, climate change, and the consequences of pollution from industries which have been handed down from Soviet times. These problems are interlinked; thus, the poor management of water resources increases desertification, while the effects of climate change aggravate the strains in respect of resources which exist in the region. This large comparative study examines in detail the national environmental policies of these five countries by making use of a wide variety of official documentation emanating from the governments involved, ratified international environmental agreements and critical evaluations of performance carried by various international agencies upon the different states. The major findings are revealed that there is marked difference in the extent to which policies have been evolved and implemented in practice in respect of these countries. All the Central Asian states have in some way or the other embraced in an official capacity international environmental agreement, for instance the Paris Agreement, and are working towards evolving national policies geared towards the promotion of renewable energy resources and adaptation to climate change, but the problems of institutional weakness and inadequate access to funds have inhibited their advancement. Kazakhstan and Uzbekistan show more advances in respect of institutional development and legislative efforts in respect of environmental governance. Kyrgyzstan and Tajikistan, on the contrary, appear to be engaged in developing adaptation strategies which are directed towards the lessening of adverse effects of climate change in their largely mountainous countries as for example the retreat of glaciers and increased hydrometeorological risk. Turkmenistan at present is more concerned about energy efficiency measures which comes within the ambit of national environmental policy development. The recommendations of this study call for the need for regional cooperation to enable the co-management of shared natural resources and the tackling of transboundary environmental problems, particularly in respect of the continuing problem which attends the Aral Sea. Furthermore, a strong need has been shown for effective methods of acquiring international funding which will help to overcome the limited means which presently exist to achieve long-term sustainable development goals in the region.

Keywords: Central Asia, Environmental Policies, National, Comparative Study, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan

Introduction

The environmental setup of Central Asia consists of dry climate conditions, large steppe areas, and mountainous areas, and interdependent waters arising especially from rivers such as Amu Darya and Syr Darya (Berndtsson and Tussupova, 2020). The environmental issues facing the region are enormous and include desertification, degradation of biodiversity and new climate-related disasters. These items are one reflection of the continued decline in the Aral Sea as well as the lasting effects of past pollution by industrial mining and agriculture (Assubayeva et al., 2022). The development of national environmental policies by the five independent Central Asian republics, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan have developed greatly since the dissolution of the Soviet Union, largely by virtue of their participation in various international treaties such as the Paris Agreement (Kulmatov, 2014). Subsequently, this study will conduct a comparative analysis of the respective national policies of the states in question with respect to their legal infrastructure, institutional arrangements, climate priorities, as well as the ongoing difficulties of implementation. The aim will be to show similarities of approach as well as significant differences in how the states are responding to the major environmental issues facing the region.

Literature Review

Scholarly inquiries have shown that environmental policies have been formally integrated into the governance of Central Asia, as evidenced by the worldwide ratification of the Paris Agreement and the establishment of Nationally Determined Contributions (Prodanova et al., 2020).

Comparative studies identify gaps in climate change adaptation and renewable energy policies on a regular basis, which is mainly due to a reliance on fossil fuel and the political environment (Vakulchuk et al., 2022). Studies of renewable energy policies vary in the support given to them, including feed-in tariffs, operating in Kazakhstan and Kyrgyzstan but with shared problems, including the non-feasibility of the grid (Shadrina, 2019). The United Nations Economic Commission for Europe conducts environmental performance reviews that are critical assessments reporting favourably on regulatory progress, but unfortunately gather regular deficiencies in the implementation (Laldjebaev et al., 2021). The subject of literature extends to transboundary environmental problems, not least conflicts arising from water allocation, and the opinions shared is that these need to be dealt with from an integrated strategy, reducing the risk of conflict (Wineland et al., 2021). The common approach of Central Asian Countries is to reduce environmental degradation and safeguard the Aral Sea, which show the necessity for mutual understanding and peaceful settlement of transboundary water disputes, recognized in the existence of regional agreements (Orynbayev et al., 2024). This being said, amid all these efforts, the area of the policy framework and its handling of the possible problems arising in relation to water resources constitutes a gap in research, which needs a closure (Orynbayev et al., 2024). The object of this study will be to fill this void by giving a systematic analysis of the environmental policy of each state, which will encompass the complete conception of legislative undertakings, strategic plans, and their implementation if there are to be further successes to add to sustainable development and stability in the region.

Methodology

This study employs a comparative qualitative methodology and relies on secondary data collected mainly from national policy documents, Nationally Determined Contributions, Environmental Performance Reviews and various international reports. Data collection involved web searches of topics and focused review of official PDF documents such as UNECE reviews and UNFCCC submissions. The comparative analysis is structured around several criteria including policy frameworks, institutional capacity, climate targets and adaptation. The limitations of this study include its reliance on English-language materials that are in the public domain, as well as the potential for bias in government-produced statistical materials due to their self-reported status.

Comparative Analysis

Kazakhstan

Kazakhstan's environmental policy is underpinned by the 2021 Environmental Code, which ensures the governance of environmental activities, and implements important reforms like tougher pollution control regimes (Tleppayev et al., 2022). An environmental culture is to be instilled through its Taza Kazakhstan concept to galvanize clean-up initiatives, with an estimated 10 million citizens involved (Alimbaev et al., 2020). Climate policy aims at an aim of carbon-neutrality by 2060. Updated Nationally Determined Contribution sees an unqualified 15% cut in green-house gas emissions by 2030 from 1990 levels, across all sectors of the economy (Wang et al., 2019). Kazakhstan is said to enjoy a strong Ministry of Ecology and Natural Resources, though its implementation at sub-national levels is weak (Nurgozhayeva, 2024). Among the considerable problems faced is its reliance on fossil fuels and industrial pollution, a reliance being alleviated using emissions trading and renewable energy auctions (Humbatova, 2022). Kazakhstan faces an imminent threat of dwindling water resources arising from increased consumption levels and lower runoff from neighbouring states, making effective water management core to its national development strategies (Orynbayev et al., 2024). This problem is particularly prevalent given Kazakhstan's geographical and climatic conditions which, by their nature, militate against effective water management (Orynbayev et al., 2024). Its extensive arid territories and isolated geographical formations enforce the great necessity of intensive management of water and natural resource quantities in the preservation of its environmental and socio-economic systems (Orynbayev et al., 2024). E.g., its water security policy faces strictures of aging infrastructure and antiquated management, as shown by recent enquiries into its regulatory structures and institutions of the state (Orynbayev et al., 2024). To ameliorate these conditions, Kazakhstan is promoting actively effective technologies and has entered into international treaties based upon environmental protection and sustainable utilisation of resources (Caporin et al., 2023).

Kyrgyzstan

Kyrgyzstan's policies are oriented towards including environmental safety in national security strategies. It is noteworthy that, according to the 3rd EPR, since 2009 the situation in governance has improved, as in the economy greening policies are being introduced and improvement of natural disaster risk management (АКМАТОВА et al., 2024). Environmental Safety Concept (until 2020), concepts related to biodiversity (2014-2024) emphasize the aspect of adaptation; there are also narrower sectoral plans dedicated to climate change priorities until 2017. The area of renewable energy is formed by certain policy instruments, as, for example, auctions, construction of small hydropower blocs. Institutions such as the State Agency on Environment Protection and Forestry experience funding problems, since 90% of funds are devoted to salaries. Problems of policy include, as weaknesses, fragmentation of management and high reliance on external assistance, while it can be said that the influence of civil society on the shaping of policy, here on a wider scale than in the neighbouring countries. The share of Kyrgyz renewables in the overall share of consumption of energy is about 28%, meaning that here also compared to several countries of Central Asia this layer is larger, giving it the possibility to consider a solid achievement, a physical possibility, just for transition to sustainable energy out of the experience of transition to renewable energy (Caporin et al., 2023). However, the melting of glaciers in neighbouring Tajikistan and in neighbouring Kyrgyzstan due to the climate is one of the biggest threats to the water security of Kyrgyzstan, since these glaciers are one of the basic sources of drinks, irrigation and rest energy (Makhmudov et al., 2023). The decrease of glacial waters makes the

country's reliance greater on increasing unpredictable cross-border flows of water and therefore makes the problems associated with management of water resources and of regional co-operation greater (Orynbayev et al., 2024).

Tajikistan

Tajikistan's framework consists of the Law on Environmental Protection (revised) and the State Environmental Programme (2023–2028), which follow a strategy on sustainable development and the transition to a green economy (Toderich et al., 2004). The revised Nationally Determined Contribution by Tajikistan provides for an unconditional reduction of greenhouse gas emissions in the order of 60–70 % by 2030 compared to 1990, and adaptation efforts focus mainly on the energy, water, and agricultural sectors (Arabov et al., 2024). The fourth Environmental Performance Review records improvements in institutional capacity of the Committee for Environmental Protection, which suggests that it could be possible to elevate it to the status of a ministry to improve coordination. This country has its strengths in the bilateral agreements which attend to transboundary matters, such as pollution management with Uzbekistan; but the other problems relate to insufficient staffing and antiquated regulations. The financial requirements in relation to sufficing for the implementation of climate actions exceed annually 7% of the Gross Domestic Product (Prodanova et al., 2020). Furthermore, Tajikistan has great hydropower potential and critically relies on its extensive glacial systems as the sources of water for this renewable energy potential. But those glaciers are melting progressively because of climate change and present huge water security problems (Makhmudov et al., 2023) (Zhao et al., 2023). This dependence on hydropower is creating a problem for the nation, even though it diminishes the carbon emissions, because at the same time the country is exposed to all the unpredictable circumstances of climate change, and there is a necessity for greater diversity in energy sources and resilient water management systems (Zhao et al., 2023).

Turkmenistan

The environmental policy of Turkmenistan defines the environment as a key priority in state policy. This is reflected in the National Strategy on Climate Change and Nationally Determined Contribution of Turkmenistan, which aims to achieve a 20% reduction in greenhouse gas emissions by 2030 compared to their level in 2010. Adaptation measures are aimed at the agriculture, water management, and health protection sector, supported by the legislative framework, the Renewable Energy Sources Law (applicable from 2021), etc. The institutional structure is characterized by a high degree of centralized decision-making, as the Ministry of Agriculture and Environmental Protection is the main coordination body, although there are serious limitations in terms of transparency. The serious restrictions on non-governmental organization activities because of autocratic governance, and its heavy dependence on fossil fuel utilization. However, they are attempting to reduce the impact of these policies through the implementation of energy efficiency programs (Shen, 2024). This has not solved the problems of Turkmenistan, which has a very dry climate, which is dependent on cross-border water systems, especially the transboundary river systems of Amu Darya, these create great dangers for water deficit and subsequently salinization, which is facilitated by the inefficient use of irrigation methods (Arabov et al., 2024; Didovets et al., 2021). Moreover, the vast reserves of hydrocarbons found in Turkmenistan and the export-oriented energy policy in the energy sector generally outweigh any attempts to diversify its energy generation by solar and wind energy sources. (Radovanović et al., 2021).

Uzbekistan

Uzbekistan's policies are examined in the Concept of Environmental Protection until 2030 and through 2025's Law on Strategic Environmental Assessment, which strengthen the efficacy of impact assessments (Yalbacheva, 2021). The National State of the Environment Report provides such areas of priority as air quality and waste disposal, with the reforms of President Mirziyoyev reforming the heightened status of environmental issues. Climate commitments include updates on NDCs and mean to a green economy, albeit there are no specific reduction targets required by recent submissions. Institutional greatness consists of a great deal of the State Committee for Nature Protection, though centralized authority is made in a way that inhibits cross sectoral action. Fundamental issues relate to the restoration of the Aral Sea and water tensions, addressed by regional funds (Kaipnazarov, 2021). Uzbekistan's decarbonisation of its energy sector is central to national policy aiming at net zero emissions by 2050, largely through changes to renewable energy sources such as solar and wind, revamping of the existing power grid, and undertaking energy efficiency measures (Kamolov et al., 2025). These things find foundations in national strategies, such as the "Strategy of Actions for the further development of Uzbekistan in 2017–2021" and the more recent "Uzbekistan - 2030" strategy, which lay down plans in detail for the further extension of "green" technology and enhancement of energy efficiency in economic and environmental areas (Arabov et al., 2024).

Cross-Country Comparison

Aspect	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Key Legal Framework	Environmental Code (2021)	Environmental Safety Concept	Law on Environmental Protection	National Strategy on Climate Change	Concept until 2030
GHG Reduction Target (by 2030)	15–25% from 1990	Not specified in detail	50–70% from 1990	20% from 2010	Focus on green economy

Institutional Strength	Strong ministry, local weaknesses	Fragmented, aid-dependent	Committee, staffing issues	Centralized, low transparency	Large committee, hierarchical
Adaptation Focus	Energy efficiency, RES	Mountain ecosystems, disasters	Water, agriculture	Water management, forestry	Aral Sea, air quality
Challenges	Fossil fuels, pollution	Funding, coordination	Resources, standards	Participation, finance	Implementation, cooperation

All states show policy awareness of environment-security links but lack substantive integration, with intra-country disparities larger than inter-country ones. Renewable energy policies vary, with Kazakhstan leading in auctions and Kyrgyzstan in small hydro. Regional cooperation through bodies like the International Fund for Saving the Aral Sea is essential but hampered by financing gaps.

Conclusion

After gaining independence, the Central Asian countries introduced sophisticated environmental norms that respected international standards such as the Paris Agreement. However, implementation is inconsistent owing to the institutional capacity, financing, and political structure of each country. Kazakhstan and Uzbekistan have more clearly defined conditions, while the rest of the region depends heavily on external aid. The recommendations for increasing the resilience of the region's environment are harmonizing the relevant laws, strengthening the government organizations responsible for environmental control, and strengthening international initiatives, especially in transboundary problems. Future research should focus on the effectiveness of the NDC of each country as well as their acceptance of the relevant SDG considering continuing climate pressures.

Acknowledgment

I, Rakesh Kumar, Asst. Prof, Dept. of Geography, Murarka College, Sultanganj, TMBU, Bhagalpur do hereby confirm that there has been no financial support extended to me by any institution to carry out these works and also that there has been no Conflict of Interest to carry out these works and get published.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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