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The Problem and Solution of Water Scarcity in Uzbekistan On the Example of The Development of The Jizzakh Steppe

Shapiev Shavkat Tursunovich

Senior Teacher, Jizzakh State Pedagogical University, Department of General History, Uzbekistan

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Abstract: Uzbekistan, located in Central Asia, has limited water resources, which makes their management particularly relevant. Effective water management, as exemplified by the integrated development of the Jizzakh steppe, is one of the important factors for the sustainable development of Uzbekistan, ensuring food security, protecting ecosystems and improving the quality of life of the population.

Keywords: Ecosystem, climate, optimization, modernization, eco-education, drip irrigation.

Introduction: Water resources are one of the key factors determining the sustainable development of any country, especially in the context of global climate change and increasing pressure on natural ecosystems. The Republic of Uzbekistan, located in Central Asia, faces unique challenges in managing its water resources. The country is characterized by a continental climate, which leads to significant variations in the distribution of precipitation and, as a result, to a shortage of fresh water.

Uzbekistan has several large rivers, among which the Amu Darya and Syr Darya stand out, which are the main sources of water supply for agriculture and the population. However, despite the presence of these reservoirs, the country experiences an acute shortage of water resources, which is caused by both natural factors and human activity. Intensive irrigation of agricultural lands, inefficient use of water resources and pollution of water bodies lead to deterioration of water quality and a decrease in the availability of clean fresh water [1].

In recent decades, Uzbekistan has taken active steps to improve water management, including the introduction of modern irrigation technologies, the development of water monitoring and control systems, and international cooperation in water management. However, to achieve sustainable water management, it is necessary to take into account not only economic but also environmental aspects, as well as the social needs of the population.

The purpose of this article is to analyze the current state of water resources in Uzbekistan, identify the main problems and challenges facing the country, and consider possible ways to solve them in the context of sustainable development.

Uzbekistan's water resources are under pressure from both natural factors and human activities. One of the most serious challenges is climate change, which is increasing the frequency and intensity of droughts and changing precipitation patterns. These changes have a negative impact on agriculture, which relies heavily on irrigation. With limited water resources, farmers are faced with the need to optimize their irrigation methods and choose crops that are more drought-resistant.

In addition, the problem of water pollution requires urgent attention. Industrial emissions, agricultural runoff and unauthorized waste dumping lead to deterioration of water quality, which threatens the health of the population and the ecosystem. It is important to note that water pollution not only reduces the availability of clean water, but also increases the cost of its purification, which in turn affects the economic sustainability of the country.

In response to these challenges, Uzbekistan is actively developing water management strategies. One of the key areas is to adopt the experience of integrated irrigation of the Jizzakh steppe in the 1970s and the subsequent introduction of drip irrigation technologies, which can significantly reduce water consumption and increase crop yields. During the years of low water and low precipitation in 1974-1975, the Jizzakh steppe showed that, thanks to the high level of the engineering system that allows managing the water-air regime, melioration well-being was preserved here due to the systematic use of drainage water for irrigation and the development of the drainage system. Developing in an integrated manner, the Golodnosteppe massif turned into a powerful industrial zone, the total gross production of which reached half a billion rubles at that time. The water use system created here reduced water losses and has the highest efficiency. The accelerated development of lands and irrigation systems, followed by high yields of cotton and fruit and vegetable products, required a radical change in the approach to this enormous work, the technology of development based on broad industrialization [2].

Today, based on Uzbekistan's past experience, an important step for the competent distribution of water has become the creation of monitoring systems that allow tracking the state of water resources in real time, which contributes to more efficient distribution and use of water. These systems help identify problem areas where leaks or inefficient use of water occur, and allow for prompt response to emerging problems.

However, despite the measures taken, serious challenges remain that require a comprehensive approach. Further work is needed to raise public awareness of the importance of rational use of water resources and environmental protection.

An important step in this direction is the implementation of educational programs and campaigns aimed at raising public awareness of the importance of water resources and the need for their careful use. The participation of educational institutions, non-governmental organizations and local communities in these initiatives can significantly increase the level of awareness and involvement of citizens in water management processes.

One of the famous authors in this field is Professor Alisher Tursunov, who studies hydrological processes and their impact on agriculture. His works are devoted to the issues of irrigation optimization and rational use of water resources. And also the honored irrigator of Uzbekistan, Doctor of Technical Sciences Dukhovny Viktor Abramovich in his scientific work "Water management construction and experience of land development of the Hungry Steppe" - where he indicated the development of measures to combat salinization of irrigated lands based on drainage and leaching. [2] In addition, an important contribution to the study of water resources is made by international organizations and experts working in Uzbekistan, such as the United Nations Development Program "UNDP"

and the "World Bank", which support projects on sustainable water resources management.

METHOD

Uzbekistan is one of the countries with high levels of water stress, which is caused by both natural factors and human activity.

One of the main problems that Uzbekistan faces is the inefficient management of water resources. The irrigation system used in the country is often characterized by low efficiency, which leads to significant water losses. In addition, the pollution of

water bodies caused by industrial waste and agricultural chemicals aggravates the situation [3] .

Another important issue is climate change, which affects the level of available water resources. Increased temperatures and changes in precipitation patterns can lead to reduced river flows and deterioration of water quality.

To address water resource issues, Uzbekistan needs to develop an integrated approach to water resource management that takes into account both economic and environmental aspects.

One of the key areas is the modernization of irrigation systems. The introduction of modern technologies, such as drip irrigation and automated control systems, can significantly improve the efficiency of water use. These technologies help minimize losses and ensure a more rational distribution of water resources, which is especially important in conditions of limited reserves.

It is also necessary to pay attention to the restoration and protection of water bodies. Cleaning rivers and water bodies from pollutants, as well as restoring ecosystems associated with water resources, will help improve water quality and increase its availability. It is also important to develop environmental protection programs that will be aimed at preventing water pollution and preserving natural resources.

International cooperation is also an important aspect. Uzbekistan shares its water resources with neighboring countries, and effective water management requires coordinated actions at the regional level. Establishing a dialogue with neighboring countries, joint water management projects, and sharing experiences can contribute to more sustainable use of water resources in Central Asia. Water Resources Issues

1). "Overuse": One of the main causes of water depletion is the uncontrolled use of water in agriculture. Crops that require a lot of water, such as cotton, require significant amounts of irrigation.

2) “Water Loss”: The efficiency of irrigation systems in Uzbekistan leaves much to be desired. Outdated technologies lead to significant water losses due to evaporation and leakage.

3) "Environmental Problems": Pollution of water bodies also creates significant problems. The use of pesticides and fertilizers in agriculture and the discharge of wastewater into rivers worsen the quality of water [4].

POSSIBLE SOLUTIONS

1) "Modern Irrigation Technologies": The introduction of more efficient irrigation systems such as drip irrigation will help to significantly reduce water consumption and increase crop yields.

2) “Sustainable water management”: The development and implementation of a comprehensive water management strategy will optimize their use and reduce the level of losses.

3) “International cooperation”: Uzbekistan should actively cooperate with neighboring countries in the field of transboundary water resources management. This includes data exchange, joint projects and coordination of water resource volumes.

4) “ Eco-education ”: Raising awareness among the population about water resource problems and ways to solve them will help stimulate a more responsible approach to water use.

CONCLUSION

One of the key aspects is the need to develop and implement innovative technologies for monitoring and managing water resources. The use of satellite technologies and remote sensing systems can help in monitoring the state of water bodies, as well as in assessing the efficiency of irrigation and identifying problem areas. Such technologies can form the basis for creating a unified information system that will be available to both government agencies. It is also worth paying attention to the need to create economic incentives for the rational use of water. The introduction of a water tariff system based on the principles of sustainable use can contribute to a more careful attitude to water. For example, farmers who use modern irrigation methods and save water can receive tax breaks or subsidies, which will stimulate them to implement efficient technologies [5].

Water shortage in Uzbekistan requires a comprehensive and multi-sectoral approach to solving the problem. It is necessary to introduce modern irrigation technologies, develop infrastructure for water reuse and raise awareness of the population about the rational use of water resources. International cooperation and integration of local knowledge also play a key role in effective water management. It is important to create economic incentives for sustainable use of water and develop educational programs to train specialists in this field. Only through joint efforts can we ensure sustainable development and improve the quality of life of the population.

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