BG Pulse Journal USA
ISSN:1947-2536 http://www.bgpulseusa.com/index.php/bg
BG PULSE JOURNAL

SCIENTIFIC, ECOLOGICAL AND LEGAL FOUNDATIONS OF WATER RESOURCES PROTECTION

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Abstract: This paper analyzes the scientific, ecological, and legal foundations of water resources protection based on a comprehensive approach. The study scientifically substantiates the natural water cycle, factors affecting the quantitative and qualitative indicators of water resources, the increasing anthropogenic pressure, and water scarcity problems under climate change conditions. Furthermore, it highlights ecological mechanisms for ensuring the sustainability of aquatic ecosystems, preserving biodiversity, and preventing water pollution.

Keywords: water resources, water protection, rational water use, environmental safety, water pollution, water quality, surface and groundwater, wastewater, water monitoring, sustainable development, environmental protection, water legislation, water law, environmental control, water resources management.

Introduction: Today, water resources are considered one of the most strategically important natural assets worldwide. Due to population growth and the expansion of industrial and agricultural activities, the demand for water is increasing every year. This issue is particularly significant for countries located in arid and semi-arid regions. On February 3, President Shavkat Mirziyoyev reviewed a presentation focused on ensuring the efficient use of water resources and the widespread implementation of water-saving technologies. To date, the total area utilizing water-saving technologies in our country has reached 2.6 million hectares, accounting for 60 percent of all irrigated land.

For comparison, prior to 2017, the total area under water-saving technologies in the republic amounted to a mere 19,000 hectares. As a result of these efforts, an annual saving of 2.5 billion cubic meters of water is currently achieved. Today's presentation examined new proposals designed to further expand the scope of these initiatives. Specifically, it is planned to install water-saving technologies on an additional 930,000 hectares of land by 2028, thereby increasing the total coverage to 3.5 million hectares, or 80 percent of the total irrigated land. Consequently, this will enable the conservation of 3.5 billion cubic meters of water annually, improve the water supply for 300,000 hectares of land, and create opportunities for the irrigation

of secondary crops. Therefore, special attention should be paid to water resource management and protection in the process of training qualified specialists.

The ecological basis for protecting water resources from pollution, contamination, and depletion lies in the fact that water is an integral component of ecosystems and a fundamental factor ensuring life on Earth. Since water is an inseparable part of nature's holistic system, its pollution, contamination, toxicity, or quantitative reduction can trigger negative processes within ecosystems, disrupt biological balance and the exchange of matter and energy, and adversely affect flora, fauna, and human health. Preventing such situations helps maintain optimal natural conditions within ecosystems and supports the evolutionary development of the biosphere.

Main Part: For this reason, ensuring the ecological balance of water resources and protecting them from pollution and depletion are of great importance. All natural phenomena and geological formations are interconnected and exist in a state of dynamic equilibrium. This principle of dialectical materialism directly applies to water resources because all waters in nature—atmospheric moisture, rivers, lakes, seas, oceans, and groundwater—constitute a unified and dynamically interconnected system.

This objective law of nature was identified by the prominent Russian scientist Academician V.I. Vernadsky, who emphasized in his works during the 1920s and 1930s that disturbances in the natural balance of water systems should not be allowed. He argued that water use policies must be based on the principle of the unity of all waters in nature. According to this concept, the withdrawal of water from any source inevitably affects the natural balance and causes changes in both the quantity and quality of water resources.

Based on this principle, efforts should focus on minimizing such negative impacts. Where complete elimination is impossible, highly effective mitigation measures must be developed and implemented. Achieving this objective requires a thorough understanding of natural equilibrium. The protection and rational use of water resources must be carried out continuously. This process should not be limited to recording cases of pollution or depletion and imposing legal sanctions on offenders. Rather, it requires the implementation of scientifically grounded measures based on an understanding of natural laws and the identification of both natural and anthropogenic factors contributing to water pollution, depletion, and wasteful consumption.

Consequently, water resource protection should begin at the stage of water formation and include the development of technical measures aimed at preserving both the quantity and quality of surface and groundwater resources.

Based on the above considerations, water resource protection can be defined as a system of scientifically grounded legal, organizational, social, technical, and economic measures aimed at preventing water pollution, contamination, depletion, and inefficient use caused by natural and anthropogenic factors.

The legal framework for the use and protection of water resources includes the concept and characteristics of legal protection, the regulation of transboundary water resources, and liability for violations of legislation concerning the use and protection of water bodies. One of the primary objectives is to reduce or completely eliminate wastewater discharge through various supporting measures. In the process of water use, the common goal of all protection measures is the conservation of water resources. In other words, protecting water resources should not be limited to restrictions and prohibitions alone. It is equally important to promptly eliminate inappropriate practices, establish preventive measures, and avoid potential mistakes.

The legal foundations of water resource use and protection have been examined through the analysis of scientific and legal literature. When analyzing the process of water use, it is necessary to pay attention to another important issue. No country in the world utilizes irrigated agricultural land to the same extent as Uzbekistan, where almost 100 percent of agricultural land is dependent on irrigation. In the Central Asian region, particularly in Uzbekistan, precipitation is virtually absent during the summer vegetation period of crops. Therefore, maintaining soil moisture is possible only through irrigation practices. This situation requires not only a high level of responsibility but also considerable financial resources.Uzbekistan differs significantly from other countries both in terms of the importance of the water management system for cultivating irrigated lands and achieving high crop yields, and in terms of the amount of state funding allocated to this sector.

It is well known that developed countries place great emphasis on improving irrigation technologies. Although advanced irrigation methods require higher initial capital investments, they make it possible to save both water and labor resources. This is especially important in countries where labor costs are high.

The concept, characteristics, and specific features of water use rights and protection mechanisms have been studied. It has been established that collecting and utilizing reliable information serves as an important basis for the efficient and sustainable management of water resources.

Conclusion: In conclusion, there is no universal method for ensuring the qualitative protection of water resources. The primary approach is to reduce or completely eliminate wastewater discharges, which can be achieved through a range of complementary measures.

The protection of water resources during their use is a common objective shared by all management and conservation strategies. In other words, safeguarding water resources should not be limited solely to prohibitions and restrictions. It is equally important to prevent inappropriate practices, develop preventive measures in advance, and avoid potential errors that may negatively affect water resources. The legal foundations of water resource use and protection were analyzed based on available literature sources. The concepts and specific features of water use rights and water protection mechanisms were studied, and relevant information was collected. Furthermore, different forms of water use, the rights and obligations of water users, and measures aimed at protecting water use rights were examined.

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