

PROBLEMS OF TRANSBOUNDARY WATERS AND REGIONAL COOPERATION IN UZBEKISTAN

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Abstract: *Uzbekistan is a country dependent on transboundary water resources in Central Asia, and the growth of population, agriculture, and energy demand is increasing water scarcity and environmental problems. The Aral Sea crisis is recognized as the largest consequence of this process. Although there are studies on water resources management in the region, Uzbekistan's experience in integrating political, economic, and environmental cooperation mechanisms over transboundary waters has not been sufficiently studied. The research is based on the analysis of historical and modern documents, international agreements, and state strategies. The distribution of water in the Amu Darya and Syr Darya basins, the efficiency of irrigation systems, and the water–energy balance were comparatively evaluated. Mismanagement of the Amu Darya and Syr Darya flows accelerated the drying of the Aral Sea, resulting in climate change, soil salinization, and negative impacts on public health. Existing irrigation systems have a high level of water loss, and water consumption significantly exceeds international standards. In recent years, water-saving technologies (drip irrigation, laser leveling), digital monitoring systems, water–energy cooperation, and water diplomacy have been developed. New mechanisms for the use of water resources among neighboring countries are being established at the initiative of Uzbekistan. The study shows that water security must be addressed beyond national borders. For sustainable development, environmental security, and regional integration, it is necessary to ensure fair distribution of transboundary waters, the wide introduction of innovative technologies, and the strengthening of international cooperation.*

Keywords: *transboundary waters, Aral Sea crisis, Amu Darya, Syr Darya, water resources management, Central Asia, water scarcity, environmental problem, irrigation system, agriculture, water-saving technologies, international cooperation, sustainable development, interregional agreements, water policy, environmental security, water diplomacy, integration, alignment of neighboring countries' interests*

Introduction

Uzbekistan is located in the center of Central Asia, and water resources play a crucial role in ensuring the country's socio-economic development, agriculture, industry, energy, and ecological stability. The main water sources in the republic are the Amu Darya and Syr Darya rivers. Since a large part of these rivers flow from neighboring countries, nearly ninety percent of Uzbekistan's water supply depends on external sources. Therefore, the management of transboundary waters and their fair distribution is of strategic importance for Uzbekistan. One of the most severe ecological crises caused by the mismanagement of water resources is the Aral Sea disaster. From the second half of the

twentieth century, most of the waters of the Amu Darya and Syr Darya were directed to irrigated lands, as a result of which the area and volume of the sea sharply decreased. This process led to the degradation of the ecological environment in the Aral Sea region, air pollution, climate change, soil salinization, and deterioration of public health. Today, the Aral Sea region is recognized as a zone of global ecological catastrophe. Agriculture holds a leading position in Uzbekistan's economy, and irrigation is the main factor. However, existing irrigation systems are mostly outdated and characterized by high water losses. Therefore, the wide introduction of water-saving technologies, such as drip irrigation and laser leveling, has become urgent. At the same time, rapid population growth and the inclusion of new lands into irrigation are further intensifying water scarcity. Water resources are not only an economic but also a political factor. Uzbekistan conducts constant dialogue with neighboring states on the use of water. In recent years, several initiatives have been put forward among Central Asian countries to create a coordinated approach to the management of water and energy resources, take into account mutual interests, and cooperate for sustainable development. Water diplomacy has become an important tool for ensuring regional security and stability today.

Method

In order to mitigate future water scarcity and prevent conflicts over transboundary waters, several tasks must be implemented. First, the wide application of water-saving technologies, balancing water and energy use, ensuring ecological security, and reaching agreements with neighboring countries on the basis of mutual trust are considered priority directions. Accelerating ecological restoration processes in the Aral Sea region in cooperation with international organizations and donors is also a pressing issue. From this perspective, the management of transboundary waters in Uzbekistan is of priority importance not only at the national but also at the international level. Decisions on water resources cannot be made within the framework of a single state, but must be formed on the basis of regional interests. All Central Asian countries have their own priorities in water use: mountainous countries tend to develop hydropower, while lowland countries mainly rely on irrigated agriculture. This requires maintaining a constant balance in water distribution. In recent years, Uzbekistan's foreign policy has placed special emphasis on strengthening regional cooperation. Constructive dialogue has been established with neighboring countries through water diplomacy. At Uzbekistan's initiative, joint projects on the use of water resources are being developed, and international programs aimed at ensuring ecological security and supporting sustainable development in the Aral Sea region are being implemented. In particular, with the cooperation of the UN and other international organizations, ecological restoration and socio-economic development programs have been introduced, which play an important role in ensuring regional stability.

In addition, scientific research and the introduction of innovative technologies are of great importance in managing water resources. Through modern hydrological monitoring systems, satellite data, modernization of irrigation systems, and the wide use of water-saving technologies, it is possible to increase the efficiency of water resources. At the same time, raising the culture of water-saving among the population remains one of the urgent tasks.

Result and Discussion

In addressing the issues of transboundary waters and regional cooperation in Uzbekistan, the legal framework for the use of water resources is also of great importance. Since independence, the republic has relied on several international documents and conventions in forming its water policy.

These include the UN “Convention on the Protection and Use of Transboundary Watercourses and International Lakes,” the “Principles of Equitable Use of Water Resources,” as well as international programs aimed at mitigating the Aral Sea crisis, which are regarded as important directions in Uzbekistan’s foreign policy. In the management of water resources in the region, economic interests are often closely linked with political issues. For example, mountainous countries tend to release more water in winter for electricity generation, while lowland countries need more water in summer for irrigation. Therefore, the issue of water–energy exchange requires constant balance. Uzbekistan’s diplomatic approach is aimed at finding such a balance and taking into account the interests of all parties. Climate change is also identified as a separate threat in the future of water resources. Due to global warming, rapid glacier melting, decreased precipitation, and weakened ecosystems, Central Asian states may face even more serious water shortages. Therefore, it is necessary to implement a development policy based on sustainability from today, develop scientifically grounded strategies, and prioritize water conservation at the national and regional levels.

The Aral Sea region is not only an ecological but also a social and economic source of problems for Uzbekistan. The standard of living, health, and social well-being of the population living here are facing many difficulties. Therefore, joint programs for the restoration of the Aral Sea have been developed within the framework of international cooperation, and measures are being taken to improve the living conditions of millions of people. In the process of solving the issues of transboundary waters and regional cooperation in Uzbekistan, raising ecological awareness among the population is also of special importance. Rational use of water resources does not depend only on state policy or technical measures, but directly affects the ecological culture of the wider public. Promoting water-saving habits, strengthening environmental education in the education system, and regularly explaining the importance of water resources to the population will bring significant results in the future.

Furthermore, the development of science and technology also plays an important role in this field. Modernization of hydraulic structures, reducing losses in reservoirs and canals, and controlling water distribution through artificial intelligence and digital technologies are increasingly possible. In Uzbekistan, a policy of “digital transformation” in water management is being implemented, aimed at accurately accounting for existing resources and increasing efficiency. At the regional level, it is necessary to strengthen constant dialogue mechanisms in the management of water resources. Regular meetings, the activity of joint commissions, and the involvement of international experts within the framework of water diplomacy help to mitigate problems. Such an approach makes it possible to harmonize common interests not only in water distribution but also in the fields of energy, transport, and ecology.

Today, gender issues also require special attention in water management. Water scarcity directly affects living standards, particularly the lives of women and children. Therefore, it is appropriate to take into account the principles of social equality and justice in water management policies and to involve all segments of the population in decision-making processes.

Conclusion

Future prospects show that water resources will remain one of the most important factors of regional security in Central Asia. Therefore, Uzbekistan is striving not only to develop national programs for water management but also to strengthen international cooperation. The support of initiatives aimed at sustainable development, ecological restoration, and economic opportunities in the

Aral Sea region is a clear example of this. Thus, although the issues of transboundary waters and regional cooperation in Uzbekistan are multifaceted and complex, they can be mitigated through sound policies, modern technologies, international cooperation, and an environmentally conscious society, leading towards sustainable development. Transboundary waters and regional cooperation issues in Uzbekistan are of decisive importance for the country's economic, ecological, and political stability. The dependence of water resources mainly on external sources, the consequences of the Aral Sea crisis, high water consumption in agriculture, and problems caused by climate change further increase the urgency of this issue. Moreover, water resources are closely linked not only with economic interests but also with regional security and stability. The most important tasks facing Uzbekistan and neighboring countries in the future are the wide introduction of water-saving technologies, balancing water and energy use, ensuring ecological security, supporting socio-economic recovery in the Aral Sea region, and strengthening international cooperation. At the same time, harmonizing common interests through water diplomacy and regional integration will remain the guarantee of peace, prosperity, and sustainable development in Central Asia.

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