

NATIONAL DEVELOPMENT PROSPECTS IN THE PRISM OF CLIMATE CHANGE CHALLENGES

BABAEVA IRODAKHON

Doctoral Researcher at UWED

Abstract. *This article examines the Republic of Uzbekistan's domestic adaptation efforts to the effects of climate change. With an emphasis on essential industries like agriculture, water resources, and energy —areas most susceptible to climate risks—it examines current policies, institutional processes, and regulatory frameworks to improve climate resilience. Global sustainability trends, national climate programs, and their conformity with international obligations are considered. The report also examines the difficulties and opportunities for bolstering Uzbekistan's adaptation plans. The drying of the Aral Sea, desertification, land degradation, temperature changes, and the increased frequency of natural disasters are among Uzbekistan's urgent environmental issues, driven by its arid climate, expanding population, and reliance on agriculture. Notwithstanding these obstacles, the nation has launched several programs to lessen the effects of climate change and actively participates in international climate agreements, such as the Paris Agreement. Agriculture, energy adaptability, and water management have all seen notable advancements. However, more must be done to strengthen policy execution, innovate technology, and improve infrastructure to increase climate resilience. Long-term sustainability depends on bolstering cross-sectoral collaboration, securing additional funding, and integrating climate adaptation into national development plans. To ensure successful climate adaptation in Uzbekistan, this study emphasizes the need for ongoing advancements in regional cooperation, scientific research, and governance.*

Keywords: *climate change, adaptation, Uzbekistan, sustainable development, water resources, agriculture, energy, renewable energy sources, climate risk.*

Introduction

In recent years, issues related to adaptation to climate change and mitigation of its negative consequences have become central to the Republic of Uzbekistan's sustainable development strategy. Due to its high vulnerability to climate change, Uzbekistan consistently raises issues related to environmental and climate risks at all significant international and regional platforms.

Some of the country's most acute problems are the drying up of the Aral Sea, progressive desertification and land degradation, changes in the temperature regime, and the increasing frequency of natural disasters.



This is open-access article
distributed under the terms of
the **Creative Commons**
Attribution 4.0 International License

This vulnerability determines Uzbekistan's active participation in international climate initiatives. For example, the Uzbek delegation participated in the 28th and 29th Conferences of the Parties to the UN Framework Convention on Climate Change, held in Dubai and Baku, respectively, and attended by the President of the Republic of Uzbekistan for the first time. This underscores the country's commitment to the climate agenda and its determination to contribute to global efforts to combat climate change.

The President of the Republic of Uzbekistan's speech at COP28, President Shavkat Mirziyoyev, not only highlighted the negative trends of climate change affecting the Central Asian region but also proposed several practical initiatives aimed at mitigating climate impacts. Among the proposed measures, special attention is paid to developing comprehensive programs to restore ecosystems, improve water management, switch to renewable energy sources, and reduce greenhouse gas emissions.

Meanwhile, during COP-29, broadening technical assistance from major nations and multilateral organizations to address the climate challenges faced by developing countries led to the proposal to establish an International Center for Assessing Climate Losses and Damages.

Emphasizing the need to develop unified approaches to preventing pollution of transboundary water resources and preserving sustainable biodiversity, the Head of our state advocated elaboration of the Declaration on Obligations to Ensure the Health and Environmental Safety of River Ecosystems under the auspices of the United Nations. Establishing a regional bank of genetic resources in Uzbekistan was also proposed to increase plant resistance to climate change, as was the UN Agro-Industrial Innovation Hub for landlocked countries.

Climate change poses one of the most serious threats to the socio-economic development of States worldwide. The Republic of Uzbekistan, a country with a continental climate, faces acute problems related to temperature changes, decreasing water resources, and the increasing frequency of extreme weather events. These factors pose serious challenges to the national economy, especially to agriculture and water resources, which are critical to the country's sustainability.

Scope and Methods of Research

This article analyzes the measures taken by Uzbekistan to adapt to climate change and considers the prospects for further development of climate policy. In addition, as part of the scientific analysis of these issues, it should be noted that Uzbekistan's climate policy aims to fulfill its international obligations under the Paris Agreement and to establish

national adaptation mechanisms. In particular, it is worth mentioning the program for reforestation and stabilization of the Aral Sea ecosystems, the development of new agricultural practices that are resistant to a changing climate, and the improvement of water management systems to minimize losses and increase the efficiency of water resource use in light of our reduction.

Prospects for developing Uzbekistan's national climate policy depend on integrating mitigation and adaptation efforts in economic sectors such as agriculture, energy, and water, as well as increased international cooperation to mobilize financial resources and introduce advanced technologies.

A comprehensive methodological approach was used to write this article, including analysis of Uzbekistan's legal and regulatory framework, the state strategy on climate change, and reports of international organizations. The following methods were used within the framework of the research: normative acts, such as the Law "On Nature Protection", as well as international agreements to which Uzbekistan has acceded; comparative analysis of climate policies in other Central Asian countries to assess the effectiveness of Uzbekistan's approaches; expert interviews with representatives of scientific and governmental structures dealing with climate change.

Core Issue

Uzbekistan, a country highly vulnerable to climate change, faces increasing environmental challenges, including water scarcity, desertification, and extreme temperatures. In response, the government has implemented domestic measures, including policy reforms, climate adaptation programs, and sustainable resource management initiatives. However, gaps remain in financing, technological advancement, and institutional capacity. This article examines Uzbekistan's current adaptation strategies, evaluates their effectiveness, and explores prospects for strengthening climate resilience through policy innovation, international cooperation, and sustainable development practices.

1. Legislative and institutional measures

Uzbekistan has various legislative acts and regulatory documents aimed at addressing climate change. One of the most important documents is the National Strategy to Combat Climate Change, approved in 2020. This strategy envisages reducing greenhouse gas emissions, improving water management, introducing sustainable agro-technologies, and developing renewable energy sources. There is also a law "On Nature Protection", which regulates legal relations in environmental protection and provides measures to adapt to climate change. The central bodies

responsible for implementing environmental and climate policy are the Ministry of Ecology, Environmental Protection and Climate Change of the Republic of Uzbekistan, and other relevant agencies.

The Republic of Uzbekistan joined the Paris Agreement in 2017, committing to combat climate change. As part of these commitments, in 2019, a Strategy for Transition to a Green Economy for the period 2019-2030 was developed. The key objectives of this strategy are to increase the energy efficiency of the national economy, rationalize the use of natural resources, and develop renewable energy technologies. An essential step towards reducing the carbon footprint was the adoption of the Updated National Greenhouse Gas Emissions Reduction Plan in 2021. Under this plan, Uzbekistan committed to reducing CO₂ emissions per unit of GDP by 35% by 2030 compared to the 2010 baseline.

To diversify the energy sector and minimize dependence on fossil fuels, the republic is actively developing the potential of renewable energy sources (RES). The first significant successes were achieved in 2021 with the launch of one of the largest solar photovoltaic plants (SPP) in Central Asia in Navoi. Subsequently, in December 2023, five Solar power plants in different regions - Samarkand, Jizzakh, Surkhandarya, Bukhara, and Kashkadarya - were connected to the national grid. A wind power plant (WPP) in Navoi was also commissioned. These projects have become key elements of the national energy strategy aimed at increasing the share of RES in the country's energy balance.

Currently, 12 major projects are underway to build "green" power plants and energy storage systems, implemented in cooperation with international companies from Saudi Arabia, UAE, China, France and Switzerland. In 2024, it was planned to increase the total capacity of solar power plants to 2.6 gigawatts and wind farms to 900 megawatts, and to launch energy storage devices with a total capacity of 400 megawatts.

One promising area is the production of "green" hydrogen, which became possible after the launch of the first production in the Tashkent region in 2023. By 2030, the share of renewable sources in the total electricity generation structure is planned to increase to 40%.

In parallel with efforts to decarbonize the energy sector, climate change adaptation projects are being actively implemented in the country. One significant achievement was the implementation of 15 projects under the Clean Development Mechanism of the Kyoto Protocol. Special attention is paid to water-saving technologies, which have already been implemented on 27% of agricultural land. Until 2030, it is planned to plant 26.2 thousand hectares of protective forest plantations and

expand the use of drought-resistant and low-water crop varieties to increase the sustainability of the agricultural sector.

Particularly significant measures are being taken to minimize the environmental impacts of the drying of the Aral Sea. Successful afforestation programs on the 2 million hectares of dried seabed contributed to reducing air pollution in the Aral Sea region. By 2030, it is planned to develop an additional 600,000 hectares of green areas, bringing the greening area to 80% of the former Aral Sea bed.

2. Adaptation in the agriculture sector.

Agriculture is one of the most vulnerable sectors of Uzbekistan's economy. Due to increasing average annual temperatures and decreasing water resources, the country is actively implementing measures to adapt to changing conditions. In particular, this includes transitioning to water-saving technologies such as drip irrigation, using drought-resistant crops, and optimizing land use to reduce environmental impact.

The Decree of the President of the Republic of Uzbekistan "On measures to create a climate-resilient agro-ecosystem and increase the resilience of agricultural producers to the risks associated with climate change", in the context of global climate change, is an essential step in the realization of the strategy of adaptation of the agricultural sector of the country to climate challenges. This document is aimed at systemic modernization of agrarian production, taking into account climate risks and increasing the resilience of agroecosystems to extreme climatic conditions.

The main objective of this decree is to form a sustainable agroecosystem capable of adapting to climate change through the introduction of innovative agricultural practices and technologies for the sustainable use of natural resources, as well as improving the skills of farmers and agrarian producers. Adapting agricultural production to drought, water scarcity, and changes in the temperature regime is important.

The Key Areas of Implementation of the Resolution are:

1. Development of climate-resistant agricultural technologies: Introducing drip irrigation technologies and other water-saving methods is a priority in addressing water scarcity. These technologies increase crop productivity and reduce water losses.

2. Crop adaptation: it is planned to breed and introduce high-yielding and drought-resistant crop varieties, which will reduce the adverse effects of climate change on the agricultural sector. This is especially relevant in a changing temperature regime and increasing frequency of droughts.

3. Increasing producers' resilience to risks: The decree provides support to agricultural producers through the provision of subsidies, grants, and soft loans for the introduction of innovative technologies aimed at reducing the risks associated with climate change.

4. Institutional support and coordination: considerable attention is given to establishing effective institutions and coordination mechanisms between ministries and agencies to ensure an integrated approach to agro-ecosystem sustainability.

5. International cooperation and scientific research: The document emphasizes the need to intensify cooperation with international organizations such as the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Environment Program (UNEP), as well as with scientists and research centers working on agricultural adaptation to climate change.

Special attention is paid to developing legal and regulatory frameworks to support innovation and investment in agricultural technologies that ensure food security in the context of climate change. The document also sets tasks to improve monitoring of climate risks and to develop an early warning system, enabling a prompt response to unfavorable climatic events.

Thus, this decree represents a significant step towards transforming Uzbekistan's agro-industrial complex towards sustainable development and adaptation to climate change. It establishes mechanisms to protect farmers and agricultural enterprises from climatic risks and lays the foundation for the country's long-term, sustainable agricultural development.

3. Water resources management

Uzbekistan, located in Central Asia, faces significant challenges in managing its water resources due to its arid climate, growing population, and reliance on agriculture. The country primarily relies on two major river systems, the Amu Darya and Syr Darya, which are shared with neighboring countries, making transboundary water management a critical issue. Uzbekistan's water resources heavily depend on upstream countries like Kyrgyzstan and Tajikistan, where the main rivers originate. This reliance creates a need for international cooperation to ensure equitable water distribution. Internally, Uzbekistan has a network of reservoirs, canals, and pumping stations to distribute water, but these systems often suffer from aging infrastructure and high-water losses. Over-extraction of water has led to the desiccation of the Aral Sea, one of the world's worst environmental disasters. This has resulted in severe ecological damage, health issues, and economic losses for the region. Rising temperatures

and unpredictable weather patterns are expected to reduce water availability and increase competition for resources.

Uzbekistan has developed a comprehensive legislative framework to address its water management challenges, reflecting the importance of water as a critical resource for agriculture, industry, and domestic use. The country's legal system is designed to regulate water use, ensure equitable distribution, promote sustainable practices, and address transboundary water issues.

The government of Uzbekistan has implemented policies to improve water management, including adopting the Water Code and establishing Basin Irrigation System Authorities. The Water Code serves as the cornerstone of Uzbekistan's water legislation. It outlines the principles for water use, conservation, and management. The midpoints of the Code are recognition of water as state property, prioritization of water use for drinking, agriculture, and environmental needs, regulation of water withdrawals, and the issuance of permits for usage.

The organizational structure and structure of the central apparatus of the Ministry of Water Resources of the Republic of Uzbekistan were approved by the Decree of the President of the Republic of Uzbekistan No. PP-5055 dated April 6, 2021. This document defines the Ministry of Water Resources' main activities, including the widespread adoption of resource-saving technologies and advanced foreign experience, the introduction of digital technologies, the application of market economy principles, public-private partnerships, and outsourcing mechanisms in the water sector. The above decision of the head of state raised the level of control in the water sector of the country through the reorganization of the State Inspectorate for Control and Supervision of Technical Condition and Safety of Large and Especially Important Water Management Facilities under the Ministry into the State Inspectorate for Control over Safety of Water Management Facilities under the Cabinet of Ministers of Uzbekistan.

At the same time, the establishment of the Center for implementing foreign investment projects in the water sector under the Ministry of Water Resources and the Agency for implementing capital construction projects in the water sector was approved. Large-scale measures to reform the water sector implemented in the country will serve as an essential basis for improving the population's welfare and creating conditions for sustainable development not only in Uzbekistan but also across the whole Central Asian region.

4. Energy policy and climate in Uzbekistan.

Uzbekistan's energy sector is also changing to adapt to climate change. The country is actively developing renewable energy sources, including solar and wind power plants. One of the main goals of the energy

strategy is to reduce the country's carbon footprint and phase out fossil fuels. Introducing renewable energy sources helps reduce emissions and increases the country's energy independence.

Uzbekistan's energy system is closely integrated with those of neighboring Central Asian states, which contributes to its reliability. A significant development in 2019 was the unbundling of the electricity sector into three parts — generation, transmission, and distribution — which enabled more flexible and efficient management of energy resources. As of 2021, the installed capacity of generation facilities amounted to 15.8 GW, dominated by gas-fired power plants and hydroelectric and coal-fired plants.

Two key strategic programs were adopted for the industry's long-term development: the Strategy for Transition to a Green Economy and the Concept of Electricity Supply for 2020-2030. These documents aim to reduce energy intensity, develop renewable energy sources, and support projected annual growth in electricity consumption of 6-7%. Compliance with the Paris Agreement commitments is an important part of the strategic plans.

One significant step was modeling the transition to zero carbon emissions by 2050, which will require an investment of \$94 billion. The Energy Management Act, first enacted in 1997, remains an essential legislative framework, with 2020 updates that gave the Department of Energy authority to improve energy efficiency.

Developing and implementing roadmaps for energy efficiency and renewable energy development remains essential. From 2019 to 2021, an energy sector digitalization program was in place, enabling better management and control of energy consumption in the country. Current projects also include introducing advanced technologies in hydropower and other types of alternative energy sources.

Executive Summary

Uzbekistan's domestic climate change adaptation measures demonstrate significant progress in water management, agriculture and energy. Nevertheless, significant challenges remain. One of the main barriers is insufficient funding for climate projects, which limits opportunities for the broader adoption of modern technologies. In addition, there is a need to more closely integrate international standards into the national climate policy, which will require greater interaction with international organizations.

The prospects for developing Uzbekistan's climate policy largely depend on successfully implementing existing strategies and introducing innovative solutions. An important step forward will be the involvement of the private sector and foreign investment in developing sustainable

technologies and strengthening the research base for more accurate forecasting and mitigation of climate change.

Strengthening the institutional framework for implementing climate programs is also an important development area. In this context, it is necessary to improve monitoring systems, assess the impact of climate change across sectors of the economy, and develop flexible mechanisms to respond to emerging climate risks.

The scientific community of Uzbekistan actively discusses climate change and the need to adapt to new conditions. Scientists emphasize strengthening national measures to reduce the vulnerability of key sectors of the economy, such as agriculture and water management. According to the authors, water-saving technologies and improvements in energy efficiency are essential for adaptation. The need for increased investment in green economy projects, including private sector involvement and international support, is also noted.

A.Khujaev considers key aspects of water resources and their management in the context of climate change. Climate impacts, along with population growth and economic development, entail negative economic and social consequences for Uzbekistan and the entire region, jeopardizing water, food, and energy security and exacerbating environmental problems.

Uzbekistan is implementing essential measures to adapt to the impacts of climate change, including modernizing water resources, introducing sustainable agricultural technologies, and developing renewable energy. However, for the successful development of the country's climate policy, additional efforts are needed to attract investment, improve the legal framework, and develop international cooperation.

Prospects for further development include greater use of international standards and technologies, stronger cooperation with international institutions, and the introduction of innovations in agriculture and energy. Effective climate policy implementation will enhance the sustainability of the country's economy and improve the quality of life for its population.

It is necessary to underscore:

First, to prioritize approving a low-carbon energy transition roadmap for the electricity sector and developing a long-term national energy strategy. The strategy should include clear targets to meet the country's commitments under the Paris Agreement and to achieve net-zero emissions in the energy sector by 2050.

Second, consider establishing an Energy Efficiency Fund as a self-sustaining body. It is necessary to consider a revolving fund model that

shifts from state and local budget allocations to revenues generated by energy efficiency projects and energy service companies (ESCOs).

Third, introduce public awareness campaigns to inform the public about the many benefits of energy efficiency. Consider establishing sustainable energy information centers to promote energy efficiency and renewable energy.

Bibliography

1. Abashidze, A. et al., 2018. Current problems of international environmental law. RUDN University Repository. Available at: <https://repository.rudn.ru/ru/recordsources/recordsource/10331/> [Accessed 31 July 2025].
2. Abdullaev, I. and Rakhmatullaev, S., 2015. Water management in Central Asia: Challenges and prospects. Springer.
3. Asian Development Bank, 2021. Climate and energy policies in Central Asia. Available at: <https://www.adb.org> [Accessed 31 July 2025].
4. Food and Agriculture Organization of the United Nations (FAO), 2021. Sustainable agricultural practices and water management in Uzbekistan. Available at: <https://www.fao.org> [Accessed 31 July 2025].
5. Government of Uzbekistan, 2021. Nationally Determined Contributions (NDC) under the Paris Agreement. Available at: <https://unfccc.int> [Accessed 31 July 2025].
6. Khuzhaev, A., 2023. The role of Uzbekistan in overcoming climate challenges. UzA. Available at: https://uza.uz/ru/posts/rol-uzbekistana-v-preodolenii-klimaticheskix-vyzovov_543533 [Accessed 31 July 2025].
7. Law of the Republic of Uzbekistan "On measures to increase the effectiveness of reforms aimed at the transition of the Republic of Uzbekistan to a green economy until 2030", 2022. Available at: <https://lex.uz/en/docs/6303233> [Accessed 31 July 2025].
8. Law of the Republic of Uzbekistan "On Nature Protection", 1992. Available at: <https://www.lex.uz/acts/7065> [Accessed 31 July 2025].
9. Micklin, P., 2014. The Aral Sea disaster and water policy in Uzbekistan. *Global Environmental Change*, 29, pp.302–315.
10. Organisation for Economic Co-operation and Development (OECD), 2022. Environmental performance of Uzbekistan: Policies and progress.
11. President of the Republic of Uzbekistan, n.d. Address by the President of the Republic of Uzbekistan Shavkat Mirziyoyev at the UN Climate Change Conference (COP28). Available at: <https://president.uz/en/lists/view/6897> [Accessed 31 July 2025].
12. President of the Republic of Uzbekistan, n.d. Address by the President of the Republic of Uzbekistan Shavkat Mirziyoyev at the UN Climate Change Conference (COP29). Available at: <https://president.uz/en/lists/view/7690> [Accessed 31 July 2025].

13. Resolution of the President of the Republic of Uzbekistan "On measures to create a climate-resistant agroecosystem and increase the resilience of agricultural producers to risks associated with climate change", 2024. Available at: <https://lex.uz/ru/docs/6982708> [Accessed 31 July 2025].
14. Resolution of the President of the Republic of Uzbekistan "On measures to further improve the activities of the Ministry of Water Resources of the Republic of Uzbekistan", 2021. Available at: <https://lex.uz/docs/5360482> [Accessed 31 July 2025].
16. Tursunov, M., 2018. Renewable energy development in Uzbekistan: Challenges and strategies. *Energy Policy Journal*, 47(2), pp.109–121.
17. United Nations Development Programme (UNDP) Uzbekistan, 2021. Supporting low-carbon development in Uzbekistan. Available at: <https://www.uz.undp.org> [Accessed 31 July 2025].
18. United Nations Development Programme (UNDP) Climate Promise, n.d. Ensuring a green future for Uzbekistan through 1 billion trees, by Matilda Dymovska. Available at: <https://climatepromise.undp.org/news-and-stories/ensuring-green-future-uzbekistan-through-1-billion-trees> [Accessed 31 July 2025].
19. United Nations Economic Commission for Europe (UNECE), 2017. Water management in Central Asia: Regional overview and policy recommendations.
20. UzDaily, n.d. In 2024, Uzbekistan plans to increase the total capacity of FES to 2.6 gigawatts, WES - up to 900 megawatts. Available at: <https://www.uzdaily.uz/ru/uzbekistan-v-2024-g-planiruet-dovesti-obshchuiu-moshchnost-fes-do-26-gigavatta-ves-do-900-megavatt/> [Accessed 31 July 2025].